SESSIONAL PAPERS

VOLUME 14

FIRST SESSION OF THE ELEVENTH PARLIAMENT

OF THE

DOMINION OF CANADA

SESSION 1909

VOLUME XLIII

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TO THE

SESSIONAL PAPERS

OF THE

PARLIAMENT OF CANADA

FIRST SESSION, ELEVENTH PARLIAMENT, 1909

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Arranged in Numerical Order, with their titles at full length; the dates when Ordered and when Presented to the Houses of Parliament; the Name of the Senator or Member who moved for each Sessional Paper, and whether it is ordered to be Printed or Not Printed.

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Printed for both distribution and sessional papers

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3. Estimates of the sums required for the services of Canada for the year ending 31st March, 1910. Presented 1st February, 1909, by Hon. W. Paterson.

Printed for both distribution and sessional papers.

4. Estimates of the sums required for the services of Canada for the year ending on the 31st March, 1909. Presented 15th March, 1909, by Hon. W. S. Fielding.

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4*a*. Further Supplementary Estimates of sums required for the service of Canada for the fiscal year ending 31st March, 1909. Presented 10th May, 1909, by Hon. W. S. Fielding.

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5. Supplementary Estimates of sums required for the service of Canada, for the fiscal year ending on 31st March, 1910. Presented 10th May, 1909, by Hon. W. S. Fielding.

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5*a*. Further Supplementary Estimates of sums required for the service of Canada, for the year ending on 31st March, 1910. Presented 18th May, 1909, by Hon. W. S. Fielding.

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6. List of Shareholders in the Chartered Banks of Canada, as on 31st December, 1908. Presented 13th May, 1909, by Hon. F. Oliver.

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7. Report of dividends remaining unpaid, unclaimed balances and unpaid drafts and bills of exchange in Chartered Banks of Canada, for five years and upwards, prior to 31st December, 1908.. .. ..*Printed for both distribution and sessional papers.*

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8. Report of the Superintendent of Insurance for the year ended 31st December, 1908.
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9. Abstract of Statements of Insurance Companies in Canada, for the year ended 31st December, 1908... .. ..*Printed for both distribution and sessional papers.*

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10. Report of the Department of Trade and Commerce, for the fiscal year ended 31st March, 1909. Part I.—Canadian Trade. Presented 27th January, 1909, by Hon. W. Paterson.
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10*a*. Report of the Department of Trade and Commerce, Part II, Trade of Foreign Countries and Treaties and Conventions, for the fiscal year ended 31st March, 1908. Presented 5th April, 1909, by Sir Wilfrid Laurier.
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11. Tables of the Trade and Navigation of Canada, for the fiscal year ended 31st March, 1908. Presented 21st January, 1909, by Hon. W. Paterson.
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12. Inland Revenues of Canada. Excise, &c., for the fiscal year ended 31st March, 1908. Presented 21st January, 1909, by Hon. W. Paterson.
Printed for both distribution and sessional papers.

13. Inspection of Weights, Measures, Gas and Electric Light, for the fiscal year ended 31st March, 1908. Presented 21st January, 1909, by Hon. W. Paterson.
Printed for both distribution and sessional papers.

14. Report on Adulteration of Food, for the fiscal year ended 31st March, 1908. Presented 11th March, 1909, by Hon. W. Templeman.
Printed for both distribution and sessional papers.

15. Report of the Minister of Agriculture, for the fiscal year ended 31st March, 1908. Presented 21st January, 1909, by Hon. S. A. Fisher.
Printed for both distribution and sessional papers.

15*a*. Report of the Dairy and Cold Storage Commissioner, for the fiscal year ended 31st March, 1908. Presented 21st January, 1909, by Hon. S. A. Fisher.

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20*c*. Third Report of the Board of Railway Commissioners for Canada, to 31st March, 1907, for the year ending 31st March, 1908. Presented 29th January, 1909, by Hon. G. P. Graham.. .. ..*Printed for both distribution and sessional papers.*

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25*c*. Correspondence and papers, including financial statement, relating to Seed Grain Distribution of 1908 in the provinces of Saskatchewan and Alberta. Presented 28th January, 1909, by Hon. F. Oliver.. ..*Printed for both distribution and sessional papers.*

25*d*. Return to an order of the House of Commons, dated 1st March, 1909, showing how many bushels of seed wheat were bought for Saskatchewan and Alberta for the season of 1908, whom it was bought from, at what price, and what grade it was; if the wheat so bought was cleaned for seed; how the wheat so bought was used; who it was sold to, and at what prices; the total loss in connection with the wheat so bought. Presented 15th March, 1909.—*Mr. Sharpe (Lisgar).. .. ..Not printed.*

25*e*. Return to an order of the House of Commons, dated 1st March, 1909, showing how many bushels of English oats were bought for seed in Saskatchewan and Alberta for the season of 1908, and at what prices; the condition the oats were in before or when they were bought; if used for seed or sold; whom they were sold to and in what places; the total loss in connection with the oats bought in England, and any complaints there were about them. Presented 15th March, 1909.—*Mr. Sharpe (Lisgar).....Not printed.*

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26*a*. Summary Report of the Mines Branch of the Department of Mines, for the nine months ended 31st December, 1908..*Printed for both distribution and sessional papers.*

27. Report of the Department of Indian Affairs, for the year ended 31st March, 1908. Presented 22nd January, 1909, by Hon. F. Oliver.
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29. Report of the Secretary of State of Canada, for the year ended December, 1907, and the first three months of the year 1908 Presented 22nd January, 1909, by Hon. C. Murphy.. .. ..*Printed for both distribution and sessional papers.*

30. Civil Service List of Canada, 1908. Presented 22nd January, 1909, by Hon. C. Murphy.
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31. Report of the Board of Civil Service Examiners, for the year ended 31st December, 1908.
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32. Annual Report of the Department of Public Printing and Stationery, for the fiscal year ended 31st March, 1908. Presented 7th May, 1909, by Hon. C. Murphy.
Printed for both distribution and sessional papers.

33. Report of the Joint Librarians of Parliament for the year 1908. Presented 21st January, 1909, by the Hon. the Speaker.. .. ..*Printed for sessional papers.*

34. Report of the Minister of Justice as to Penitentiaries of Canada, for the fiscal year ended 31st March, 1908. Presented 21st January, 1909, by Hon. W. Paterson.
Printed for both distribution and sessional papers.

35. Report of the Militia Council, for the fiscal year ended 31st March, 1908. Presented 9th March, 1909, by Sir Frederick Borden.
Printed for both distribution and sessional papers.

35*a*. Memorandum respecting the estimates for Militia and Defence for 1909-10. Presented 9th March, 1909, by Sir Frederick Borden.
Printed for both distribution and sessional papers.

36. Report of the Department of Labour, for the fiscal year ended 31st March, 1908. Presented 21st January, 1909, by Hon. R. Lemieux.
Printed for both distribution and sessional papers.

37. Report upon the Survey of the Georgian Bay Ship Canal, with plans and estimate of cost.. .. ..*See No. 19a.*

38. Report of the Hon. Mr. Justice Cassels, Commissioner appointed to investigate the affairs of the Department of Marine and Fisheries. Presented 22nd January, 1909, by Hon. L. P. Brodeur.. .. ..*Printed for both distribution and sessional papers.*

38*a*. Minute of a Report of the Committee of the Privy Council, approved by His Excellency the Governor General on the 29th March, 1909:—The Committee of the Privy Council have had under consideration a report, herewith, dated 27th March, 1909, from the Minister of Marine and Fisheries, upon the investigation recently held by the Honourable Walter Cassels respecting the statement contained in the Report of the Civil Service Commission reflecting upon the integrity of officials of the Department of Marine and Fisheries and submitting certain recommendations affecting the officials therein named. The Committee, concurring in the said Report and the recommendation therein contained, submit the same for Your Excellency's approval. Presented 30th March, 1909, by Hon. L. P. Brodeur.
Printed for both distribution and sessional papers.

39. Report of the Royal Commission appointed to inquire into industrial disputes in the cotton factories of the province of Quebec. Presented 25th January, 1909, by Hon. R. Lemieux.. .. ..*Printed for both distribution and sessional papers.*

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tractors or sub-contractors on Districts B and F after mentioned, as to classification or alleged over classification on Districts B and F of the Eastern Division of said railway, and of all estimates, returns, certificates, memoranda, statements or writings, showing classification or over-classification of the cuttings and work on said Districts B and F. Presented 22nd April, 1909.—*Mr. Lennox*.. .. ..*Not printed.*

46*g*. Return to an order of the House of Commons, dated 26th January, 1909, showing the names of all persons appointed to office or employment by the Transcontinental Railway Commission since its creation, showing the county or city from which such person came, the office or employment to which he was appointed, the date of appointment, the salary and allowances attached thereto, the place or district where the work of each employee is done, and the total amount paid each year for all such services up to the end of December, 1908. Presented 22nd April, 1909.—*Mr. Foster*.. .. .. ..*Not printed.*

46*h*. Return to an order of the House of Commons, dated 3rd March, 1909, for a copy of all tenders received for the construction of the following sections of the Eastern Division of the National Transcontinental Railway, together with the itemized schedules of the engineer's estimates of quantities on which the award of contracts was based, the sections referred to being those mentioned in the answer of the Minister of Railways and Canals in the House on the 13th April, 1908, as follows:—

STATEMENT NO. 1.—COMMISSIONERS—EASTERN DIVISION.

Mileage from Moncton.		Description.	No. of One Miles.	Amount of Estimate on which Contracts were let.	Date of	
From	To				Contract.	Completion.
				$ cts.		
0·00	50·00	Moncton to near Chipman	50·00	989,895 20	Mar. 14, '07	Sept. 1, '08
50·00	58 55	Near Chipman easterly 8·55 miles	8·55	289,190 62	Aug 23, '07	Aug. 1, '08
58·55	97·60	Near Chipman westerly to I.C.R. crossing	39·05	767,434 95	Mar. 28, '08	Sept. 1, '10
97·60	164 00	I.C.R. crossing to Mile 164	66·40	1,898,124 21	" 28, '08	" 1, '10
164·00	195·80	Mile 164 to Grand Falls	31·80	1,646,253 65	" 28, '08	" 1, '10
195 80	256·68	Grand Falls to New Brunswick boundary	60·88	1,385,941 09	" 9, '07	" 1, '08
256·68	309 74	N.B. boundary to 150 miles east of Quebec Bridge	5 143·06	2,377,409 60	" 28, '08	" 1, '10
309 74	459·74	From Quebec Bridge 150 miles eastward.. Quebec Bridge link (not included in estimate	8·89 1·11	5,011,346 50	" 9, '07	" 1, '09
459 74	509·74	Quebec Bridge westerly 50 miles	50·00	1,489,537 92	May 15, '06	" 1, '07
509 74	609·74	50 miles west Quebec Bridge to 150 miles west	100·00	3,807,719 54	" 15, '06	" 1, '07
609·74	654·74	150 miles west Quebec Bridge to near Waymontachene	45·00	1,691,073 41	Mar. 14, '07	" 1, '08
654·74	656·07	To be included in this contract	1 33			
656·07	877·75	Near Waymontachene to near Harricanaw River	221·68	Not let.		
877·75	1,027·75	Near Harricanaw River to Junction T. & N. O. Ry.	150·00	3,986,901 42	" 14, '07	" 1, '09
1,021·75	1,127·75	Junction T. & N. O. Ry. for 100 miles west.	100·00	3,936,566 00	" 28, '08	" 1, '10
1,027·75	1,171·85	100 miles west of Junction T. & N. O. Ry. to west end of District 'D'	44·10	Not let.		
1,171·85	1,334·35	West end of District 'D' westerly	162·50	"		
1,334·35	1,409·35	From 19½ miles west of Mud River, easterly.	75·00	2,101,499 88	" 28, '08	" 1, '10
1,409·35	1,429·76	" " " to west end of District 'E'	20 41	Not let.		
1,429·76	1,557·80	From westward District 'E' to Lake Superior Junction	128 04	"		
1,557·80	1,804·66	From Lake Superior Junction to west bank of Red River	246·86	13,010,398 92	May 15, '06	" 1, '07

Presented 26th April, 1909.—*Mr. Lennox*.. .. ..*Not printed.*

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64. Return to an order of the House of Commons, dated 1st February, 1909, showing what sums of money have been paid each of the several holders of stock in the Quebec Bridge Company on account of stock, bonus and interest, respectively; and what amount remains to be paid and to whom. Presented 8th February, 1909.—***Mr. Foster.***
Not printed

65. Return to an order of the House of Commons, dated 1st February, 1909, showing what disposition has been made in detail of the vote of $25,000 under Miscellaneous, for seed grain in Alberta and Saskatchewan. Presented 11th February, 1909, by Hon. F. Oliver.. .. ..*Not printed.*

66. Return to an order of the House of Commons, dated 26th January, 1909, showing in detail the assets amounting to $157,483,926.17 in the balance sheet of Canada on 31st December, 1909. Presented 11th February, 1909.—*Mr. Ames.. .. ..Not printed.*

67. Return to an address of the House of Commons, dated 11th February, 1909, for a copy of the report of the commissioners appointed by the government to inquire into, examine and report upon the branch lines of railway connecting with the Intercolonial Railway; also a copy of the report of the commissioners appointed by the government of the province of New Brunswick to inquire into, examine and report upon the branch lines of railway within said province and connecting with the said Intercolonial Railway. Presented 11th February, 1909.—*Mr. Emmerson.*
Printed for both distribution and sessional papers.

67*a*. Return to an order of the House of Commons, dated 1st February, 1909, showing the tenders called for by the Department of Railways and Canals for 144 miles, more or less, of wire fencing during the summer or fall of 1908, and the advertisements or circulars calling for same: how many tenders were received and from whom; how the contract was let, at what price and to whom; the quantity of wire fencing purchased by the Department of Railways and Canals during 1908, by tender or otherwise, and the prices paid per mile. Presented 2nd March, 1909.—*Mr. Taylor (Leeds).. ..Not printed.*

67*b*. Return to an order of the House of Commons, dated 26th January, 1909, showing, in respect of the following items which appear in the Public Accounts:—

Intercolonial Railway, open account..	$965,418 00
Windsor Branch, open account..	180 34
Prince Edward Island Railway, open account..	19,687 00

(*a*) what proportion of these amounts represents moneys due the government since a date prior to the end of the fiscal year 1906-7; (*b*) what part of the amount thus overdue was incurred in each fiscal year prior to 1906-7; (*c*) a list of the items included in (*a*) which represent an amount exceeding one hundred dollars, with name in each case of debtor, date and nature of services. Presented 4th March, 1909.—*Mr. Ames.*
Not printed.

67*c*. Return to an order of the House of Commons, dated 15th March, 1909, for a copy of the Report of the Conciliation Board in connection with the freight clerks of Halifax and St. John. Presented 23rd March, 1909.—*Mr. Crosby.. .. ..Not printed.*

67*d*. Return to an order of the House of Commons, dated 22nd March, 1909, showing the names of the Intercolonial employees dismissed or suspended during the year 1908, the position held by each, the date of dismissal or suspension, and the special cause alleged therefor; also the names of any such persons so dismissed or suspended who have been reinstated up to 28th February, 1909, and the dates of reinstation. Presented 22nd April, 1909.—*Mr. Foster.. .. ..Not printed.*

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142. Return to an order of the House of Commons, dated 1st March, 1909, showing: 1. At what work the Translation Branch of the House of Commons is employed. 2. The number of permanent translators in this branch. 3. The total amount of salaries paid to these translators. 4. The documents, reports and other matters which have been translated in this branch in the last twelve months, not including the pages already translated in the preceding year and repeated for the purpose of the report, nor the tables already made and translated and repeated for the purpose of completing these reports and documents, which have been most recently translated. 5. The total number of pages translated by the permanent translators. 6. The total number of persons, outside of the Translation Branch, to whom has been given translation work. 7. How much this outside work has cost, and how many pages have been translated in this way. 8. What Blue-books, if any, and other matters, excepting *Hansard*, is translated in other departments other than the Translation Branch of the House of Commons, and in what departments. Presented 19th April, 1909.—*Mr. Boyer.* ***Not printed.***

143. Certified copy of a Report of the Committee of the Privy Council, approved by His Excellency on the 19th April, 1909.—Regulations of the Civil Service Commission with reference to entrance into and promotion in the service. Presented 20th April, 1909, by Hon. C. Murphy.. .. ..***Not printed.***

144. Return to an order of the House of Commons, dated 25th January, 1909, showing all armouries built since 1st July, 1896, giving situation, cost, capacity, officials employed in each, with yearly expenses of each armoury, distributed under the head of maintenance, improvements, extensions and salaries, with the number of troops actually making use of the same, and to what extent each year. Presented 20th April, 1909.—*Mr. Foster*.. .. ..***Not printed.***

145. Return to an address of the House of Commons, dated 22nd March, 1909, for a copy of all correspondence, reports, documents, orders in council, in the possession of the Government relating to the establishment of a Geodetic Service Bureau, and the commencement of a Geodetic Survey in Canada. Presented 20th April, 1909.—*Mr. MacLean (Lunenburg)*.. .. ..*Printed for both distribution and sessional papers.*

145*a*. Supplementary Return to No. 145. Presented 27th April, 1909.
Printed for both distribution and sessional papers.

145*b*. Further Supplementary Return to No. 145. Presented 28th April, 1909.
Printed for both distribution and sessional papers.

146. Return to an order of the House of Commons, dated 17th February, 1909, for a copy of all correspondence respecting the improvements made in the Assiniboia River near Portage la Prairie, in September and October, 1908; and of all papers, vouchers, orders, resolutions, returned cheques, &c., in any way relating to the said work or to carrying out of same. Presented 22nd April, 1909.—*Mr. Staples*.. .. ..***Not printed.***

147. Return to an order of the House of Commons, dated 25th January, 1909, showing the various statistical and special informative publications issued by the several departments of the Government, the number and pages of each, the number and cost of each for the year 1908, the number of persons employed in their preparation, the salaries paid to each person so employed, the number of special employees for engraving or illustrating these publications, and the salaries and expenses of the same, including work and apparatus, the firm or printing company publishing the same, and the amount paid in each case for printing and binding. The above return is not to include the regular reports of the departments, but to be so presented as to show the

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ANNUAL REPORT

OF THE

DEPARTMENT OF THE INTERIOR

FOR THE

Fiscal Year ending March 31, 1908

PRINTED BY ORDER OF PARLIAMENT

OTTAWA
PRINTED BY C. H. PARMELEE, PRINTER TO THE KING'S MOST EXCELLENT MAJESTY.
1909

[No. 25—1909.]

To His Excellency the Right Honourable Sir Albert Henry George, Earl Grey, G.C.M.G., &c., &c., Governor General of Canada.

MAY IT PLEASE YOUR EXCELLENCY:

The undersigned has the honour to lay before Your Excellency the report of the transactions of the Department of the Interior for the fiscal year ending March 31, 1908.

Respectfully submitted,

FRANK OLIVER,
Minister of the Interior.

OTTAWA, September 5, 1908.

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PART II.—IMMIGRATION.

PART III.—SURVEYS.

NOTE.—The remaining schedules, from 13 to 44, inclusive, comprising reports of surveyors and descriptions of surveyed townships, and the maps, will appear with the monograph form only of the Surveyor General's Report.

SESSIONAL PAPER No. 25

PART IV.—CHIEF ASTRONOMER.

NOTE.—This part, comprising the Report of the Chief Astronomer and Appendices, will appear as a separate report, in monograph form.

PART V.—ROCKY MOUNTAINS PARK.

PART VI.—YUKON TERRITORY.

PART VII.—FORESTRY.

APPENDICES.

REPORT

OF THE

DEPUTY MINISTER OF THE INTERIOR

1907-8

DEPARTMENT OF THE INTERIOR,
OTTAWA, September 1, 1908.

The Honourable FRANK OLIVER,
Minister of the Interior.

SIR,—I have the honour to submit the report of the Department of the Interior for the year ending March 31, 1908, being the thirty-fifth annual presentment of the department since its inception in the year 1873.

While the general results obtained were not so satisfactory as for the previous year, as evidenced by the falling off in the number of free homestead entries recorded and in the gross amount of revenue collected, it is gratifying to note that the depression caused by the unfavourable climatic conditions prevailing during the winter of 1906 and the following spring and summer of 1907, has been only of a momentary character and has not perceptibly retarded the progress of the western grain fields.

The grain shortage of 1907, coupled with the temporary financial depression which existed at the time, made it necessary for the government to assist needy settlers with advances of grain so as to enable them to seed their farms last spring, and a special appropriation for this purpose was made by parliament at its last session. Thanks to the active co-operation of the governments of Saskatchewan and Alberta, the purchase and distribution of the grain was effected by the department in a very satisfactory manner, and the present crop prospects are such that there is every reason to believe that the majority of the settlers affected will be in a position to return promptly the amount of the advances made to them. A report was issued some months ago containing full particulars as to the terms of the contracts under which the seed grain was purchased, and as to the methods followed in distributing the same.

On the whole, the season of 1907 has been a difficult one for a large proportion of the western settlers, but it has not been without its compensations. It has demonstrated beyond doubt that if the expectations of one season are not realized, those of the next may safely be relied upon; that on the whole the western farm compares favourably in constant productiveness with the best grain areas in the world, and that the magnificent crops now maturing adequately testify to the sturdiness and intelligence of the present tillers of the soil.

NEW APPOINTMENTS.

The only new appointment at headquarters during the past year was that of Mr. J. A. Coté as assistant deputy minister. The necessity for bringing about such a division of the work as would relieve the deputy head of a portion of the arduous duties devolving upon him became imperetive as a result of the large increase in the business of the department within the past few years. Under the present arrangement, with a judicious apportionment of the work of the office between the deputy head and his assistant, the former will thus be enabled to devote to the general administration of the department such attention as the same demands, which will better ensure the proper carrying out of the regulations.

Mr. Coté has been connected with the department in a permanent capacity since 1882, and having been for the past twenty years attached to the office of the deputy minister, he is in every way specially fitted to discharge satisfactorily the new duties now devolving upon him.

In the outside service the following new appointments were made during the year, namely:—

Mr. Howard Douglas, who had for a number of years past occupied the position of Superintendent of the Rocky Mountains Park of Canada, was appointed to the new position of Commissioner of Dominion Parks on April 1, 1908. Mr. Douglas had heretofore exercised supervision over the several Dominion parks and buffalo reservations in the west ever since the establishment of these reservations, and in view of the fact that it is proposed to place these parks under the control of superintendents it was felt that it would be in the public interest to have a responsible outside officer who would have the general control of the parks and act upon direct instructions from Ottawa. Mr. Douglas has shown himself to be eminently qualified to fill the position of commissioner, and there is no doubt that the general administration of parks will be greatly benefited by the new arrangement.

Mr. G. E. Hunter, who has been employed at the Rocky Mountains Park office for several years past, and whose services have been highly satisfactory, was promoted to the position of superintendent of the park on the first of April last.

In the Dominion lands outside service two new agents were appointed, namely, Mr. K. W. McKenzie as agent for the district of Edmonton, in lieu of Mr. A. G. Harrison, who resigned, and Mr. James Stafford as agent for the district of Lethbridge, in lieu of Mr. J. W. Martin, who was promoted to the position of assistant inspector. Mr. McKenzie's appointment was dated September 16, 1907, and that of Mr. Stafford, July 1, of the same year.

DEATHS.

I regret to report that there were ten deaths in the department during the past twelve months, three at headquarters, four in the Dominion lands service, and three in the immigration branch.

The following is a list of the officials in question, and of the dates of their deaths:—

Head Office—

Mr. Brown-Wallis, September 22, 1907.
Miss Reba Sharp, November 21, 1907.
Miss M. L. Ouimet, August 2, 1907.

Dominion Lands (outside service)—

T. H. Aikman, Crown timber office, Winnipeg, August 22, 1907.
J. W. E. Darby, Dominion lands office, Winnipeg, in March, 1908.
Charles Fisher, on half-breed claim commission, in August, 1907.
James Paisley, Dominion lands office, Brandon, January 14, 1908.

Immigration Branch—

Samuel Gray, Winnipeg office, August 22, 1907.
Joseph Daigle, Montreal office, March 13, 1908.
Thos. Bennett, immigration agent, January 27, 1908.

STATEMENT showing Gross Cash Revenue received from all sources, during the fiscal year ended March 31, 1908, compared with the receipts of the previous twelve months.

Source of Revenue.	Twelve months ended March 31, 1908.	Twelve months ended March 31, 1907.	Increase.	Decrease.	Net Decrease.
	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.
Dominion lands	1,998,219 92	2,125,958 51		127,738 59	
School lands	708,045 83	829,881 90		121,836 07	
Ordnance lands	8,674 95	9,216 59		541 64	
Seed grain	12,899 84	15,016 35		2,116 51	
Casual revenue	20,069 03	13,328 47	6,740 56		
Registration fees	2,256 65	107,407 47		105,150 82	
Fines under the Immigration Act	1,650 00	2,875 00		1,225 00	
Fines and forfeitures, Northwest Territories		21 00		21 00	
	2,751,816 22	3,103,705 29	6,740 56	358,629 63	351,889 07

STATEMENT of receipts of Dominion Lands Revenue for the fiscal year ended March 31, 1908, compared with the receipts for the previous twelve months.

Particulars.	1907-1908.	Twelve months ended March 31, 1907.	Increase.	Decrease.	Net Decrease.
	$ cts	$ cts	$ cts.	$ cts.	$ cts.
Homestead fees	301,693 73	377,043 55		75,349 82	
Improvements	71,139 47	51,221 50	19,917 97		
Sales of lands	656,303 03	721,441 00		65,137 97	
Map sales, office fees, &c.	7,727 29	7,680 38	46 91		
Rental of lands	5,309 01	15,213 44		9,904 43	
Survey fees	141,255 35	74,993 28	66,262 07		
Timber dues	473,608 94	490,048 44		16,439 50	
Grazing lands	43,211 78	59,436 43		16,224 65	
Coal lands	29,697 64	3,803 91	25,983 73		
Hay permits	4,976 45	3,100 15	1,876 30		
Mining fees	130,703 55	126,221 00	4,482 55		
Hydraulic leases	6,248 97	3,844 58	2,404 39		
Dredging leases	19,616 84	4,263 54	15,353 30		
Export tax on gold	70,504 65	128,531 40		58,026 75	
Free miners' certificates	76 25	19,578 34		19,502 09	
Free certificates for export of gold	162 50	266 50		104 00	
Stone quarries	1,270 93	1,526 38		255 45	
Irrigation fees	516 75	589 51		72 76	
Rent of water power	2,640 78	500 00	2,140 78		
Fees re Board of Examiners D.L.S.	690 00	554 00	136 00		
Patent and interchange fees	1,283 50	1,069 00	214 50		
Rocky Mountains Park	27,232 87	21,679 33	5,553 54		
Townsite sales		9,085 32		9,085 32	
Suspense account	1,385 35	4,284 97		2,899 62	
Refunds of refunds	692 77	1,230 76		537 99	
Miscellaneous	271 52	228 17	43 35		
	1,998,219 92	2,127,434 88	144,325 39	273,540 35	
Refunds	114,600 04	50,337 50	64,262 54		
Net totals	1,883,619 88	2,077,097 38	80,062 85	273,540 35	193,477 50

STATEMENT showing yearly the Gross Revenue (in cash only) received from all sources from July 1, 1886, to March 31, 1908.

Fiscal Year.	Dominion Lands (Cash).	School Lands.	Seed Grain.	Ordnance Lands.	Fines and Forfeitures.	Registration Fees.	Casual Revenue.	Total.
	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.
1886-1887	183,114 78	35,707 41	.....	21,676 57	3,249 25	3,317 16	90 15	247,155 32
1887-1888	223,360 73	42,045 11	.....	36,230 88	1,267 05	7,212 02	372 79	310,497 58
1888-1889	243,046 84	52,351 94	26,146 13	42,072 07	739 25	6,543 53	1,075 36	371,978 12
1889-1890	224,770 16	45,188 57	5,017 44	29,921 61	958 75	8,866 39	261 63	314,984 55
1890-1891	268,751 35	38,826 33	3,385 60	51,229 69	1,595 02	10,866 65	627 81	380,282 45
1891-1892	337,106 07	136,131 80	5,957 65	42,360 80	788 92	9,302 11	532 14	532,179 49
1892-1893	303,550 86	82,615 22	5,866 21	33,776 90	777 00	10,750 38	1,331 96	438,668 53
1893-1894	214,540 30	47,574 11	2,339 16	22,318 20	864 15	10,358 02	1,982 04	299,975 98
1894-1895	171,085 48	47,665 10	2,752 56	22,645 97	693 85	9,811 77	875 36	255,530 09
1895-1896	174,509 38	56,584 32	8,748 05	17,550 28	502 00	8,737 87	1,920 66	268,552 56
(Total, 10 years)	2,343,835 95	584,692 91	62,212 80	322,791 97	11,435 24	85,765 90	9,069 90	3,419,804 67
1896 1897	187,424 19	24,292 43	9,887 13	9,831 27	1,316 00	8,997 24	2,683 05	244,431 31
1897-1898	780,313 10	52,410 82	12,351 71	22,537 17	529 06	14,263 50	260 92	1,082,666 28
1898-1899	1,563,020 74	41,249 77	12,388 69	12,349 65	2,801 03	19,220 73	2,620 91	1,653,651 52
1899-1900	1,410,883 48	220,874 78	15,271 84	11,043 53	1,452 92	21,751 90	3,664 00	1,684,942 45
1900-1901	1,533,197 07	48,049 83	15,711 63	14,604 47	1,977 96	33,979 77	1,587 57	1,649,108 30
1901-1902	1,254,333 56	193,410 75	20,293 06	16,967 36	1,955 61	50,854 99	3,900 62	1,541,715 95
1902-1903	1,716,597 20	392,206 93	28,789 97	17,612 79	5,220 88	81,104 18	2,230 26	2,244,062 21
1903-1904	1,478,106 33	233,769 62	26,122 30	30,494 34	5,911 92	109,233 73	3,402 91	1,887,041 18
1904-1905	1,311,485 40	332,914 48	16,471 34	10,316 90	10,018 49	123,082 86	4,258 14	1,811,577 61
1905-1906	1,701,580 71	608,960 79	12,577 29	10,893 17	3,304 77	180,310 73	8,496 09	2,526,123 55
	13,139,941 78	2,148,140 20	169,864 96	156,680 65	34,488 64	643,099 63	33,104 50	16,325,320 36
1906 1907 (9 months)	1,478,749 51	724,353 73	10,850 06	6,663 90	21 00	46,121 20	11,785 81	2,278,548 21
1907-1908	1,998,219 92	708,045 83	12,899 84	8,674 95	1,650 00	2,256 65	20,069 03	2,751,816 22
(Total, 11 yrs. & 9 months)	16,616,911 21	3,580,539 76	193,614 86	172,019 50	36,159 64	691,480 48	64,959 34	21,355,684 79
Grand total	18,960,747 16	4,165,232 67	255,827 66	494,811 47	17,594 88	777,246 38	74,029 24	24,775,489 46

STATEMENT showing Receipts on Account of Dominion Lands from July 1, 1872, to March 31, 1908.

Fiscal Year.	Homestead Fees.	Pre-emption Fees.	Improvements.	Sales.		Map Sales, Office and Registration Fees, &c.	Surveyor's Examination Fees.	Survey Fees, Miscellaneous, including Trust.	Inspection, Cancellation and Sundry Fees.	Timber Dues.
				Cash.	Scrip.					
	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.
1872-73	6,960 00			19,170 20						109 25
1873-74	7,310 00			19,834 75				125 50		2,710 55
1874-75	11,510 00			13,666 90		129 00				2,335 25
1875-76	4,680 00			3,478 94	320 00					387 00
1876-77	2,250 00			1,085 86	136,955 16	4 60		100 00	40 00	320 00
1877-78	14,540 00			2,794 86	120,159 54		180 00		290 00	1,620 00
1878-79	17,690 00			4,998 39	210,904 84	81 00	310 00	13 70	410 00	325 00
1879-80	41,255 00	10,241 43		45,708 97	81,685 86	245 40	580 00	183 25	1,780 00	25,121 46
1880-81	20,450 00	10,801 75	269 00	71,170 17	70,828 30	985 40	420 00	37 58		32,028 34
1881-82	54,155 00	39,843 90	1,758 00	1,240,328 27	50,590 84	3,036 45	890 00	58 10		58,753 14
1882-83	73,015 00	54,725 00	7,114 91	516,092 21	33,638 40	3,109 50	890 00	501 77		90,066 46
1883-84	41,580 00	28,810 00	2,596 11	424,863 36	40,919 67	1,289 55	530 00	45,766 53	1,713 45	137,983 10
1884-85	25,645 00	17,100 00	2,328 75	199,275 32	45,875 60	1,621 82	370 00	50,068 57	2,685 00	87,474 99
1885-86	26,110 00	14,371 00	1,101 50	76,140 41	214,657 97	1,339 34	360 00	20,070 00	5,025 00	64,820 31
1886-87	19,614 00	6,887 93	1,971 55	48,175 76	337,640 19	1,171 39	240 00	44,561 00	7,778 40	65,111 74
1887-88	23,691 00	4,830 00	1,918 35	52,238 36	313,522 67	1,660 75	240 00	20,591 41	12,078 53	94,964 55
1888-89	39,460 00	10,550 00	4,128 48	57,513 16	318,238 57	1,410 16	220 00	10,389 57	20,402 50	90,290 00
1889-90	35,920 00	8,580 00	3,250 54	54,896 85	228,744 47	2,099 07	190 00	3,316 23	29,252 50	84,642 95
1890-91	29,164 10		6,302 61	91,664 98	171,425 14	1,854 78	88 00	7,951 05	14,712 50	102,902 71
1891-92	46,994 00		6,472 31	108,901 01	97,822 41	2,147 31	135 00	25,898 49	23,104 50	106,461 35
1892-93	37,689 74		7,113 50	93,671 67	77,231 18	975 20	82 00	18,509 35	22,011 00	105,865 24
1893-94	36,462 26		3,497 76	53,254 71	27,840 96	973 11	40 00	13,457 09	11,097 00	81,290 51
1894-95	29,664 88		3,567 90	37,293 71	23,269 62	695 99		6,271 77	6,566 90	74,079 20
1895-96	18,278 00		3,163 15	46,373 98	46,929 65	610 78	50 00	21,679 31	6,819 50	61,923 47
1896-97	21,179 00		3,737 01	49,335 53	16,929 38	795 05	70 00	19,421 98	8,527 50	68,992 82
1897-98	34,780 00		5,649 63	80,178 64	28,918 14	1,987 40	10 00	21,242 66	10,042 00	119,313 78
1898-99	58,235 00		4,297 62	116,598 35	21,307 58	1,262 05	20 00	75,085 95	13,549 50	155,360 63
1899-1900	72,690 00		4,835 81	103,247 58	88,756 22	1,258 85	190 00	38,072 54	14,937 00	126,345 82
1900-1901	79,910 00		5,213 32	40,360 93	326,270 03	3,874 14	165 00	70,970 51	12,722 00	209,309 32
1901-1902	144,425 00		8,481 46	66,950 21	169,767 13	5,792 96	370 00	71,997 39	663 00	207,790 90
1902-1903	320,409 65		11,829 08	155,507 59	158,452 66	5,911 96	365 00	125,158 56	595 00	470,916 93
1903-1904	255,772 36		15,119 47	196,750 15	188,424 22	5,549 13	463 50	81,550 46	1,081 00	397,344 33
1904-1905	304,806 25		21,571 25	154,128 04	19,644 59	4,879 13	906 50	144,924 31	1,205 00	266,951 46
1905-1906	417,834 25		31,795 19	442,588 69	7,654 57	6,042 34	474 00	141,948 55	976 25	292,684 53
1906-1907 (nine months)	215,449 55		39,763 63	494,117 12	11,349 89	5,449 06	420 00	69,536 31	1,089 51	379,476 32
1907-1908	301,693 73		71,139 47	656,303 03	92,311 24	7,727 29	690 00	148,914 00	1,283 50	473,608 94
	2,891,272 77	206,741 01	279,987 26	5,838,658 66	3,778,986 69	74,969 36	9,959 00	1,302,373 43	223,412 04	4,549,772 35

STATEMENT showing Receipts on Account of Dominion Lands from July 1, 1872, to March 31, 1908.—*Concluded.*

Fiscal Year.	Grazing Lands.		Hay Permits, Mining, Stone Quarries, Export Tax on Gold, &c.		Rocky Mountains Park of Canada.	Colonization Lands.		Gross Revenue.	Refunds.	Net Revenue.
	Cash.	Scrip, &c.	Cash.	Scrip.		Cash.	Scrip.			
	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.
1872-73								26,239 45		26,239 45
1873-74								29,980 80		29,980 80
1874-75								27,641 15		27,641 15
1875-76								8,865 94		8,865 94
1876-77								140,755 02		140,755 02
1877-78								139,584 40		139,584 40
1878-79								234,732 93		234,732 93
1879-80								206,801 37	4,636 08	202,165 29
1880-81								206,990 54	5,038 22	201,952 32
1881-82	2,245 00		40 00			354,036 17		1,805,734 87	10,687 55	1,795,047 32
1882-83	22,844 43		913 91			248,492 01		1,051,403 60	8,746 05	1,042,657 55
1883-84	11,370 60		640 90			253,713 40		1,001,776 67	9,220 50	992,556 17
1884-85	17,089 75		815 63			1,214 22		451,564 65	12,070 85	439,493 80
1885-86	29,562 51	3,131 08	1,284 83					457,973 95	63,389 12	394,584 83
1886-87	14,242 77	39,487 67	1,570 40	80 00				588,532 80	19,543 16	568,989 64
1887-88	5,922 47	23,023 28	2,273 73	80 00	2,951 58		10,000 00	569,986 68	6,277 66	563,709 02
1888-89	2,207 69	16,802 63	3,946 55		2,528 73		16,000 00	594,088 04	5,226 23	588,861 81
1889-90	1,205 57	9,021 63	9,242 08		1,094 37			462,536 26	8,209 74	454,326 52
1890-91	3,079 55	16,193 77	8,628 44	160 00	2,397 35	5 28	4,460 50	460,990 76	7,195 27	453,795 49
1891-92	3,726 80	17,222 60	5,616 85		3,648 45			452,151 08	15,291 39	436,859 69
1892-93	6,380 80	11,542 39	6,266 13		4,983 23			392,324 43	18,314 97	374,009 46
1893-94	5,740 79	7,687 86	6,213 15		2,523 92			250,069 12	4,544 01	245,525 11
1894-95	5,353 72	8,628 00	5,229 54		2,321 87			202,983 10	4,365 99	198,617 11
1895-96	7,071 86	6,255 90	5,813 51		2,734 82			227,694 93	8,368 79	219,326 14
1896-97	4,715 01	2,500 00	8,518 18		2,132 11			206,853 57	15,010 54	191,843 03
1897-98	4,728 58	510 39	699,334 76		3,045 65			1,009,741 63	4,678 55	1,005,063 08
1898-99	5,245 88		1,130,371 60		2,994 16			1,584,328 32	32,296 39	1,552,031 93
1899-1900	8,382 86	4,083 30	1,038,195 42	20 00	2,727 60			1,503,743 00	23,062 28	1,480,680 72
1900-1901	4,726 28	14,671 99	1,101,808 33	20 00	4,047 31			1,874,159 09	18,368 85	1,855,790 24
1901-1902	7,292 46	8,409 27	737,878 43		*2,861 13			1,432,679 25	27,165 55	1,405,513 70
1902-1903	13,913 33	15,041 33	607,722 05		*5,063 69			1,890,886 83	21,519 84	1,869,366 99
1903-1904	19,790 27	15,202 15	495,579 18		*9,198 48			1,681,824 70	36,721 75	1,645,102 95
1904-1905	36,145 32	5,237 36	364,923 59		*14,059 55			1,339,382 35	25,786 90	1,313,595 45
1905-1906	51,583 89	80 00	296,769 19		18,883 83			1,709,315 28	33,418 36	1,675,896 92
1906-1907 (nine months)	43,711 91	400 00	213,852 59		*15,887 42			1,490,503 31	35,117 48	1,455,385 83
1907-1908*	43,211 78	4,048 01	266,415 31		27,232 87			2,094,579 17	115,080 04	1,979,499 13
	381,591 88	229,180 61	7,019,894 28	360 00	*133,318 12	857,461 08	30,460 50	27,809,399 04	599,352 11	27,210,046 93

* Including scrip.

STATEMENT of the Rocky Mountains Park Revenue for the fiscal year ended March 31, 1908.

Particulars.	Amount.
Rent	$5,351 49
Timber dues	1,341 39
Water rates	208 44
Transfer fees	46 00
Cave and basin (bathing tickets)	3,277 00
Quarry permits	488 00
Dog licenses	181 50
Livery licenses	567 00
Pool and billiard licenses	160 00
Boat licenses	25 00
Butcher licenses	40 00
Coal lands	11,866 80
Grazing lands	230 00
Hot springs (bathing tickets)	3,108 50
Telephone rent	242 50
Fines	11 00
Sale of lumber	20 00
Peddlers' licenses	36 00
Camping permits	22 00
Miscellaneous	10 25
Total	$27,232 87

NOTE.—The average monthly revenue for the nine months ended March 31, 1907, was $1,765.27.

The average monthly revenue for the twelve months ended March 31, 1908, was $2,269.40.

REVENUE.

The financial returns will show that the falling off in the gross cash revenue is chiefly attributable to a decrease in the amount realized from the sale of school lands and the collection of registration fees. As regards the latter item, it may be explained that the revenue from this source ceased from and after September 1, 1906, when land titles offices passed from federal to provincial control as a result of the coming into force of the Acts establishing the provinces of Saskatchewan and Alberta.

The falling off in the revenue on account of school lands amounted to $121,836.07, which added to the decrease in the collection of registration fees, $105,150.82, and $58,026.75 on the export tax on gold, represents a total decrease for these three items of $285,016.34, leaving a deficit of only $66,875.43 properly chargeable to the Dominion lands, and which is accounted for by the falling off of 7,000 entries during the past year, as compared with the previous twelve months.

SESSIONAL PAPER No. 25

The following is a comparative statement of the homestead entries and sales which have been made at the several agencies of the department during the fiscal years ending March 31, 1907 (nine months), and March 31, 1908 (twelve months), respectively:—

	Fiscal Year ending March 31, 1907. (Nine months).		Fiscal Year ending March 31, 1908. (Twelve months).	
	No. of Entries.	Acres.	No. of Entries.	Acres.
Homesteads	21,648	3,463,520	30,424	4,867,840
Sales		56,430		179,894

The following statement shows the number of homestead entries reported in each year since 1874:—

Departmental year ended.	Number of Entries.
October 31, 1874	1,376
" 31, 1875	499
" 31, 1876	347
" 31, 1877	845
" 31, 1878	1,788
" 31, 1879	4,068
" 31, 1880	2,074
" 31, 1881	2,753
" 31, 1882	7,483
" 31, 1883	6,063
" 31, 1884	3,753
" 31, 1885	1,858
" 31, 1886	2,657
" 31, 1887	2,036
" 31, 1888	2,655
" 31, 1889	4,416
" 31, 1890	2,955
" 31, 1891	3,523
" 31, 1892	4,840
" 31, 1893	4,067
" 31, 1894	3,209
December 31, 1895	2,394
" 31, 1896	1,857
" 31, 1897	2,384
" 31, 1898	4,848
" 31, 1899	6,689
June 30, 1900	7,426
" 30, 1901	8,167
" 30, 1902	14,673
" 30, 1903	31,383

June 30, 1904	26,073
" 30, 1905	30,819
" 30, 1906	41,869
Nine months ended March 31, 1907	21,647
Twelve months ended March 31, 1907	37,788
Year ended March 31, 1908	30,424

STATEMENT showing the number of Homestead Entries made during the fiscal year ended March 31, 1908, and the Nationality of the Homesteaders, as reported by the several Agencies of the Department in Manitoba, Saskatchewan, Alberta and British Columbia.

Nationalities.	No. of Entries.
Canadians from Ontario	3,696
" " Quebec	494
" " Nova Scotia	197
" " New Brunswick	120
" " Prince Edward Island	74
" " Manitoba	1,043
" " Saskatchewan	1,152
" " Alberta	532
" " British Columbia	109
Persons who had previous entry	2,949
Newfoundlanders	7
Canadians returned from the United States	510
Americans	7,818
English	4,840
Scotch	1,026
Irish	339
French	306
Belgians	128
Swiss	30
Italians	29
Roumanians	58
Syrians	11
Germans	574
Austro-Hungarians	2,472
Hollanders	59
Danes (other than Icelanders)	84
Icelanders	106
Swedes	437
Norwegians	433
Russians (other than Mennonites and Doukhobors)	722
Mennonites	5
Doukhobors	36
Chinese	2
Japanese	3

Persians	9
Australians	8
New Zealanders	
Bermudians	3
Servians	1
Portuguese	1
Hindoos	1
Total	30,424

Representing 73,078 souls.

STATEMENT showing the number of Homestead Entries made during the fiscal year ended March 31, 1908, by persons coming from the various States and Territories of the American Union.

States.	No. of Entries.
Arizona	4
Alabama	3
Alaska	2
Arkansas	21
California	66
Carolina, North	6
Carolina, South	2
Colorado	30
Columbia, District of	
Connecticut	8
Dakota, North	2,795
Dakota, South	445
Delaware	4
Florida	
Georgia	2
Idaho	96
Illinois	296
Indiana	79
Indian Territory	6
Iowa	460
Kansas	115
Kentucky	8
Louisiana	2
Maine	13
Maryland	3
Massachusetts	82
Michigan	391
Minnesota	1,543
Mississippi	
Missouri	119
Montana	199

Nebraska	173
Nevada	2
New Hampshire	10
New Jersey	9
New Mexico	1
New York	137
Ohio	98
Oklahoma	138
Oregon	91
Pennsylvania	75
Rhode Island	6
Tennessee	8
Texas	22
Utah	28
Vermont	14
Virginia	5
Virginia, West	14
Wisconsin	364
Wyoming	18
Washington	315
Total	8,328

STATEMENT showing the number of Letters Patent issued by the Department of the Interior in each year since 1874.

Period.	Number Issued.
Year ended October 31, 1874	536
" 31, 1875	492
" 31, 1876	375
" 31, 1877	2,156
" 31, 1878	2,597
" 31, 1879	2,194
" 31, 1880	1,704
" 31, 1881	1,768
" 31, 1882	2,766
" 31, 1883	3,591
" 31, 1884	3,837
" 31, 1885	3,257
" 31, 1886	4,570
" 31, 1887	4,599
" 31, 1888	3,275
" 31, 1889	3,282
" 31, 1890	3,273
" 31, 1891	2,449
" 31, 1892	2,955
" 31, 1893	2,936
" 31, 1894	2,553

Year ended December 31, 1894	2,682
" 31, 1895	2,118
" 31, 1896	2,665
" 31, 1897	2,972
" 31, 1898	3,037
" 31, 1899	3,904
Six months ended June 30, 1900	1,970
Year ended June 30, 1901	6,461
" 30, 1902	8,768
" 30, 1903	7,349
" 30, 1904	6,890
" 30, 1905	8,798
" 30, 1906	12,370
Nine months ended March 31, 1907	10,596
Year ended March 31, 1908	18,690

STATEMENT showing the number of Homestead Entries made during the fiscal year 1907-8, at the several Dominion Land Agencies.

Agencies.	1907–1908.
Battleford	4,535
Brandon	90
Calgary	1,278
Dauphin	772
Edmonton	4,055
Estevan	502
Humboldt	2,493
Kamloops	195
Lethbridge	2,456
Moosejaw	5,181
New Westminster	42
Prince Albert	1,622
Regina	1,653
Red Deer	1,825
Winnipeg	886
Yorkton	2,839
Total	30,424

CORRESPONDENCE.

The following statement shows the number of letters received and sent by the department in each year since its establishment:—

Departmental Year ended October 31.	Letters Received.	Letters Sent.	Total.
1874	3,482	4,120	7,632
1875	1,974	2,189	4,163
1876	2,253	3,097	5,353
1877	3,137	3,677	6,814
1878	4,642	6,009	10,651
1879	5,586	6,179	11,755
1880	8,222	9,910	18,162
1881	13,605	15,829	29,434
1882	25,500	30,300	55,800
1883	27,180	33,500	60,680
1884	27,525	33,386	60,911
1885	33,970	43,997	77,967
1886	60,964	67,973	128,937
1887	47,845	60,890	108,735
1888	43,407	52,298	95,705
1889	48,316	50,500	98,816
1890	36,200	36,008	72,208
1891	38,000	36,267	74,267
1892	41,990	42,203	84,193
1893	50,794	48,145	98,939
1894	48,619	50,840	99,459
1895	49,991	45,898	95,889
1896	47,501	44,238	91,739
1897	65,714	64,147	129,861
1898	88,913	87,845	176,758
1899	95,023	91,876	186,899
1900	121,219	133,177	254,396
1901	144,978	136,348	281,326
1902	167,200	185,548	352,748
1903 (From June 30, 1902, to July 1, 1903)	185,582	223,463	409,045
1904 (From June 30, 1903, to July 1, 1904)	222,316	274,675	496,991
1905 (From June 30, 1904, to July 1, 1905)	245,470	302,723	548,193
1906 (From June 30, 1905, to July 1, 1906)	407,794	529,465	937,259
1907 (From June 30, 1906, to April 1, 1907)	372,231	620,968	993,199
1908 (From March 31, 1907, to April 1, 1908)	543,647	1,106,772	1,650,419

The number of registered letters during the departmental year ending March 31, 1908, was: received, 11,097; sent, 36,770.

HOMESTEAD ENTRIES.

As will be seen from these returns, there were in all 30,424 homestead entries made during the twelve months ending March 31 last. This is a falling off of 7,364 as compared with the corresponding previous year. However, it is still surprisingly large when one considers that for the previous five years 147,922 entries were granted, or an annual average of 29,584.

The acreage of the land taken as free homesteads during the past year was 4,867,840 acres, and for the past six years 28,535,360 acres. At the present rate of settlement, vast as are the grain areas of the western provinces at present opened to entry, the time must soon come when it will be necessary to direct the incoming settler to the northern parts of Alberta and Saskatchewan, where it will probably be found that the agricultural possibilities are in no way inferior to those of the regions more to the south.

It is interesting to note that of the 30,424 entries granted last year, 7,417 were made by Canadians, 7,818 by Americans, 6,205 by English, Scotch and Irish, and 510 by Canadians returned from the United States, or 21,950 in all, representing a population of over 52,000 souls, and leaving 8,534 entries made by other nationalities representing a population of about 21,000 souls.

STATEMENT of Land Sales by Railway Companies having Government

YEAR.	HUDSON'S BAY COMPANY.		CANADIAN PACIFIC RAILWAY COMPANY.		MANITOBA SOUTH-WESTERN COLONIZATION RAILWAY COMPANY.		QU'APPELLE, LONG LAKE AND SASKATCHEWAN RAILROAD AND STEAMBOAT COMPANY.	
	Acres.	Amount.	Acres.	Amount.	Acres.	Amount.	Acres.	Amount.
		$		$		$		$
1893	.....	.....	93,184	295,288	14,164	57,559	1,603	.....
1894	7,526	48,225	43,155	131,628	6,312	28,003	640	.....
1895	4,431	23,209	55,453	176,950	5,623	22,330	2,391	.....
1896	9,299	52,410	66,624	220,360	21,254	88,568	286	.....
1897	10,784	53,277	135,681	431,095	63,800	234,644	2,524	.....
1898	62,000	310,000	242,135	757,792	106,473	363,982	22,534	.....
1899	56,875	274,625	261,832	814,857	58,019	199,458	61,030	178,517
(Fiscal Year) 1900	70,196	352,631	379,091	1,152,836	133,507	437,449	18,932	53,974
(Fiscal Year) 1901	82,308	399,804	339,985	1,046,665	59,749	214,953	22,266	74,810
(Fiscal Year) 1902	269,577	1,412,532	1,362,478	4,410,500	206,411	713,365	39,835	147,365
(Fiscal Year) 1903	330,046	1,939,804	2,260,722	8,472,250	250,372	699,210	843,900	1,476,900
(Fiscal Year) 1904	144,857	879,910	857,474	3,516,864	29,522	113,303	.....	.....
(Fiscal Year) 1905	139,721	865,905	411,451	2,045,800	80,342	296,936	.....	.....
(Fiscal Year) 1906	236,191	1,863,375	1,012,322	6,015,060	83,418	360,889	.....	.....
(9 months to March 31, 1907)	69,158	742,221	851,083	4,817,632	3,051	22,645	1,353	16,789
(Fiscal Year) 1908	21,184	267,215	81,060	727,367	31,982	153,007	5,621	68,869
Totals	1,514,153	9,484,943	8,453,730	35,062,944	1,153,999	4,006,301	1,022,915	2,017,224

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Land Grants and by the Hudson's Bay Company.

Calgary and Edmonton Railway Company.		Canadian Northern Railway Company.		Great Northwest Central Railway Company.		Totals.		Average Per Acre.
Acres.	Amount.	Acres.	Amount.	Acres.	Amount.	Acres.	Amount.	
	$		$		$		$	$ cts.
11,260						120,211	352,847	2 93
11,035						68,668	207,856	3 02
46,815						114,713	222,489	1 94
10,553						108,016	361,338	3 31
9,436						222,225	719,016	3 23
15,481						448,623	1,431,774	3 18
24,738	53,335					462,494	1,520,792	3 28
46,653	128,256					648,379	2,125,146	3 27
116,719	352,037					621,027	2,088,269	3 36
323,494	1,033,396					2,201,795	7,746,958	3 56
231,800	909,600	183,736	631,503	128,435	522,490	4,229,011	14,651,757	3 46
129,007	563,507	64,469	313,575	41,858	177,081	1,267,187	5,564,240	4 39
105,191	512,898	231,707	1,221,469	17,593	103,564	990,005	5,046,572	5 09
85,784	480,063	204,966	1,014,351	20,003	137,503	1,642,684	9,871,241	6 01
59,515	346,061	289,576	1,711,109	4,623	41,470	1,277,759	7,697,930	6 02
8,606	75,644	196,946	1,746,504	1,294	13,855	341,072	2,985,992	8 78
1,240,087	4,454,800	1,171,400	6,638,511	213,206	995,963	14,763,869	62,594,217	

SALES.

There has been a large decrease in the acreage of land disposed of by sale during the year by the Hudson's Bay Company, and railway companies holding government land grants. The total area of land sold during the fifteen years ending March 31 last has been 14,769,490 acres, and the gross amount derived therefrom was $62,663,086, or an average of $4.24 per acre. In 1893, when the acreage disposed of was nearly the same as during the past year, the average price per acre was $2.93, whereas the average per acre for the latter period rose to $8.78, or an increase of $5.85. In 1893 only a comparatively small proportion of these companies' lands had passed into private hands, so that those desirous of acquiring lands from the companies at that time were favoured with the opportunity of selecting the choicest sections available in near proximity to the lines of railway. Notwithstanding this fact, there was then such a depreciation in the value of real estate that the average price which these lands commanded was but $2.93, whereas during the past year, with nearly one-half of the entire land grants disposed of, the average price was $8.75, or over three times as large as in 1893.

It should be further considered that the large reduction in the total acreage disposed of, as compared with the previous year, is an indication that the high advance in the price per acre was not the result of an increased demand and the consequent abnormal inflation of this class of property, but that land value in the western provinces is on a sound and permanent basis, and is regulated by the prosperous condition of the country.

IMMIGRATION.

Comparative statement of arrivals at inland and ocean ports during the twelve years ending March 31, 1908.

ARRIVALS.

Year.	Great Britain and Ireland.	Other Countries.	United States.	Total.
1896-7	11,383	7,921	2,412	21,716
1897-8	11,173	11,608	9,119	31,900
1898-9	10,660	21,938	11,945	44,543
1899-1900	* 5,141	* 10,211	* 8,543	23,895
1900-1	11,810	19,352	17,987	49,149
1901-2	17,259	23,732	26,388	67,379
1902-3	41,792	37,099	49,473	128,364
1903-4	50,374	34,785	45,171	130,330
1904-5	65,359	37,255	43,652	146,266
1905-6	86,796	44,349	57,919	189,064
1906-7 (nine months ending March 31)	55,791	34,217	34,659	124,667
1907-8	120,182	83,975	58,312	262,469
	487,720	366,442	365,580	1,219,742

* Arrivals for six months only.

The report of the Superintendent of Immigration will be found under Part II. of the general report.

There arrived in the country during the twelve months ending March 31 last, 262,469 immigrants, which is an increase of 39,767 over the preceding year. It is the largest immigration in any one year in the history of Canada.

During the decade ending 1907-8 the total number of arrivals was 1,166,126, of which 819,213 came from Great Britain, Ireland and the United States, and the remainder, or 356,913, from other countries.

This tremendous movement of people is more than one-sixth of the total population of Canada, according to the census of 1901. And if the present population of the country be estimated at 7,000,000, the immigration during the past twelve months represents over one-twenty-sixth of such population. Never in the history of the United States, where during the past century there was witnessed the mightiest immigration ever recorded in the annals of the world, even when the movement reached its highest tide, did there come in from outside, during any given space of time, such a large immigration as flowed into Canada since the advent of the new century, proportionately to its population. During the decade ending 1830 there arrived into the United States 143,439 immigrants, and this represented one-seventy-eighth of the average population of the country in 1820, when it was 9,638,453, and in 1880, sixty years afterwards, when the population was 50,155,783, there arrived 457,257 immigrants, which represented one-one hundred and ninth of the total population, and even in 1907, when the immigration in the neighbouring republic had passed the million mark, each new-comer on arrival was thrown into a group of at least one hundred old occupants of the soil with which he has become merged, and thus the absorption of this large influx of new comers has been going on quietly. An eminent American economist has said, after reviewing the movement of immigration to the United States during the nineteenth century:—

'No probability can be discerned that any later century will see the equal of this migration. The fairest parts of the world that were wildernesses in 1800 now teem with industry and population. There are no more virgin lands in abundance to occupy in this country; no more such enticements to draw millions from the homes of their fathers.'

Judging from the unprecedented influx of population to Canada during the past eight years, and the consequent increase in agricultural products and railroad mileage, there would appear to be a strong probability discernible that the twentieth century will see a migration to Canada equal to that witnessed in the United States during the last half of the century just closed. There still remain vast areas of the fairest parts of the world in the northern half of the American continent that were wildernesses in 1900 but which will teem with industry and population before the milestone marking the half of the present century has been passed, and it is these virgin lands that are to-day drawing from the homes of their fathers the hundreds of thousands of settlers who are arriving in Canada.

The same conditions which induced the movement of population to the United States in the decade 1831 to 1840, namely the construction of railroad works and the opening up of new territory for settlement, where land could be secured cheaply, while

a market would be open for the produce raised, are presenting themselves to-day in connection with the opening up of the wheat fields of the western provinces and the consequent development of industrial and commercial activity. The statistics furnished by the Superintendent of Immigration indicate clearly that the vast majority of arrivals are agriculturists or workers who have found it to their advantage to move to Canada in view of the large demand for labour. Within the last six years the total immigration to Canada has been 1,097,689. All these immigrants were carefully inspected at the ports of landing, and, as a result of this inspection, 3,294 were refused admission. The remainder were allowed to enter and they have dispersed throughout the various parts of Canada, have become self-supporting, and are now adding to the common wealth. There come, it is true, a few complaints from isolated quarters as to the inability of new-comers to provide for themselves, but such cases, compared with the hundreds of thousands of contented and successful immigrants, are so limited that on the whole, viewed from a selfish national point of view, our immigration has been of a superior class, and it is sincerely to be hoped that for a long time yet the same predominating elements may continue to be added to our nationality.

BRITISH IMMIGRATION.

From the above schedule it will be seen that during the past twelve years there arrived in Canada from the British Isles 487,720 immigrants, whose nationalities were declared to be English, Scotch, Irish and Welsh. Of these, 376,502 came during the past five years, 262,769 during the past three years, and 120,182 during the past twelve months. As compared with the total British arrivals in the twelve years, more than three-quarters came in within the last five years, considerably more than one-half within the last three years, and one-quarter during the twelve months ending April 1, 1908. It will thus be seen that in so far as the quantity of this particular class of immigration is concerned, it has now assumed sufficiently large proportions to satisfy the widely expressed desire on the part of Canadians throughout the old and new provinces that for obvious reasons we should receive a fair share of British subjects emigrating from the old land. Complaint was made, however, early last year that sufficient care was not exercised by the department in eliminating from prospective British emigrants such of them as were not possessed of the necessary means to enable them to become self-supporting on arrival here. This matter engaged your serious attention during your visit to England last year, and I have no doubt that the changes which were subsequently made in the regulations governing the inspection of immigrants at the ports of sailing will have the desired effect in this regard.

I desire to add, however, that in my opinion there were scarcely any grounds for the uneasiness manifested as to the large proportion of undesirables who found their way to Canada from the British Isles. It is true that some, otherwise deserving immigrants who had not on entering Canada the necessary means to permit them to at once become self-supporting, may have been induced to come through the injudicious zeal of philanthropic societies engaged in this class of work. But of this class there were only few as compared with the hundreds of thousands of British immigrants who have been added to our population. When ten years ago there arrived from England ten or twelve thousand immigrants, there may have been a comparatively larger number

of undesirables than to-day, but it was not felt, owing to the limited number of the total arrivals. According to the report of the chief medical inspector, Dr. Bryce, which will be found under Part II. of the general report, after a rigid inspection at the ports of landing, 1,002 immigrants were refused entry, out of which 112 were British, or about one-ninth of the total exclusions, although British arrivals last year were nearly one-half of the total immigration. This proportion is a highly satisfactory one, and, on the whole, when one considers the strenuous efforts that are being put forth by other colonies to attract British settlers to their shores, from a national point of view it must be admitted that Canada has been singularly fortunate in this respect. Our immense undeveloped resources certainly justify such a policy of selection and exclusion as will ensure the entry into Canada of the choicest immigration possible, but there is little doubt that Australia, South Africa, and other British colonies, which also have immense undeveloped resources, would gladly bear with the momentary inconvenience caused by the incoming, within less than half a decade, of 376,502 settlers from the mother country, even if out of that number they had to deport, at the expense of the transportation companies bringing them in, one thousand of undesirables on account of disease or other causes.

CONTINENTAL IMMIGRATION.

The total arrivals during the year from European and other foreign countries amounted to 83,975, which was an increase of 24,502 as compared with the previous twelve months. It is satisfactory to note from the report of the Commissioner of Immigration at Winnipeg that the vast majority of continental immigrants who proceeded direct to the western provinces were of a desirable class, and that they have either engaged at once in farm work or secured employment on railway construction.

It will be observed also that there has been a large increase in the number of Austro-Hungarian arrivals. This particular current of immigration, which from its inception found its way to the western wheat fields, has been gradually and steadily increasing during the past decade. Concurrently with the increase in the total arrivals do we find a corresponding increase in the number of free homesteads taken up by them during each successive year. It is worthy of notice that of the 5,510 entries made by foreigners last year, exclusive of Americans, 2,472 were recorded by Austro-Hungarians. Of these people, the Commissioner of Immigration speaks as follows:—

'The largest number of Ruthenians and Poles came from the Austrian provinces and a few from Bohemia and Russia. Most of the people from Austria were farmers and went immediately to homesteads. The majority of the others went to railway construction work. Quite a number came from the United States, nearly all of whom entered homesteads.'

FRENCH AND BELGIAN IMMIGRATION.

There has again been an increase in the number of arrivals from France during the past year. In fact, it has been the largest immigration from that country since 1897, when reliable statistics were first obtained by the department in this relation. During that year the combined French and Belgian immigration only totalled 740 arrivals, whereas during the past twelve months it was 3,885, or more than five times as large as in 1897.

COMPARATIVE STATEMENT of Immigrant Arrivals from France and Belgium during the twelve years ending March 31, 1908.

Year.	France and Belgium.
1897	740
1898	545
1899	413
1900	483
1901	492
1902	645
1903	1,240
1904	(1,534)—2,392—(858)
1905	(1,743)—2,539—(796)
1906	(1,648)—2,754—(1,106)
1907 (9 months)	(1,314)—1,964—(650)
1908 (to March 31)	(2,671)—3,885—(1,214)

Total French and Belgian immigration from 1897 to 1902 (six years), 3,318.

Total French and Belgian immigration from 1903 to 1908 (five years and nine months), 14,774.

Special attention is called to the report submitted by Mr. Paul Wiallard, the agent of the Canadian government in France, and also the report of Mr. D. Treau de Cœli, the Canadian agent at Antwerp, Belgium.

Mr. Arthur Geoffrion, advocate, of Montreal, was added to the staff of the Paris office early last spring, as it was felt that Mr. Wiallard could not, consistently with the proper administration of the work of his office, devote the time necessary for visiting the rural districts and disseminating among the peasants and sons of agriculturists reliable information with regard to Canada. Mr. Geoffrion is well fitted for this special class of work, and will be able to render good service.

There is little doubt that the substantial increase within the past few years in the number of arrivals from France has been due directly to the efforts put forth by the department to attract this very desirable class of settlers to Canada.

Attention is also called specially to Mr. De Cœli's report. This officer has been carrying on in Belgium a most effective propaganda. His achievement in inducing 2,380 schools in Belgium to introduce in their curriculum the study of the geography of Canada certainly speaks very highly for the effectiveness of his work. No better means could possibly be devised to convey to the minds of the growing population of Belgium reliable information as to the advantages offered by Canada as a suitable field for settlement and the investment of capital.

IMMIGRATION FROM THE UNITED STATES.

By far the most satisfactory feature of the immigration of 1907-8 has been the unprecedented number of arrivals from the neighbouring republic. Mr. W. J. White, inspector of agencies in the United States, in submitting his annual report, makes the following very significant remarks:—

'The most pleasing feature of the work has been the splendid character and quality of the immigrants. The money and effects brought in by these 58,312 people was in the neighbourhood of the total value of $52,000,000, or nearly $1,000 per head. This has been added to the money wealth of Canada in one year. In addition to its money wealth there is the physical wealth which these people bring. Forty-eight thousand of those arriving took up homesteads; most of the balance purchased land and went into farming, a life that 90 per cent of them had been following in their old homes.'

These figures of course refer to the total membership of the families comprised in the 8,000 odd homestead entries made by settlers from the United States.

JUVENILE IMMIGRATION.

The report of Mr. G. Bogue Smart, chief inspector of British immigrant children and receiving homes, which will be found under Part II. of the general report, contains much valuable information upon this interesting subject.

It is estimated that since this class of emigration was inaugurated in 1869, or forty years ago, 60,000 British children have been sent to Canada. The work, which is a purely philanthropic one, is conducted under the immediate supervision of the Home and Dominion governments. It is gratifying to note that, under the existing regulations, the emigration of each child is subject to such careful inspection, both at the ports of sailing and of landing, that we are receiving only the most carefully selected wards of the state homes in the old country. It is significant, as pointed out by Mr. Smart, that, although during the past seven years and nine months there arrived in the country 16,610 of these immigrant children, two of these only were formally charged with offences in our courts during the past year. This percentage compares very favourably with any of the other classes of our population. The work of general supervision and inspection would appear to be carried on in the most satisfactory manner.

SURVEYS.

The work of the year consists of 6,123,040 acres of new subdivision, 1,372,160 acres of resurveys, 377 miles of base lines and initial meridians, and of other surveys of a miscellaneous character.

Sixty-three parties were employed on the survey of Dominion lands. Of these, eleven were located in Manitoba, fourteen in Saskatchewan, twenty-five in Alberta, six in British Columbia, one in the Northwest Territory, one on the boundary between British Columbia and Yukon Territory and five part of the time in one province and part in another. Five of the parties were engaged part of the time in the examination of the surveys made under contract.

The following table shows the distribution of parties paid by the day and of those working under contract:—

Parties.	In Manitoba.	In Saskatchewan.	In Alberta.	In British Columbia.	In the Territories.	On the boundary between B.C. and Y.T.	Partly in one province and partly in another.	Total.
Paid by the day	6	4	13	6	1	1	2	33
Under contract	5	10	12	.....	.....	.....	3	30
	11	14	25	6	1	1	5	63

Two hundred and twenty-three whole townships and eighteen fractional townships were completely subdivided, while 126 townships were partially subdivided. Also 32 whole townships and one fractional township were completely resurveyed, while 131 townships were partially resurveyed.

An effort is being made to extend the system of initial meridians and base lines, from which all township surveys are started, so as to be ready to proceed with the subdivision of the land wherever a demand may arise. These lines must be located with the greatest care and accuracy; as they run through difficult country and are far from settlements, they are very expensive.

In comparing data of this report with the surveys report of the former year, it is to be observed that the report of last year covered a period of only nine months, while all data in this report cover a period of twelve months.

The statement of mileage for the year ended March 31, 1908, shows 21,494 miles surveyed; the number of parties is fifty-nine as, owing to the nature of their work, Messrs. P. A. Carson, P. G. Stewart, W. Thibaudeau and A. O. Wheeler are not included, and the average number of miles per party is 364.

The amount of land thrown open for homesteading during the past year was exceptionally large owing to the rapid settlement of the western provinces. There were many requests for surveys in remote districts, especially along the line of the Grand Trunk Pacific railway and around Lesser Slave lake.

The fifth meridian is being extended northward from Lesser Slave river to Peace river by Mr. A. W. Ponton, with a view to the establishment of the base lines westerly to the sixth meridian. He started work in May, 1907, and is about half way through. This survey will be carried out until the line reaches Peace river.

The sixth meridian was produced southerly to the Yellowhead pass and base lines were surveyed westerly from the fifth meridian towards the Rocky mountains. It is the intention to continue this work until all the base lines are surveyed to the boundary of British Columbia or to the foot of the mountains where the boundary is the summit of the mountains.

A few base lines were also surveyed in Manitoba at the southeast end of Lake Winnipeg and near the narrows of Lake Manitoba; these were wanted for the immediate subdivision of the adjoining land.

Mr. P. A. Carson was engaged on the triangulation of the railway belt in British Columbia; his survey was west of the Beaverfoot range. This work is for the purpose of fixing accurate reference points from which subdivision and other surveys may be started or to which they may be connected.

Mr. A. O. Wheeler continued the photo-topographical survey of the main range of the Rocky mountains near the Canadian Pacific railway; he was working in the valley of the Columbia river and along Blaeberry, Spillimacheen and Beaverfoot rivers. The connection with the survey of the Selkirk range is nearly complete and the map is well advanced.

Mr. P. G. Stewart explored the country along the line of the Grand Trunk Pacific railway west of Edmonton, for the purpose of selecting the townships which are adapted for settlement and require to be subdivided immediately.

Two parties were employed on irrigation surveys in Southern Alberta, under the direction of the Commissioner of Irrigation. They were in charge of Messrs. P. M. Sauder and R. J. Burley.

An investigation of the water powers available in the northwest provinces has been commenced and it is expected that the results will prove of great value to the public. Mr. W. Thibaudeau, an experienced engineer, has been placed in charge of the investigation. He began with a preliminary survey of the Winnipeg river, the intention being to resume the work another year and to make a more exhaustive investigation.

A further extension of the Yukon-British Columbia boundary was made by Mr. J. N. Wallace, the part of the line located being across the Dalton trail. The sixtieth parallel of north latitude is the boundary and its position has to be determined by astronomical observations.

Hereunder is the usual table of subdivision or settlement survey work completed each year since the inception of the surveys, with the result of last season's operations added:—

Period.	Acres.	Number of Farms of 160 acres each.
Previous to June, 1873	4,792,292	29,952
1874	4,237,864	26,487
1875	665,000	4,156
1876	420,507	2,628
1877	231,691	1,448
1878	306,936	1,918
1879	1,130,482	7,066
1880	4,472,000	27,950
1881	8,147,000	50,919
1882	10,186,000	63,662
1883	27,234,000	170,212
1884	6,435,000	40,218
1885	391,680	2,448
1886	1,379,010	8,620
1887	643,710	4,023
1888	1,131,840	7,074
1889	516,968	3,231
1890	817,075	5,106
1891	76,560	476
1892	1,395,200	8,720
1893	2,928,640	18,304
1894	300,240	1,876
1895	406,240	2,539
1896	506,560	3,166
1897	428,640	2,679
1898	859,840	5,374
1899	1,022,720	6,392
1900 (first 6 months)	735,480	4,596
1900-1901	1,603,680	10,023
1901-1902	2,553,120	15,957
1902-1903	6,173,440	38,584
1903-1904	12,709,600	79,435
1904-1905	10,671,520	66,697
1905-1906	4,973,920	31,087
1906-1907 (9 months)	3,819,700	23,873
1907-1908	6,123,040	38,269
	130,427,195	815,165

INTERNATIONAL BOUNDARY SURVEYS.

The operations of last year under the treaty of 1906 consisted primarily in the production of the 141st meridian of west longitude southward from the point determined by astronomical observation on the Yukon river, and the selection of suitable points on the line for the permanent monuments, having regard to the intervisibility required by the treaty. The line was laid down for a distance of 130 miles from the Yukon. Arrangements have been made for the placing of the monuments on this section of the line this season. Following the principal line party, were parties engaged in cutting out the line where it passes through woods, and in making a topographical survey of the country adjacent to the line. The general management of the field work, on the part of Canada, is in the hands of Mr. A. J. Brabazon, D.L.S.

The demarcation of the international boundary along the Alaska 'Coast Strip' has made satisfactory progress.

Mr. J. D. Craig, D.L.S., was instructed to determine the boundary line from Mt. Whipple, which lies to the south of Stikine river, to the successive boundary peaks, southeasterly, to connect with the surveys already made near Unuk river. He entered this region by way of Bradfield inlet and Bradfield river, ascending to the height of land between this river and Iskut river, a tributary of the Stikine. He found that the boundary line, as defined by the award of the tribunal, falls into the valley of the Iskut, to which it was impracticable for him to bring his party from the Bradfield. It was, therefore, necessary to leave this section until the present year, when Mr. Craig will approach it by way of the Stikine and Iskut rivers. Through the upsetting of a canoe in Bradfield river, some of his topographic photographs were lost. This unfortunate accident, though involving considerable expense in going over some of the ground a second time, does not seriously affect the main results of Mr. Craig's survey.

Mr. W. F. Ratz, D.L.S., monumented the line at the crossing of Taku and Whiting rivers, and conducted a topographic survey of the region lying between Stikine river and Stephens passage. The object of this survey was to determine the topography of the mountains with a view to the selection, by the commissioners, of the peaks which the boundary line shall follow, in accordance with the agreement of 1905, supplementary to the award of 1903.

This region is a very difficult one to traverse, containing many high mountain masses, which can only be approached over the glaciers, there being hardly any water communication into the interior.

An American party under Mr. Fremont Morse, who was accompanied by Mr. D. H. Nelles, D.L.S., as Canadian representative, made a triangulation from Glacier bay, with the view of locating the boundary line along the summits southwesterly from the vicinity of Klehini river to the Fairweather range. An important part of this survey was a triangulation to determine the geographical position of a certain peak, lying among the glaciers at the height of land between Glacier bay and Alsek river, which was required for the determination of the crossing of the Alsek river.

Another United States party was engaged in connecting by a triangulation the boundary peaks on the east side of Lynn canal.

The re-monumenting of the 49th parallel has been completed west from the Rocky mountains to the straits of Georgia. Inspection of the accuracy of the line tracing and the setting of the monuments was made by Messrs. N. J. Ogilvie, D.L.S., and C. H. Sinclair of the United States Coast Survey, over so much of the line as they were able to reach during the season. The part from Osoyoos lake to the straits is to be inspected this season.

A general inspection of the line was made by Dr. King with Messrs. Tittmann and Walcott, the United States commissioners.

A little work still remains to be done to complete the survey of this section of the 49th parallel. This consists in the completion of the triangulation in the western part of the Cascade mountains, which will be done this year.

Mr. J. J. McArthur, who has field charge of this work on behalf of Canada, has transferred his party to the east side of the Rocky mountains, to continue the resurvey of the 49th parallel.

The survey of the boundary line between the province of Quebec and the state of Vermont, under Messrs. G. C. Rainboth, D.L.S., and J. B. Baylor, of the United States Coast and Geodetic Survey, with the establishment of the new monuments, has been completed. The survey this season will be transferred to the north line from the source of the St. Croix, dividing the province of New Brunswick from the state of Vermont.

The survey of the eastern section of the boundary and that of the 49th parallel have hitherto been carried on under agreements between the governments. By a treaty recently entered into, provision is made for the survey and monumenting of the whole of the boundary line from the Atlantic to the Pacific ocean, comprising, besides the above mentioned sections, the boundary line in Passamaquoddy bay, along St. Croix river to its source, along the St. Johns river and the Highlands to the Connecticut river, from Lake Superior to the northwest angle of Lake of the Woods, from the 49th parallel, through the straits of Georgia and Fuca to the Pacific ocean, and along the St. Lawrence river and through the Great Lakes and connecting waters.

Reconnaissance for the geodetic survey has now extended from near the city of Quebec to west of Toronto.

Towers have been erected where necessary for the purposes of observation, and the observing itself has been actively proceeded with. Lines of precise levels, necessary as a basis for the vertical co-ordinates of the points determined, have been carried on along the railway lines.

The geographical positions of five points in Yukon Territory and nine in eastern Canada have been determined by the field observing staff of the observatory.

Full details of the astronomical, astrophysical, seismological and other work of the observatory will be found in the report of the Chief Astronomer and Boundary Commissioner.

NATIONAL PARKS.

The Dominion parks were all, in the latter part of the year, placed in charge of the Forestry Branch, and Mr. Howard Douglas, Superintendent of the Rocky Mountains park, was appointed to have general oversight of them with the title of Commissioner of Dominion Parks.

These parks are now six in number, comprising the Rocky Mountains park, Yoho park and Glacier park on the main line of the Canadian Pacific Railway, Jasper park on the Grand Trunk Pacific Railway, where it crosses the Rocky mountains, Elk Island park, near Edmonton, and Buffalo park, on the Battle river near Wainwright. These parks comprise a total area of 15,500 square miles, or 9,920,000 acres, the largest being Jasper park, with an approximate area of 5,450 square miles.

The mountain parks include some of the grandest of the beautiful mountain scenery of the Rockies and Selkirks, and the large and increasing number of people resorting to those which are accessible demonstrates that they are a public necessity and that the policy of thus retaining for the use of the public in general opportunities for delightful and healthful outdoor recreation is fully justified. The number of visitors at the Rocky Mountains park increased from 10,696 in 1893 to 32,209 for last year. And with the increase of visitors has come an increase of revenue from $6,143.08 in 1903 to $25,586.43 in 1908. It may be expected that in time these parks will become entirely self-supporting.

Buffalo park was established to provide for the herd of buffalo purchased from Mr. Pablo, of Montana, and which have been temporarily placed in Elk Island park. Three hundred and thirteen head were placed in the latter park and will be transferred to Buffalo park next year, it having been completely fenced and made ready for occupation. There are still some 300 head to be shipped from Montana and it is hoped before the end of another year to have them all safely in Buffalo park. The Dominion is to be congratulated on having thus secured the last great herd of buffalo in existence.

FORESTRY.

The report of the Superintendent of Forestry for the year ending March 31 last, will be found under Part VII. of the general report.

It has been found advisable to place under the immediate control of the superintendent of forestry the work in connection with irrigation and the administration of parks, as it was felt that these services are closely connected with the preservation of forest areas, and there is no doubt that under the present arrangement the Forestry Branch, which has become one of very great importance from a public point of view, will be in a position to devote to the work coming within its purview the careful attention which it deserves.

Mr. Campbell, who has been placed in charge of the branch, has devoted considerable time to both forestry and irrigation, and he is in every way specially qualified to efficiently discharge the duties now entrusted to his care.

From the various statements submitted, it will be observed that considerable progress is being made by the department in having the permanent forest reserves carefully examined with a view to ascertaining the existing conditions and taking such steps as may be necessary to properly protect the timber growing thereon.

It is satisfactory to note that there has been a growing demand in the west on the part of actual settlers for a supply of trees from the nursery station at Indian Head, and that the efforts of the department within the last few years to encourage tree-planting have proved highly satisfactory.

SCHOOL LANDS.

In view of the very satisfactory result of the auction sale held in Manitoba during the autumn of 1906 it was decided to hold another series of sales in that province in

the spring of 1907, for which purpose the lands had previously been inspected and valued.

The sales were held at twelve different points in the province, which were so selected as to be within a convenient distance of the lands offered, the sales beginning at Pilot Mound on May 28, and ending at Winnipeg on June 28.

The result was most satisfactory, 86,511·50 acres being sold for $902,624.71, or an average price of $10.43 per acre. Further details of the sales, showing the acreage sold, the amount realized, and the average price per acre at each point of sale, will be found in the report of the chief clerk of the School Lands Branch.

While it was not considered advisable to hold general auction sales of school lands in the following autumn, it was decided in view of the number of applications received for school lands in that vicinity to hold sales at Rossburn and Russell in the western part of the province.

Sales were accordingly held at these points on November 5 and 7, 1907, and 16,250·20 acres were sold for $160,533.27, or an average of $9.88 per acre.

It had been arranged to hold a sale at several points in the province of Saskatchewan during the autumn of 1907, but owing to the comparatively poor harvest, and the general financial stringency, it was found advisable to postpone them. A number of small parcels were, however, disposed of for school sites, and a number sold to railway companies under the Railway Act for right-of-way, station grounds, and other purposes.

Two parcels applied for by the Canadian Pacific Railway Company were also offered at public auction so as to afford them an opportunity of acquiring them, on the condition that the company should pay half the expenses of the sale, namely, section 11, in township 25, range 5, west of the 3rd meridian, and the northeast quarter of section 29, in township 39, range 27, west of the 3rd meridian.

The sales took place in October, 1907, the first parcel mentioned being sold for $13,200, or an average of $20.62 per acre, and the latter for $25 per acre, half the expenses of the sale being paid as agreed upon by the Canadian Pacific Railway Company.

Auction sales were also held in the province of Alberta, at Calgary and Cardston, on November 13 and 14, 1907, respectively, 4,779·52 acres being sold at the former point for $41,106.69, or an average price of $8.06 per acre, and at the latter point 5,261·33 acres for $55,958, or an average price of $10.62 per acre.

The total area sold during the fiscal year in the three provinces of Manitoba, Saskatchewan and Alberta was 114,712·07 acres for $1,192,615.85, or an average price of $10.40 per acre.

There has been a strong demand for leases for grazing purposes, 411 leases having been issued during the past fiscal year.

The revenue from this source is $21,123.32, and the revenue from coal leases for the same period is $4,463.84.

The total gross revenue from school lands for the fiscal year was $709,074.08, and the net revenue $703,692.99.

The revenue would have been even larger had it not been for the financial stringency and the comparatively poor harvest, owing to which the number of auction sales held was not as large as it would otherwise have been.

The statement accompanying the report of the chief clerk of school lands shows balances to the credit of the three school lands funds on March 31, 1908, to be as follows:—

Manitoba	$1,935,791 84
Saskatchewan	736,703 75
Alberta	369,763 43

THE YUKON TERRITORY.

The report of the Commissioner of the Yukon Territory, Mr. Alexander Henderson, and of the other Yukon officials who are in charge of the several branches of the administration of that Territory, will be found in Part No. VI. of the general report.

These reports would appear to indicate that the spirit of optimism which has hitherto prevailed still exists among the people of the Territory. It would appear that former methods of mining have to a large extent been abandoned, and the principles of co-operation are being successfully applied to the gold industry. Mining claims which heretofore were operated separately by comparatively crude methods have been grouped for operation on a large scale by one plant, thus materially reducing the cost of production. Dredges of the largest type and most modern equipment appear to have been installed and are being operated with marked success. Hydraulic mining plants seem to be in full operation in different parts of the Territory, and a system of electric elevators, which appear to have been first introduced as an experiment, have proved to be highly successful. This new system of winning the gold is likely to prove a most valuable auxiliary to the recognized dredging and hydraulic methods, the efficiency of which has already been abundantly proved.

With the introduction of a hydro-electric transmission plant by the Yukon Gold Company for the operation of their dredges, elevators and other works they would appear to have overcome the obstacle hitherto encountered in the high cost of fuel for operation, and the completion of their extensive water system and of the reservoir on Bonanza creek will apparently command the pay gravels over a very considerable area, and will as a result materially increase the gold output of the Territory.

It will be noted with satisfaction that the coal production of the Territory during the year was over 12,000 tons, which, with the introduction of electric energy as a motive power, should very materially lessen the hitherto large consumption of wood for fuel purposes.

I have the honour to be, sir,
Your obedient servant,

W. W. CORY,
Deputy of the Minister of the Interior.

PART I.

DOMINION LANDS.

DOMINION LANDS.

No. 1.

REPORT OF THE COMMISSIONER OF DOMINION LANDS.

DEPARTMENT OF THE INTERIOR,
DOMINION LANDS OFFICE,
OTTAWA, April 1, 1908.

W. W. CORY, Esq.,
Deputy Minister of the Interior,
Ottawa.

SIR,—I beg to submit my report for the twelve months ending March 31, 1908, on the Dominion Lands Branch of this department, together with the reports of the Inspector of Dominion Land Agencies and the agents of Dominion Lands for the several districts.

A summary statement has been prepared of the work transacted during the period mentioned as compared with the corresponding twelve months during the previous year.

STATEMENT OF WORK FOR TWELVE MONTHS ENDING MARCH 31, 1908.

	1907.	1908.
Number of files dealt with	152,739	147,794
Letters written	119,235	125,430
Triplicates	77,305	80,014
Total letters	196,540	205,444
Applications for patent:—		
Number examined	18,759	27,557
New applications	13,153	15,269
Certificates issued	12,415	15,215

I have the honour to be, sir,

Your obedient servant,

J. W. GREENWAY,
Commissioner of Dominion Lands.

No. 2.

REPORT OF THE INSPECTOR OF AGENCIES.

DEPARTMENT OF THE INTERIOR,
OFFICE OF INSPECTOR OF DOMINION LAND AGENCIES,
BRANDON, MANITOBA, July 14, 1908.

J. W. GREENWAY, Esq.,
Commissioner of Dominion Lands,
Ottawa.

SIR,—Permit me to submit my report for the fiscal year ended March 31, 1908. Allow me to say that the past year has been marked by a check in the general and increasing progress and development which have characterized recent years for nearly a decade.

The spring of 1907 was unusually late in the three prairie provinces, delaying seeding operations beyond dates that had any precedent, and consequently jeopardizing crop prospects.

Harvest was correspondingly late, and while crops grew rank and strong in considerable areas of the country, owing to late maturing, they suffered by frost. The high prices prevailing for grain aided to some extent in making up to the country the loss occasioned by frost, but the individual losers were considerably inconvenienced, many settlers being left without seed for the present year's sowing, or, having the means with which to secure it, satisfactory seed not being within their reach.

To meet this unhappy situation which prevailed almost entirely in Saskatchewan and Alberta, the Dominion government and the governments of the provinces mentioned, acting conjointly, supplied seed to such applicants as were unable to secure it. I was assigned the duty of making the distribution of seed necessary and taking the securities required. This work involved receiving and considering 16,615 applications and delivering upwards of 1,500,000 bushels of seed wheat, oats and barley at 250 railway stations in over 30,000 consignments, with as many securities and settlements to be taken.

This work has very fully occupied my time since January 1 to the present. I opened offices in Regina in the handling of this work and a large staff was necessary to cope with the work.

HOMESTEAD ENTRIES.

From the statement of homestead entries made last year it will be observed there has been quite a falling off from the year preceding. Unfavourable climatic conditions in the spring of 1907, together with general business and financial depression prevailing, were doubtless contributing causes.

SUB-LAND OFFICES.

In the past year it has been deemed advisable to close the sub-land offices at Pincher Creek and Bowden, Alberta, and Ranchvale, Manitoba.

New offices were opened at Etiomami, Sheho and Gull Lake, Saskatchewan; Makinak, Manitoba; Sedgewick and Lesser Slave Lake, Alberta; and Revelstoke, British Columbia, the total number now being sixty-five.

INSPECTION OF OFFICES.

My formal inspections of offices have been made and reported to you from time to time, as they were made. From the regular 'returns of work' from all land agents, sub-agents and homestead inspectors and from constant travelling about among the different agencies, I am able to keep a close supervision of all the work and generally to aid in the inspection of it. In this connection I desire to note the general proficiency of Dominion Lands officials in the west and the interest and care taken in their work.

During the year I have travelled by rail 46,725 miles; by boat 1,300 miles and by team 480 miles, making a total of 48,505 miles covered.

INSPECTION OF BANFF, YOHO AND BANFF PARK RESERVATIONS.

In addition to the duties of Inspector of Dominion Land Agencies I have kept up the inspection of the Banff, Yoho and Rocky Mountains Parks, carefully noting the work being done and checking the books and records in connection with the same.

The reports of my inspections have been duly forwarded to the department, and I need only add that I have found the work generally in very good shape.

STATEMENTS ATTACHED.

Herewith please find statements attached, as follows:—

'A' Dominion Lands agencies, principal transactions.

'B' Dominion Lands sub-agencies, principal transactions.

'C' Homestead inspectors, principal work performed.

I have the honour to be, sir,

Your obedient servant,

R. E. A. LEECH,

Inspector of Dominion Land Agencies.

A. —Dominion Lands Agencies, principal transactions for the Departmental year ended March 31, 1908.

Agency.	Homestead Entries Granted.	Land Sales.	Applications for Patent Received.	Land Entries Cancelled.	Timber Permits Issued.	Hay Permits Issued.	Letters.		Revenue.		No. of Staff.	Expenditure.	
							Received.	Sent.	Scrip.	Total Scrip and Cash.		Salaries.	Contingencies.
									$ cts.	$ cts.		$ cts.	$ cts.
Battleford	4,543	25	952	2,381	243	150	46,253	31,031	560 00	62,634 79	9	8,459 32	2,023 90
Brandon	89	33	422	70	370	24	7,474	5,977		20,802 36	3	3,249 96	330 86
Calgary	1,280	78	1,498	649	904	171	31,801	29,164		72,639 45	11	9,511 57	2,087 92
Dauphin	772	13	479	260	1,169	199	16,427	10,315		21,704 98	4	3,653 33	896 95
Edmonton	4,051	54	1,841	1,906	2,630	223	37,618	34,959		76,473 35	14	11,801 28	1,433 99
Estevan	518	18	1,208	404	3	222	10,914	11,291		11,889 66	4	3,960 34	353 66
Humboldt	2,494	18	1,256	1,482	201	24	32,173	32,022		34,351 08	6	5,840 31	2,555 03
Kamloops	196	72	111	28		13	4,042	3,605	3,251 53	23,078 40	3	3,488 31	187 24
Lethbridge	2,458	96	1,061	1,094	496	102	28,208	21,926		107,096 75	6	4,986 83	1,000 81
Moosejaw	5,189	44	910	2,680	670	196	31,636	12,195	1,282 29	71,011 51	17	12,924 95	3,220 60
New Westminster	43	16	17	1			2,508	2,142		3,329 65	2	1,766 02	241 00
Prince Albert	1,626	33	848	667	1,075	70	13,379	9,968		53,663 22	5	4,449 58	1,704 66
Red Deer	1,826	26	1,072	1,288	409	35	18,730	16,479		28,179 93	6	5,319 99	809 33
Regina	1,656	70	2,736	1,304	708	283	37,441	35,449	480 00	10,128 91	14	12,098 33	1,159 66
Winnipeg	891	47	512	374	1,454	292	19,334	19,152	2,071 33	103,927 75	13	14,630 00	3,150 85
Yorkton	2,840	88	1,438	3,024	474	42	29,973	23,766		42,310 86	7	6,701 36	621 54
	30,472	731	16,364	17,612	10,806	2,046	373,911	329,441	7,648 15	773,222 65	124	112,887 48	22,073 00
Compared with preceding twelve months	37,855	1,112	11,948	17,370	8,333	1,490	378,556	292,881	4,280 61	829,211 33	132	96,251 78	18,220 02

R. E. A. LEECH.
Inspector of Dominion Land Agencies.

B.—Dominion Lands Sub-Agencies, principal work performed during the Departmental year, April 1, 1907, to March 31, 1908.

Name.	Place.	Applications for Homestead entry taken.	Applications for Patent taken.	Applications for Inspections taken	Applications for Timber Permits taken.	Applications for Hay Permits taken.	Amount remitted to Land Office.	Expenditure.		Remarks.
								Salary.	Postage and Commission.	
							$ cts.	$ cts.	$ cts.	
Barker, R. T	Macleod, Alta	198	166	146	50	10	3,992 41	600 00	21 62	
Baetz, Geo. O	Ft. Saskatchewan, Alta	115	28	42	47	21	1,490 85	225 00	12 78	Resigned December 31, 1907.
Libby, J. J		18	6	....	89	21	520 93	75 00	4 54	Appointed January 10, 1908.
Barschel, J. F. P.	Canora, Sask	594	196	405	103	32	6,682 70	600 00	50 60	
Bobier, J. S.	Dubuc, Sask	19	198	45	.....	17	279 32	300 00	10 76	
Bowtell, Frank	Denwood, Alta	40	.....	32	.....	1	400 80	225 00	2 21	
Bowtell, Harry	Vermilion, Alta	220	8	109	16	4	2,544 90	50 00	17 18	Two months work.
Henry, C. E.		280	7	173	19	10	3,020 75	75 00	21 16	Three months work.
Brimacombe, M. A.		221	22	153	48	2	2,330 50	175 00	30 90	Appointed September 1, 1908.
Bunn, John R.	Milestone, Sask	86	89	69	....	5	1,862 00	225 00	14 76	Resigned January 1, 1908.
Caldwell, J. W.	Sprague, Man	7	.....	...	3	2	73 75	300 00	.....	Paid by commission.
Campbell, A	Innisfree, Alta	85	10	70	1	2	995 25	250 00	18 83	
Carroll, J. W.	Saddle Lake, Alta	175	9	14	90	25	2,048 24	180 00	8 64	
Cochran, L. B.	Medicine Hat, Alta	408	61	147	181	17	7,973 27	900 00	53 19	
Collier, Dick	Etoimami, Sask	.....	.....	.....	.....	.....	.....	.....	.....	Appointed March 24, 1908.
Cook, R. H	Arcola, Sask	46	92	46	11	21	768 35	175 00	16 94	Resigned October 31, 1907.
Cook, C. C		21	56	30	159	11	523 25	125 00	10 15	Appointed November 1, 1907.
Cox, A. E	Pincher Creek, Alta	52	43	38	13	2	1,313 40	112 50	6 61	Office closed August 13, 1907.
Davidson, D	Daysland, Alta	100	197	119	1	3	1,035 15	300 00	29 55	
DeCouninck, A	Makinak, Man	5	1	1	1	1	50 50	25 00	63	Appointed February 18, 1908.
Denovan, Robert	Sheho, Sask	45	37	23	4	...	451 00	91 93	5 78	Commenced December 10, 1907.
Dickey, W. J	Revelstoke, B. C.	13	2	1	.....	.....	90 00	239 40	2 02	Commenced June 12, 1907.
Dubois, M. J.	Duck Lake, Sask	122	54	39	58	32	1,758 17	300 00	13 80	
Edgson, John	Edison, Alta	63	25	23	106	5	718 70	300 00	9 53	
Elton, D. H.	Cardston, Alta	22	14	35	22	....	455 50	300 00	3 94	
English, J. J	Maple Creek, Sask	351	33	38	32	38	3,894 00	450 00	37 96	
Musselman, C.	Vegreville, Alta	242	112	150	7	6	2,584 70	200 00	21 03	Resigned November 30, 1907.
Spence, Chas. T.		65	63	51	39	2	747 50	100 00	9 54	Appointed December 17, 1907.
Ferguson, James	Gull Lake, Sask	162	2	42	90	8	1,818 19	200 00	14 25	Began August 1, 1907.
Gray, W. B.	Stettler, Alta	547	390	326	86	72	7,246 80	725 00	55 01	
Gregory, J. A.	N. Battleford, Sask.	171	131	104	6	29	1,927 25	200 00	3 62	Resigned August 15, 1907.
Higgs, Roland		79	54	63	10	8	1,105 70	301 94	9 04	Began August 15, 1908.
Gunn, Peter	Lac Ste. Anne, Alta	76	7	20	26	19	836 95	300 00	5 29	
Gwynn, J.	Kutawa, Sask	261	59	146	20	14	2,668 05	480 00	16 67	
Harley, Hugh	Swan River, Man	70	37	65	187	36	2,086 37	300 00	19 69	
Holmes, W. E. G.	High River, Alta	66	241	91	62	3	1,615 95	300 00	18 27	

Milburn, N. A.	Lloydminster, Sask.	687	145	227	11	14	7,766 75	555 00	41 79	Resigned March 1, 1908.
Orrange, Geo.		20	13	13	.....	2	208 00	45 00	2 52	Began March 4, 1908.
Lapointe, P.	Willow Bunch, Sask	190	14	32	134	10	1,981 75	360 00	13 31	
Malcolm, H. A.	Innisfail, Alta	118	58	22	82	16	1,437 10	600 00	11 21	
Milburn, Wm	Swift Current, Sask	636	14	219	154	121	7,347 50	570 00	51 28	
Moore, O. S.	Olds, Alta.	354	120	265	185	39	4,693 95	600 00	39 25	
MacDonald, G	Belvedere, Alta.	136	15	48	123	53	1,554 95	300 00	8 65	
Mackenzie, W. L.	Quill Lake, Sask.	277	127	200	10	6	2,971 75	300 00	42 01	
McDonald, J. S.	Sedgewick, Alta.	278	71	325	3	5	4,814 70	258 30	37 47	Appointed May 3, 1907.
McGregor, A. B.	Davidson, Sask.	310	222	343	77	10	4,465 00	480 00	38 40	
McGregor, D. S.	Rosthern, Sask.	349	238	147	121	31	4,781 16	600 00	25 16	
McIntosh, Robert.	Saskatoon, Sask.	1,348	524	1,129	4	103	17,144 15	1,050 00	116 11	
McKay, O	Leduc, Alta.	59	32	37	20	3	787 57	225 00	5 17	Resigned.
Alton, W. W.		27	10	20	36	4	434 25	75 00	5 15	Appointed February 8, 1908.
McKernan, James.	Athabaska Landing, Alta	39	1	.....	20	12	689 85	300 00	5 66	
Newth, Reginald.	Lipton, Sask.	444	259	385	5	11	4,959 00	410 00	52 66	
Oxley, R. W.	Hanley, Sask.	307	315	414	9	24	4,603 55	550 00	42 16	
Palmasson, P.	Pine Valley, Man.	36	4	3	168	18	1,248 73	180 00	.....	
Paul, S. B.	Moosomin, Sask.	37	97	16	1	1	376 75	300 00	12 27	
Reed, C. C.	Ponoka, Alta	216	73	.....	15	8	3,176 60	300 00	32 19	
Roberts, A.	Wapella, Sask.	44	19	40	.....	15	895 05	300 00	5 58	
Robertson, Wm	Nanton, Alta	224	362	263	87	9	3,543 32	410 00	36 70	
Sawatzky, J. F.	Herbert, Sask.	239	50	76	69	22	2,689 55	290 00	18 06	
Shenfield, H. E.	Bowden, Alta.	18	18	11	1	17	243 50	90 00	4 28	Office closed September 30, 1907.
Stedman, E. F.	Strasburg, Sask.	172	389	244	.....	24	2,889 60	300 00	26 80	
Stephen, A. M.	Redvers, Sask.	25	226	72	.....	1	652 31	480 00	9 71	
Stewart, Robert.	Whitford, Alta.	124	71	25	134	18	1,458 65	300 00	11 41	
Taylor, R. B.	Grenfell, Sask.	22	98	67	12	17	498 50	480 00	7 73	
Thomson, W. M.	Ft. Qu'Appelle, Sask.	2	.....	6	.....	2	24 50	60 00	1 29	Office closed May 31, 1907.
Tompkins, Peter.	Lesser Slave Lake, Alta.	25	3	2	11	.....	253 00	1,000 00	90 47	Appointed July 9, 1907.
Vickerson, Frank.	Lacombe, Alta.	174	83	152	23	23	2,817 40	450 00	21 59	
Waddell, Alex.	Weyburn, Sask.	481	346	556	4	85	5,626 00	475 00	44 88	
Wakefield, A. G.	Ranchvale, Man.	61	13	28	11	2	910 50	275 00	8 75	
Ward, D. A	Wetaskiwin, Alta.	266	69	209	27	19	3,501 00	600 00	22 08	
Wild, A. E.	Melfort, Sask.	427	215	not given	204	18	5,038 00	600 00	37 90	
Wilson, H. G. W.	Indian Head, Sask.	30	85	40	....	3	440 50	300 00	9 30	
Yeo, J. W.	Stuartburn, Man.	3	3	.....	.....	.....	30 00	25 00	02	Resigned April 30, 1907.
Wachna, Theo.		30	23	2	195	13	543 60	275 00	98	Began May 1, 1907.
		13,380	6,875	8,494	3,543	1,258	175,541 41	24,474 07	1,515 44	
Compared with preceding twelve months.		18,627	6,267	6,400	2,786	909	225,697 80	20,428 53	1,512 41	

R. E. A. LEECH,
Inspector of Dominion Land Agencies.

C.—Homestead Inspectors, statement showing principal work performed during the Departemental year, April 1, 1907, to March 31, 1908.

Name.	Headquarters.	Land Inspections made.	Applications for Patent taken.	Miles travelled by Wagon.	Miles travelled by Rail.	Travelling and living Expenses for self and team.	Expenses for new and on old travelling equipment.	Remarks.
						$ cts.	$ ct	
Axford, Fred	Glenboro, Man.	203	83	4,952	2,773	811 05	50 75	Appointed May 7, 1907.
Bannerman, J. A	Red Deer, Alta.	1,284	.....	5,252	19,329	1,878 55	.....	Acting Ranch Inspector.
Bell, George A	Estevan, Sask	209	154	3,849	3,159	907 93	99 90	
Bowtell, Harry	Vermilion, Alta.	360	126	7,753	4,033	1,988 08	350 10	Appointed May 25, 1907.
Brooke, A. W	Moosejaw, Sask.	501	175	3,506	1,138	934 25	187 75	
Bryant, T. W	Calgary, Alta.	388	251	4,538	2,986	789 08	39 00	
Buchanan, D	Minnedosa, Man.	386	207	4,916	2,474	1,066 15	192 05	
Clouston, Geo. H	Battleford, Sask.	310	114	3,475	1,142	668 56	41 80	
Cunningham, T. J	Vegreville, Alta.	311	349	4,263	2,386	937 45	47 95	
Currie, A. B	Kamloops, B.C.	385	115	2,176	7,399	1,104 62	.....	
Dodds, J. T	Swift Current, Sask	282	94	5,802	3,088	1,495 09	535 60	Appointed April 9, 1907.
Doze, I. S	Pakan, Alta	53	33	2,067	432	408 65	9 30	Began November 18, 1907.
Duggan, L	Humboldt, Sask.	309	64	4,492	2,158	1,447 75	450 00	
Foley, R. D	Winnipeg, Man.	168	120	1,377	618	189 45	9 95	Four months work. Appointed to Winnipeg Land Office.
Gibson, Jas	Brandon, Man.	297	91	2,227	4,357	645 20	80 00	
Gladstone, W. E	Prince Albert, Sask	177	69	2,653	2,590	855 00	31 00	
Helmer, A Robertson, S. M	Calgary, Alta	3,592	.....	5,830	10,448	1,860 59	.....	Combined statement.
Jonasson, P	Winnipeg, Man.	25	12	417	137	141 30	44 00	Began February 10, 1908.
Kennedy, F	Whitewood, Alta.	224	481	4,775	2,148	1,042 19	44 60	
Lagimodiere, Wm	Winnipeg, Man.	324	94	4,018	1,461	913 05	84 25	
Link, Adam	Lethbridge, Alta.	566	345	4,390	1,802	1,178 05	41 75	
Magee, W. D	Lamerton, Alta.	511	117	5,498	2,246	890 37	42 42	
Menu, Chas. L	Winnipeg, Man.	28	10	162	256	50 05	.....	Began January 20, 1908.
Moffat, James	Marcelin, Sask.	467	307	5,795	3,072	1,246 69	51 90	
McCallum, N. G	Yorkton, Sask.	420	327	3,373	854	525 75	115 40	Appointed to Land Office.
McCarthy, D. J	Lloydminster, Sask	538	42	2,594	2,880	569 90	.....	Appointed October 7, 1907.
McDiarmid, James	Edmonton, Alta.	395	310	6,069	585	1,278 05	188 95	
McGregor, R. E	Gilbert Plains, Man	55	158	3,104	1,084	843 72	135 57	
McLeod, A	Yorkton, Sask.	17	8	247	.....	44 50	4 00	Began February 10, 1908.
McLeod, D	Yorkton, Sask.	542	438	5,119	590	617 47	48 65	
McNab, D. C	Brandon, Man.	142	31	1,059	4,988	532 84	.....	
Nichol, W. F	Estevan, Sask.	245	234	4,531	1,531	926 83	40 45	
Oliver, Edward	Craik, Sask.	232	151	3,509	2,495	865 10	69 00	
Pentland, R. P	Hanley, Sask.	189	113	4,275	1,310	1,423 56	298 70	

Ridington, W. R.	Lloydminster, Sask	18	49	875	990	270 21	11 10	Appointed to Battleford Land Office, August 1, 1907.
Seale, John	Dauphin, Man.	213	114	3,464	3,756	911 17	39 80	Appointed June 18, 1907.
Skene, Alex	Grand Coulee, Sask	177	310	3,904	2,861	628 40	382 40	
Stauffer, J. E.	Didsbury, Alta.	393	280	4,189	3,378	1,049 96	135 20	
Sutton, C.	Fertile Valley, Sask	80	49	1,165	236	201 76	157 05	Appointed November 18, 1907.
Vollmer, F. J.	Moosejaw, Sask.	22	11	171	48	58 90	5 00	Began February 17, 1908.
White, W. H.	Ft. Saskatchewan, Alta	103	77	3,681	523	746 50	237 00	Resigned in October, 1907.
Williamson, C. H.	Lethbridge, Alta.	303	165	5,041	1,632	1,587 74	167 70	Began May 15, 1907.
		15,476	6,281	150,553	111,373	36,641 51	4,770 04	
Compared with preceding 12 months		39,679	4,338	118,828	71,560	26,910 79	1,620 15	

R. E. A. LEECH,
Inspector of Dominion Land Agencies.

No. 3.

REPORT OF THE AGENT AT BATTLEFORD.

DEPARTMENT OF THE INTERIOR,
DOMINION LANDS OFFICE,
BATTLEFORD, SASKATCHEWAN, April 4, 1908.

The Commissioner of Dominion Lands,
Ottawa, Ont.

SIR,—I have the honour to submit the annual report of this office for the year ending March 31, 1908.

Last summer, preceded by the severe and long winter of 1906-7, was unfavourable for farming operations, and consequently the crops failed to properly ripen in several parts of the district. This caused a scarcity of seed of sufficiently good quality, but it was again remedied by the timely action of the government in the matter.

The past winter has been unusually mild, with very little snow up to March 1, so that the settlers were saved from the fuel troubles of the previous winter.

The road bed for both the Grand Trunk Pacific and Canadian Pacific Railway passing through the southern portion of this district is now ready for the steel, and it is expected that regular railway service will be inaugurated on these two lines before the snow flies.

The spring rush of settlers has already commenced, and judging from this, as well as from inquiries received, there is all the appearance of a very heavy immigration during the coming season.

Following is a statement of the work performed during the past year:—

Homestead entries granted	4,543
Homestead entries cancelled	2,381
Land scrips located (acres)	10,840
Timber permits issued	243
Hay permits issued	150
Applications for patent recommended	952
Letters received	46,253
Letters written	31,031
Total revenue	$62,634.79

I also enclose a detailed statement showing the revenue on account of coal and minerals collected at this agency.

Your obedient servant,

L. P. O. NOEL,
Agent of Dominion Lands.

No. 4.

REPORT OF THE AGENT AT BRANDON.

DEPARTMENT OF THE INTERIOR,
DOMINION LANDS OFFICE,
BRANDON, MANITOBA, April 14, 1908.

The Commissioner of Dominion Lands,
Ottawa, Ont.

SIR,—In submitting the annual report for the year ending March 31 last, I beg to say that from the present outlook, there is every prospect of a good crop with an increased area under cultivation in this district. The spring has been most favourable and the farmers are busy seeding. Yearly, the farmers learn the advantages of mixed farming and do not now depend upon their wheat as formerly; this has the result of their bringing as much under cultivation as possible and of their having ready money the year through. The demand to purchase has not been as large as in the past two seasons, owing to the stringency in the money market, which, however, has not been felt here as much as in the eastern provinces and is now gradually passing away and the situation is becoming normal again. Before the season has passed a great deal of real estate will have changed hands.

Immigration has opened up and people from all parts of the eastern world are coming west to find homes and for the investment of their moneys. The class of people keeps improving and we are now getting settlers who will further the interests of the country. The farmers in this vicinity are making applications for experienced farm hands, but the supply does not equal the demand, very few applications being received for work.

There are no lands left in this agency suitable for homesteading, the vacant ones consisting of a few scattered quarter sections which have been left, being inferior and not worth the taking up. Intending settlers are being sent west. The cancellations grow less, as the homesteaders, who are fortunate enough to secure land within a well settled part, fulfill their duties promptly and obtain their patents.

The following is a statement of the work performed for the past twelve months, ending 31st ultimo:—

Homestead entries cancelled	88
Applications for patent received	378
Cancellation of entries	70
Letters received	7,474
Letters sent	5,970

Your obedient servant,

L. J. CLEMENT,
Agent of Dominion Lands.

No. 5.

REPORT OF THE AGENT AT CALGARY.

DEPARTMENT OF THE INTERIOR,
DOMINION LANDS AND CROWN TIMBER OFFICE,
CALGARY, ALBERTA, April 25, 1908.

The Commissioner of Dominion Lands,
Ottawa, Ont.

SIR,—I have the honour to report on the business transactions of this office during the fiscal year ending March 31 last, as follows:—

The number of homesteads granted, 1,280, although an increase of 307 over the number granted in the period covering the nine months previous, is still 226 short of the number granted in the corresponding twelve months ending March 31, 1907, but, taking into consideration the fact that no new lines of railway have been opened up since that time, this decrease cannot be considered seriously and was to be expected.

There appears to be no abatement of the anxiety of incoming settlers to secure homesteads, and their attention is now being directed towards the north-easterly part of the district, in which a large number of homesteads are yet available and through which it is expected the Grand Trunk Pacific and Canadian Northern Railway Companies will have branch lines in operation in the next eighteen months or two years.

The revenue derived from the disposal of Dominion lands is $37,210.12, which is an increase of $9,294.99 over the amount collected during the period covering the nine months previous.

The revenue collected under Timber, Grazing and Irrigation is $17,232.36 and that collected under the heading of Mines is $13,299.91.

These returns cannot be compared separately, as the revenue collected under these two headings was shown collectively under the heading of 'Timber and Mines' last year, but comparing them collectively after adding the amount collected under the heading of 'School Lands' (which was done last year) there appears to be a decrease of $1,861.27 between the total of these returns and the total collected under the heading of 'Timber and Mines' for the nine months previous. This decrease is easily explained and is caused by the difference in the amounts shown as collected from the sales of coal rights which have been discontinued since March 4, 1907.

During the year 34,801 letters were received and 29,164 written; also 1,498 applications for patents were recommended.

The past winter has been very mild and was a very easy one on farmers and ranchers, as the stock was able to graze nearly all winter and very little feeding was necessary, which will be of material assistance to the settlers in recovering from the losses sustained in the extremely hard winter of 1906 and 1907.

Owing to the mildness of the weather no shortage of fuel was experienced, and in any event every possible precaution was taken to avert a famine of fuel such as was experienced during the previous winter.

Spring opened very early and seeding is well advanced at this date. Quite a large number have availed themselves of the assistance extended to them by the government in the matter of seed grain, and satisfaction is being expressed both as to the quality of the seed supplied and also as to the action of the government in furnishing such supply, which was urgently required in some localities owing to the damage done to last year's crop.

This part of the province at least appears to be recovering rapidly from the wave of financial stringency which has been experienced more or less through the whole Dominion, and wholesale houses inform me that business is as good as in the past years and will within the near future be on a sounder basis than ever before; also, I am assured by bank managers that there will be no shortage of funds for legitimate business purposes.

I am forwarding by mail of even date under separate cover:—

Schedule 'A' showing revenue on account of timber, grazing and hay on Dominion lands.

Schedule 'B' showing operations of saw-mills under government license.

Schedule 'C' showing revenue collected on account of mines and minerals.

Schedule 'D' showing revenue collected on account of school lands.

Attached to schedule 'B' you will find a summary showing the amount of sales of timber manufactured during the year, the royalty thereon and the average price at which sold.

Your obedient servant,

R. B. MATHESON,
Acting Agent of Dominion Lands.

No. 6.

REPORT OF THE AGENT AT DAUPHIN.

DEPARTMENT OF THE INTERIOR,
DOMINION LANDS OFFICE,
DAUPHIN, MANITOBA, March 31, 1908.

The Commissioner of Dominion Lands,
Ottawa, Ont.

SIR,—I have the honour to submit the following report on the Dauphin lands district, for the fiscal year ending this day.

Conditions during the past year have on the whole been very favourable, though owing to the exceptionally late spring of 1907, which delayed seeding to a very marked extent, some portions of the district were not quite as fortunate as in former years; but even in these parts, the good prices obtained for such grains as could be marketed early compensated for any shortage in yield. Prices have dropped somewhat of late, for all but the high grades, but as most of the grain has already been disposed of this will not materially affect conditions. Owing to the many points and routes open for shipment, I am unable to arrive at an estimate, but would believe it to be largely in excess of any former season.

Stock, in both horses and horned cattle, is increasing rapidly, and a very marked improvement is met with, owing to the importation of better sires, and the establishment of several creameries has given an incentive to settlers to go further into mixed farming. This will without doubt result in great gain to the country. All varieties of stock have wintered well, and though it was feared at one time that the unfavourable weather during the haying period would cause a shortage in feed, the prolonged good, open weather during the late fall enabled animals to feed out on the meadows and stubble, for a much longer period than had usually been possible, thus effecting a great saving, with the result that farmers have still plenty of feed for spring work and many have some surplus for disposal.

More attention could with advantage still be paid to sheep, pigs and poultry, as importations of these have yet to be made to supply local demands; this may, however, be taken up ere long, in fact it is now being looked into by many.

The influx of settlers has not been quite as heavy as during the past two years; still, a fair number have reached us, and the homestead entries are in excess of last year.

Considerable activity has been noticed in sales of improved farms, and prices are steadily on the rise, these sales being chiefly to actual farmers from other parts, who preferred buying improved lands to taking wild free grants.

Many new villages have sprung up, chiefly along the extensions of line of rail, which were opened during the past two seasons, and have furnished markets, where grain and produce can be disposed of and supplies secured, at easy distances from most settlements. In fact, the tract between lakes Manitoba and Dauphin is now about the only section of the district at all remote from market, and it is expected that this will be served in the near future, as it is being rapidly settled.

Lumbering operations, so far as the larger mills are concerned, have not been prosecuted with the usual vigour, owing no doubt to the financial stringency and the fact that heavy stocks were carried over from last summer, though the fine weather experienced during the winter was most favourable for this work, just about the

proper quantity of snow having fallen to permit cheap production. Due advantage of this fine weather was taken, however, by the settlers, who secured permits in greater numbers than ever, and which, so far as I can learn, are being largely filled.

The more careful supervision of the timber in the reserves has had good effect, but it is feared that closer watch over the operations of the small portable millowners is urgently needed, as these, having no vested rights, can see nothing but the immediate profit to be derived from the cutting and disposing of the timber at the present time, and in most instances prosecute their work without any due regard to conserving the timber. At the present rate of wasteful cutting, it is feared that unless more stringent measures are adopted and carried out, the timber of any commercial value, for lumber, which has been spared by the fierce fires that several years ago devastated the Riding Mountains Reserve, will in a very short time be gone.

The municipal authorities have continued the good work in the way of improving roads, ditching and bridge building, and though perhaps not quite as much money was spent as in former years, more permanent structures have been erected, steel bridges taking the place of the former wooden ones. Many new school districts have been established, and all are well attended and kept up.

The health of the district has been good, no epidemic having visited us, though the various hospitals throughout the country have as usual had plenty of patronage, and have rendered signal service.

I attach a summary of the principal items of work carried through the office.

Your obedient servant.

F. K. HERCHMER,
Agent of Dominion Lands.

Summary of principal items of work passed through office:—

Homestead entries granted	772
Entries where improvements collected	67
Land sales	13
Searches	217
Timber permits issued	1,169
Seizures	31
Hay permits issued	199
Grazing leases	20
Mining locations	14
Letters received	16,427
Letters written	10,315
Applications for patent taken	496
Entries cancelled	2,651

No. 7.

REPORT OF THE AGENT AT EDMONTON.

DEPARTMENT OF THE INTERIOR,
DOMINION LANDS AND CROWN TIMBER OFFICE.
EDMONTON, ALBERTA, April 2, 1908.

The Commissioner of Dominion Lands,
Ottawa, Ont.

SIR,—I have the honour to submit the annual report of this office for the year ending March 31, 1908.

Two outstanding features mark the year just closed which must have had their effect upon the operations of this office, namely, the unfavourable summer of 1907, and the financial stringency which began during that summer and continues to the present time; and yet on examining the actual business done at this office during the year and comparing it with that of former years there appears to be nothing to indicate that two such potent and adverse influences have been at work within the district. There might appear to be an exception to this general statement in the falling off in the total revenue of the office for the year, which would appear to be $76,473.35 as against $82,325.72 for the nine months immediately prior to this year. The difference in revenue may be held, however, to be owing almost entirely to a falling off in the larger sales of coal and other lands which is due, in a large measure, if not entirely, to other causes than those mentioned above. Almost every other item in the statement of the year's work shows a very decided increase over the same period of the preceding year.

The very unfavourable summer of 1907 and the financial stringency which set in during that summer combined to make it a very trying season for the settlers of this district, and tended to prevent many from homesteading ; but apparently the effect passed away with the season, as the records of the past three months show a very marked increase when compared with the corresponding period of last year. The winter was very mild and in striking contrast with its predecessor, and everything points to an early spring.

The last report from this office referred to the marked increase in the value of timber lands, activity in obtaining control of coal lands by companies and individuals, great demand for labour of all kinds, and increase in the price of lumber; while now it might be quite as accurate to say that the scarcity of money has either altogether reversed the condition or checked the tendency. Now there is little doing in coal or timber lands, labour of all kinds is more than equal to the demand and prices of lumber, brick and other building material have been substantially reduced. The general effect would be to appear to induce the man who is undecided, to get out and engage more seriously in the business of farming, and there is little doubt that it will prove, perhaps within the next year, to be a benefit to the district. Very few cases of destitution have been reported and a general feeling of hopefulness prevails among the settlers.

The timely assistance rendered by the government in advancing seed grain to such of the settlers as could not afford to buy their seed grain or find it within easy reach will be gratefully remembered by thousands of settlers, and by preventing the sowing of an inferior quality of seed this action will have done perhaps more for the

benefit of the district than the mere alleviating of the comparatively few cases of pecuniary distress. The expressions from the settlers in this connection are those of general satisfaction.

There is a continued keen interest in the opening up of the country to the west and north-west of Edmonton, as also in the Peace River country. The lack of transportation facilities seems to be the only thing that stands in the way of a very speedy settlement. New surveys and the trend of railway construction are being closely watched.

The following comparison will serve to indicate the progress of the district:—

		Nine months.	
	1905-6.	1906-7.	1907-8.
Entries	4,601	2,766	4,051
Revenue	$70,984 81	$82,325 72	$76,473 35

Summary of actual business, 1907-8:

Letters received	37,618
Letters sent	35,969
Applications for patent	1,851
Homestead entries cancelled	1,906
Hay permits issued	223
Timber permits issued	2,630
Homestead entries granted	4,051
Land scrips located	16
Revenue	$76,473 35

Your obedient servant,

K. W. MACKENZIE,
Agent of Dominion Lands.

No. 8.

REPORT OF THE AGENT AT ESTEVAN.

DEPARTMENT OF THE INTERIOR,
DOMINION LANDS AND CROWN TIMBER OFFICE,
ESTEVAN, SASKATCHEWAN, April 7, 1908.

The Commissioner of Dominion Lands,
Ottawa, Ont.

SIR,—I have the honour to submit the annual report of this office for the year ending March 31, 1908.

There has been a decrease in the number of homestead entries granted over last year, owing to the fact of the lands west of range 18, west of the second meridian, which were formerly in this district, being transferred to the Moosejaw agency. Owing to the lateness of last spring and to the early frost, which struck some localities, a portion of the crop was damaged, and many of the settlers have applied for, and received, seed grain advanced by the government. The past winter has been one of the mildest on record; there was little snow, so that the cattle and horses have been able to run out most of the winter. The farmers have already commenced work on the land, and it is expected that seeding will be general in a few days. There will be considerable increase in acreage sown over any previous year.

Appended is a statement of work performed during the fiscal year:—

Letters received	10,914
Letters written	11,294
Applications for patent	1,208
Entries cancelled	404
Homestead entries	518
Land sales	18
Timber permits	3
Hay permits	222
Grazing rents	21
Mining fees and royalty	16
Coal lands (applications for lease)	11
Total revenue of the office	$11,889.66

Your obedient servant,

R. CLAUD KISBEY,
Agent of Dominion Lands.

No. 9.

REPORT OF THE AGENT AT HUMBOLDT.

DEPARTMENT OF THE INTERIOR,
DOMINION LANDS AND CROWN TIMBER OFFICE,
HUMBOLDT, SASKATCHEWAN, April 2, 1908.

The Commissioner of Dominion Lands,
Ottawa, Ont.

SIR,—I have the honour to submit for your consideration the annual report of this office for the year ending March 31, 1908.

The total receipts for the year amounted to $34,351.08, being made up as follows:

Homestead entries, 2,494	$24,740 00
Restoration of entry, 1	10 00
Payments for improvements, 207	6,018 25
Payments on account land sales, 18	2,245 86
Payments on account sundries, 150	232 75
Timber permits, 201	81 90
Hay permits, 24	61 00
School lands sales, 2	322 75
School lands sundries, 105	616 37
Seed grain collections, 2	22 20
	$34,351 08

Number of letters received	32,173
letters written	32,022
applications for patent recommended	1,256
homestead entries granted	2,494
homestead entries cancelled	1,482

As this office was only opened on November 1, 1906, I am unable to give a comparative statement, showing how the year just ended compares with the previous year.

I might say, however, that the five months from November 1, 1907, to March 31, 1908, show an increase in revenue, and a large increase in the amount of work over the corresponding five months of the year ending March 31, 1907.

Taking into consideration the fact that the year just ended includes a period of more or less world-wide depression in almost all lines of manufacture and commerce, we in Canada, and perhaps more especially those of us who are privileged to live in this western portion of our Dominion, have a right to feel, and do feel justly proud of the way our country has weathered the storm.

Immigration shows no sign of decrease, in fact from correspondence on file in this office, I am led to believe that the number of new settlers who intend settling in this district during the coming spring and summer will be greatly in excess of that of the past year. This, I believe, is also true of the west in general.

The financial assistance rendered by the federal government to assure the prompt moving of the western grain crop has had the desired result and has been greatly beneficial to western farmers and to the country at large.

The prompt action of the federal government in taking steps to provide an adequate supply of seed grain for all settlers who were in need of same has been greatly appreciated. Above two thousand applications have been received and accepted in this district alone.

The general work of this office and of the seven sub-agencies tributary thereto is in a satisfactory condition.

Extra assistance is required at this office, and will, I trust, be received shortly.

I am pleased to be able to state that the outlook for the coming season is bright, and with favourable weather conditions we may look forward to a year of renewed activity and prosperity.

Your obedient servant,

GEO. L. DEMPSTER,
Agent of Dominion Lands.

No. 10.

REPORT OF THE AGENT AT KAMLOOPS.

DEPARTMENT OF THE INTERIOR,
DOMINION LANDS OFFICE,
KAMLOOPS, B.C., April 3, 1908.

The Commissioner of Dominion Lands,
Ottawa, Ont.

SIR,—I have the honour to submit my report for this office for the year ending March 31, 1908.

As predicted in last year's report, the harvest of 1907 was a good one. All crops were above the average and, with the exception of hay, were well harvested. Rain destroyed much of the hay, but the abundant yield more than made up for the loss. Stock of all kinds went into winter quarters in good condition and the winter season being favourable, have come through in good shape. I have not heard of any losses.

Prices on the whole were high; the only complaint was from stockmen on account of the low price of beef cattle and also the slow market, some of the stockmen having to hold their stock for weeks after the date appointed for delivery. This is explained by the action of the banks refusing the usual bank accommodation to the cattle buyers. This district did not participate in the land boom to any great extent, neither did it suffer as some districts have from the money stringency.

The work in the office shows a healthy increase in all branches. Homestead entries have greatly increased. The revenue from land sales shows a large increase and that in face of the fact that the land has been withdrawn from sale. The increase is solely from collections on old sales. This of itself shows the healthy financial state of the community. The revenue from grazing leases has also increased in a marked degree.

The attention of the outside world has been directed to the possibilities of cultivation by irrigation in the dry belt, with the consequence that a large amount of private property has changed hands with that end in view. If a success, it will mean the bringing of a large unproductive area under intensified farming and make what is now almost a barren waste the happy homes of hundreds of families.

With the same end in view, the department has sold a large block of land under strict conditions as to irrigation. This, in my opinion, is the only way that the dry belt can be made productive, unless the government undertakes the building of reservoirs, dams and ditches. The undertakings are too expensive for the individual farmer.

The laws governing the disposal and distribution of water for irrigation have been under consideration by the provincial government, and a valuable report has been made by experts. Many hoped that some of the disabilities under which they are now suffering would be removed at the last session of the legislature, but the House prorogued without any measure having been introduced.

The following is a summary of work done during the year:—

Homestead entries granted	196
Homestead entries cancelled	28
Applications for patent received	114
Letters received	4,042
Letters sent	3,605
Revenue collected	$23,078.40

Your obedient servant,

A. B. CURRIE,
Agent of Dominion Lands.

No. 11.

REPORT OF THE AGENT AT LETHBRIDGE.

DEPARTMENT OF THE INTERIOR,
DOMINION LANDS AND CROWN TIMBER OFFICE,
LETHBRIDGE, ALBERTA, April 7, 1908.

The Commissioner of Dominion Lands,
Ottawa, Ont.

SIR,— I have the honour to submit for your consideration the annual report of this office for the year ending March 31, 1908.

I have much pleasure in stating that the prosperity of southern Alberta is continuing and settlers from all parts of the United States, as well as eastern Canada are daily arriving, which tends to show the faith they have in its future possibilities.

In consequence of the heavy crops harvested throughout this district during the past season, the immigration has every prospect of being larger than in any previous year.

Settlement is reaching out in every direction and in order to be able to provide suitable locations for incoming settlers it will be necessary to have surveys of this district proceeded with.

Large tracts of land are being purchased from railway corporations and others, by settlers whose intentions are to settle on this land in the near future.

The homestead entries for the Lethbridge agency are considerably larger this year than in other years. The work has increased materially in every branch and has been disposed of satisfactorily, although additional office accommodation and assistance are very necessary. The entries of homesteaders who are not performing the required duties are being cancelled, although the entries cancelled this year are not as numerous as in previous years, as the homesteaders are making every effort to comply with the regulations. In cases where cancellations are effected the lands are rapidly being taken up by people on the ground who desire suitable localities.

The revenue of the mines branch as well as the land branch, has increased during the present year to almost double that of any previous year, but as a large amount of the timber business for this district is transacted through the Calgary office, the revenue of this branch is much smaller than it would be were the whole business pertaining to the same transacted here. A large percentage of the grazing rental, as well as moneys paid on account of coal lands, is paid direct to the department and, therefore, the amounts do not appear in my returns.

The sub-agents and homestead inspectors throughout this district have been very busy and deserve credit for the manner in which they have performed their departmental duties. The staff has worked faithfully and is deserving of special mention.

The following is a partial list of the work performed during the past year:—

Letters received	28,208
Letters written	21,926
Homestead entries granted	2,458
Entries cancelled	1,094
General sales	94
Hay permits issued	102
Timber permits issued	496
Timber seizures	6
Applications for patent received	1,061
Grazing rents	213

The total revenue collected for the fiscal year 1907 and 1908 is $107,096.75.

Respectfully submitted,

J. W. STAFFORD,
Agent of Dominion Lands.

No. 12.

REPORT OF THE AGENT AT MOOSEJAW.

DEPARTMENT OF THE INTERIOR,
DOMINION LANDS AND CROWN TIMBER OFFICE,
MOOSEJAW, SASKATCHEWAN, May 7, 1908.

The Commissioner of Dominion Lands,
Ottawa, Ont.

SIR,—I have the honour to submit my report of this office for the fiscal year ending March 31, 1908.

This office was opened on March 25, 1907, representing the newly formed Moosejaw Lands District, which district was previously included in the Regina and Alameda districts.

The past year has been a very successful one, in spite of the fact that the office was opened on the eve of a general financial depression, which is happily passing into history.

Although a small percentage of the farmers in this district suffered some loss by hail and frost, the crops generally were very fair, and any loss sustained was well made up by the high prices received. There would, however, have been a great scarcity of good seed grain, had not the department taken prompt action in meeting all the requirements in this respect.

This district has a wonderful future before it, containing as it does, practically no waste land. There is a tremendous area of the finest agricultural and ranching agricultural point of view, will be observed from the fact that in the large number of various kinds may be found adjacent to ravines, creeks, lakes and rivers, which add much to the picturesque appearance of the district, as well as to the comfort and convenience of the settlers.

A large portion of this district, lying to the south and south-west of Moosejaw, is not yet surveyed. That this section of the country is very promising from an agricultural point of view, will be observed from the fact that of the large number of townships which were surveyed and opened for homestead entry last season, very few of these homesteads are now available for entry, while squatters are going into residence in adjoining townships, in advance of survey. Other parts of the district are receiving similar attention, and as most of these newly settled districts are many miles from railroads, the settlers are anxiously awaiting the advent of railway communication.

The prospects for a good crop this year were never better. The weather is all that could be desired, and the rush of home-seekers, who are of the highest grade, is steadily increasing in number.

Appended is a statement of work performed during the fiscal year.

Your obedient servant,

J. RUTHERFORD,
Agent of Dominion Lands.

STATEMENT showing the business transacted in the Moosejaw Land office during the year.

—	Number.	Revenue.	Totals.
		$ cts.	$ cts.
Patent Branch—	5,189	51,650 00	
Homestead entries	214	8,704 53	
Improvements	37	6,057 69	
Land sales, cash	7	1,282 29	
" scrip	88	66 75	
Sundries			67,761 26
Timber and Mines Branch—	1	2 80	
Royalty on sales	676	198 85	
Timber permits	196	528 10	
Hay permits	39	1,227 34	
Grazing rents	1	42 90	
Coal lands, royalty	1	2 50	
Sundries			2,002 49
Miscellaneous—	100	521 09	
School land sundries	14	726 67	
Seed grain collections			1,247 76
Total revenue			71,011 51

Letters received	34,636
Letters written	42,195
Applications for patent	910
Entries cancelled	2,680

No. 13.

REPORT OF THE AGENT AT NEW WESTMINSTER.

DEPARTMENT OF THE INTERIOR,
DOMINION LANDS OFFICE,
NEW WESTMINSTER, B.C., April 16, 1908.

The Commissioner of Dominion Lands,
Ottawa, Ont.

SIR,—In accordance with instructions and the usual custom, I have the honour to submit a report as to the operations of this office for the year ended March 31, 1908.

Although the great bulk of the immediately available agricultural lands are disposed of, yet because the remainder are peculiarly situated at the base of the mountains, and in narrow irregular valleys along the mountain streams, the number of homestead entries gives only a one-sided idea of the time and labour demanded in the carrying on of the work.

About three-fourths of the number of entrants have resided on the lands for months before the formal entries could be granted, but in nine cases out of ten these are the permanent settlers, who make the most progress.

As mentioned last year, several of the old farms in favoured localities are being subdivided to meet the demand for small holdings.

More attention to dairying is evident throughout the lower Fraser valley; but as a rule, mixed farming is carried on..

Good prices are obtainable at all seasons of the year for farm produce. The market at New Westminster has been very successful in developing trade; and the city of Vancouver is fitting up a market building at a suitable point in that city.

The monthly statements show the following details:—

Letters received	2,508
Letters sent, besides circulars	2,142
Homestead entries	43
Total receipts	$3,379.65
Total contingent expenditure	346.55
Applications for patent recommended	17

Your obedient servant,

JOHN McKENZIE,
Agent of Dominion Lands.

No. 14.

REPORT OF THE AGENT AT PRINCE ALBERT.

DEPARTMENT OF THE INTERIOR,
DOMINION LANDS AND CROWN TIMBER OFFICE,
PRINCE ALBERT, SASKATCHEWAN, April 11, 1908.

The Commissioner of Dominion Lands,
Ottawa, Ont.

SIR.—I have the honour to submit my report for the fiscal year ending March 31, 1908.

The total receipts amount to $53,600.31. The homestead entries number 1,626 as against 1,699 for the previous year, which shows that there is no falling off in the

number of settlers coming into this district, and judging from present indications, we will receive quite as large an immigration this year.

The year just closed has been the most unfavourable in the history of the country. The severe winter of 1906-7 was followed by a late spring and a cold, wet summer. The crop prospects in August were never better, but the grain did not fill properly, and in many parts of the west, owing to the rank growth and delay in ripening, the wheat crop was very seriously damaged by frost; the Prince Albert district, however, harvested a good crop of oats and a fair crop of wheat, the latter grading about 20 per cent two Northern, 30 per cent three Northern, and 50 per cent four to six Northern, with very little bad enough to grade feed. Following the partial crop failure came the consequent reaction after years of unbroken prosperity and over-expansion, giving the country a most severe test, and I am pleased to be able to report that we have come through without serious setback, which speaks volumes for the natural resources of this great country. All indications now point toward a good season, and the farmers have more land ready for crop than ever before; the crop should be in in good time, and the soil is in excellent condition.

The Prince Albert district is essentially a mixed farming country and the light wheat crop does not seriously affect the condition of the farmer. The banking institutions and implement men inform me that collections are good, and that there is no serious falling off in business.

Your obedient servant,

R. S. COOK,
Agent of Dominion Lands.

STATEMENT of work at the Prince Albert office for the twelve months ending March 31, 1908.

	Nos.	Revenue.
Homesteads	1,626	$16,000 00
Improvements	178	5,120 87
Land sales	29	2,066 53
Land sales, scrip	4	1,039 58
Sundries	50	14 10
Seed grain	19	379 13
School lands, sundries	130	616 36
Crown Timber.		
Ground rent	28	5,928 50
Royalty on sales	32	16,251 93
Timber permits	1,075	5,494 55
Timber seizures	33	445 81
Hay permits	70	209 75
Grazing rents, Dominion lands	1	3 20
Mining fees	3	15 00
Coal land fees	3	15 00
		$53,600 31

Twelve months ending March 31, 1908:—

Letters received	13,379
Letters sent	9,968
Applications for patent	848
Entries cancelled	667

No. 15.

REPORT OF THE AGENT AT RED DEER.

DEPARTMENT OF THE INTERIOR,
DOMINION LANDS AND CROWN TIMBER OFFICE,
RED DEER, ALBERTA, April 6, 1908.

The Commissioner of Dominion Lands,
Ottawa, Ont.

SIR,—I beg to submit my annual report for the fiscal year ending March 31, 1908, and am pleased to say that notwithstanding adverse circumstances the Red Deer district has made satisfactory progress during the past year.

As mentioned in my last report, we had passed through the most severe winter ever experienced in the Northwest, but at that time it was too soon to estimate with any certainty the loss of cattle: however, after the spring round-up, it was found that the losses throughout this district were little above normal. The cold winter was followed by a backward spring which retarded seeding operations, a cool summer which retarded the maturing of crops, with snow and frost in September; and yet, notwithstanding all these drawbacks, the crops harvested in the Red Deer district were on the whole satisfactory, especially so in the eastern portion of the district, where the yield of wheat, oats and barley was an average crop and the grain of good quality. In the western portion of the district, which is heavily timbered and subject to more severe frost, not much grain matured; however, as all the settlers have more or less cattle, the damaged crops were not a complete loss as they furnished excellent feed. The past winter was mild, with very little snow, and cattle came through in excellent condition, little if any feeding being required, and should we have an early spring followed by a favourable summer, farming in the Red Deer district will be a profitable calling. There has been a sufficient snowfall during the past winter to ensure ample moisture, and fall wheat looks well at the present time. This district, as well as all other portions of the North American continent, has felt the stringency in the money market, but from my observation it has not affected the farmer so much as the real estate agents, speculators and, possibly, the merchants. When the banks refused to loan money for speculative purposes, the cry became general that money was tight, and those who had the cash hung on to it, in many cases making the reported stringency an excuse for not paying their accounts, but I notice that all sales of stock, farm implements, machinery, &c., are well attended by the farming community, good prices being realized and the cash forthcoming at the close of the sale, nor can I see how, at least for some time to come, any hard times can be experienced in the west, where such large sums are being expended for public improvements and where the farmer finds a ready market for his products at good prices. The creameries throughout the district are doing well, and the butter produced is of such an excellent quality that the demand is far in excess of the supply. I very much regret to see by the press that the contract for the extension of the Canadian Pacific Railway branch line east from Stettler has been cancelled. The eastern portion of this district has been settled by a fine class of farmers, who have taken up homesteads and purchased lands in the expectation that they would be provided with transportation for their products within a reasonable time, and if the extension of this line is deferred for another year it will have a very serious effect on the settlement of the eastern portion of the district, nor would it surprise me to see many of the settlers pull up stakes and depart for pastures new. It is to be

hoped the Canadian Pacific Railway management will reconsider the matter and see their way clear to doing something on the extension of their branch line east from Stettler this summer.

There has been a large increase in all branches of the work of this office during the past year, with the exception of homestead entries, as will be seen by comparing the following statement with the statement for the nine months period ending March 31, 1907 :—

	1907-8.	1906-7.
Homestead entries	1,826	1,693
Inspections	990	453
Letters received	18,730	12,901
Letters written	16,479	10,091
Applications for patent	1,072	636

Your obedient servant,

W. H. COTTINGHAM,
Agent of Dominion Lands.

No. 16.

REPORT OF THE AGENT AT REGINA.

DEPARTMENT OF THE INTERIOR,
DOMINION LANDS AND CROWN TIMBER OFFICE,
REGINA, SASKATCHEWAN, May 5, 1908.

The Commissioner of Dominion Lands,
Ottawa, Ont.

SIR,—I have the honour to submit my report for the year ending March 31, 1908. The statement of the work performed is as follows:—

	No.	Revenue.
Homestead entries	1,656	$16,400 00
Improvements	201	8,897 28
Land sales	70	10,306 71
Sundries		202 25
Timber permits	708	228 75
Timber seizures	2	20 42
Hay permits	283	841 60
Grazing rents	41	662 86
Mining fees	7	65 00
School land sales	4	1,528 70
Seed grain collections	27	1,075 34
		$40,128 91

Land scrip located	11	1,280 acres
Letters received		37,441
Letters written		35,449
Applications for patent		2,736
Entries cancelled		1,304

The opening of the Land office at Moosejaw in March, 1907, made a great difference in the business transacted at this office during the past year, especially in the homestead entries. The other branches of the work were not affected to any great extent considering the large area which has been taken from this district in the last two years and included in the Humboldt and Moosejaw agencies.

The past year has been a very poor one so far as the farming interests are concerned. The failure of the crops by frosts, &c., in certain districts was disastrous to some. The action taken by the government this year in granting seed grain to settlers has been a great benefit to the country. There were hundreds of farmers who had no means in sight to procure the seed necessary to sow their land this spring. The granting of the seed grain has enabled these parties to procure the seed required, and a large acreage which would otherwise not have been sown this year, will now be put under crop. I have had conversations with a large number of those who have received the seed, and they pronounce it good and state that the change of seed will be of great benefit to the country at large.

The early spring has enabled farmers to have their ground seeded early, and at this date the wheat is about all sown and everything points to a prosperous year.

Your obedient servant.

L. RANKIN,
Agent of Dominion Lands.

No. 17.

REPORT OF THE AGENT AT WINNIPEG.

DEPARTMENT OF THE INTERIOR,
DOMINION LANDS AND CROWN TIMBER OFFICE,
WINNIPEG, MANITOBA, June 1, 1908.

The Commissioner of Dominion Lands,
Ottawa, Ont.

SIR,—I have the honour to submit the following report upon the business transacted at this branch of the department, for the year ended March 31, 1908.

I regret to record the death on the 3rd of March last, of Mr. J. W. E. Darby, who held the position of assistant agent in this office from the date of his entering the service in January 1902. The vacancy caused by his death was filled by transferring Mr. A. F. Crowe from the Crown Timber Branch. Mr. Andrew Freeman succeeded Mr. Crowe as assistant Crown Timber agent.

The revenue from all sources collected from Dominion lands, amounted to the sum of $98,375.70, and from school lands, $5,552.05, of which sum $19,544.05 was realized from homestead entry fees and land sales, and the balance from timber, grazing and mines.

The year was an exceedingly busy one in all departments of the work. The counter work was extremely heavy, arising in part from the increased number of callers at the office, seeking general information.

The settlers within the agency obtained good results from their farming operations of last year. There was practically no loss in grains from frost, and prices and demand for all kinds of farm products were good. A few cases of distress were reported in the northern part of the district, among certain foreigners on bush farms, who obtained the needed relief from the immigration branch.

The trend of settlement during the year was northward, chiefly along the east side of Lake Manitoba.

Conditions are showing favourably for good crops during the current year. The spring opened some three weeks earlier than that of 1907, and the weather has been most favourable for growth.

Your obedient servant,

E. F. STEPHENSON,
Agent of Dominion Lands.

No. 18.

REPORT OF THE AGENT AT YORKTON.

DEPARTMENT OF THE INTERIOR,
DOMINION LANDS AND CROWN TIMBER OFFICE,
YORKTON, SASKATCHEWAN, May 18, 1908.

The Commissioner of Dominion Lands,
Ottawa, Ont.

SIR,—I beg to submit for your consideration the report of the transactions of this office for the year ending March 31 last.

The number of homestead entries granted for the past year was 2,840, an increase of 1,119, which can be attributed to the throwing open of certain lands held by Doukhobors and made available for homestead entry, while the fact that the Yorkton district has acquired a reputation for good land, progressive and successful farming, and easy distance to market points, serves as an inducement and arrests the attention of home-seekers, consequently wild land that gives promise of being turned into profitable farms by scrubbing and clearing are taken as homesteads rather than going further afield for open prairie.

The important and outstanding feature of last year was the cancelling of Doukhobor entries and the confining of these people to the land immediately surrounding their villages, a course of action which was hailed with satisfaction and approval. The entries thus cancelled made available 1,386 quarter-sections, and the granting of entries commenced on June 1 and continued each working day until July 6 following. Arrangements were made so that entries could be granted with despatch and errors guarded against. When this work was finished, after five weeks of strenuous labour, it was found that not one mistake had been made, clerical or otherwise, in the granting of entries.

Land-seekers were from almost every part of the Dominion, hotels and restaurants being overcrowded with men, young and old, awaiting the particular day for the chance of securing a homestead. On days when lands near the Canadian Northern Railway were for entry an enormous crowd of determined homesteaders were massed in front of the office, so much so that doors and windows were barricaded with stout timbers.

The Royal Northwest Mounted Police had charge of the besieging homesteaders, and they discharged their duties in a fair, just and impartial manner, which can be placed on record as a matter of commendation. When, as a matter of fact, many of the homesteads were worth $2,000, and men were there determined to secure the prize of a lifetime in a rush for first places, the moderation and patience of the police are a credit to the discipline of that force.

There were rumours of favoritism on the part of the police and collusion of officials of the Land Office with outsiders. There was no truth whatever in these rumours. The police were strangers in the town and the inside arrangements were such that no collusion could happen without the knowledge of the whole staff engaged at the work. All publicity possible was afforded as to the lands, and I am not aware of one instance of individual preference.

The district has gone through a very trying period during last year. Seeding did not commence until about May 10, which shortened the growing season about a month. The result was that the wheat crop was No. 2 feed and oats rejected. This

calamity to some extent was counterbalanced by a fall of dry weather and sunshine, which dried away the moisture of the frozen grain. On account of shrinkage which follows a frozen crop, the yield was badly impaired, although prices were high and altogether farmers fared better than was expected.

The conditions as described left the district without seed, and it was soon apparent that government aid must be rendered, which was done, and locally the distribution of seed was placed in the hands of homestead inspectors and in other respects has been the source of extra work at this office. This distribution of seed grain is appreciated by those whom it has helped, the quality of seed being sound and free from noxious weeds.

The work of the office appears to me to be in a very satisfactory position, and each member of the staff efficient and interested in doing his work thoroughly.

The following is a summary of the work transacted:—

Homestead entries	2,840
Timber permits	474
Hay permits (Dominion lands)	42
Hay permits (school lands)	141
Letters received	29,973
Letters written	23,766
Applications for patent	1,438
Entries cancelled	3,024
Revenue	$42,310.86

Your obedient servant,

JAS. E. PEAKER,
Agent of Dominion Lands.

No. 19.

REPORT OF THE MINES BRANCH.

DEPARTMENT OF THE INTERIOR,
OTTAWA, June 1, 1908.

W. W. CORY, Esq.,
Deputy Minister of the Interior,
Ottawa.

SIR,—I have the honour to submit herewith the report of the Mines Branch of the Department of the Interior for the fiscal year which ended on March 31, 1908.

The total revenue derived from all sources during the fiscal year amounts to $649,083.39, and the statements lettered 'A' and 'B,' showing in different forms how this amount is made up, will be found at the end of the report. Statement lettered 'A' shows the total revenue for each month, and statement lettered 'B' shows the revenue collected at each agency, including the Yukon Territory.

The revenue for the Yukon Territory, which amounts to $260,319.10, is shown separately in statement lettered 'C.'

The reports and statements for the fiscal year from the Gold Commissioner at Dawson and the Assistant Gold Commissioner at Whitehorse will be found under Part VI. of the general report.

TIMBER IN THE YUKON TERRITORY.

The total amount of dues collected on account of timber in the Yukon Territory during the fiscal year was $17,555.22.

There are in existence 114 timber berths held under license to cut timber within the territory, covering an area of 270·11 square miles, which licenses were granted prior to May 10, 1906, on which date the regulations governing the granting of licenses to cut timber in the territory were rescinded and regulations for the issue of permits to cut such timber substituted therefor. Three saw-mills are in operation within the territory, two on the Klondike river near Dawson and one on Twelvemile river.

According to returns received in the department the number of feet, B.M., of lumber manufactured during the year was 3,116,967, and the quantity sold 3,220,669, a quantity of the lumber having been held over from the previous year. The number of cords of wood cut during the year was 5,509·5, and the number sold 5,697. This does not include the very large amount of timber and cordwood cut free of dues for mining purposes.

MINING LANDS OTHER THAN COAL.

During the fiscal year 97 entries for quartz mining claims were granted by the agents of Dominion Lands in the western provinces and territories.

In the Yukon Territory 38,290 placer mining claims, 8,408 quartz mining claims and 59,838 renewals and relocations were recorded up to March 31, 1908.

According to the returns received during the fiscal year 1,537 entries for placer mining claims, 1,054 entries for quartz mining claims and 5,647 renewals and relocations were recorded during that period. The revenue collected from these sources, and from fees for registering documents in connection with mining operations, was $127,355.50.

ROYALTY ON GOLD MINED IN THE YUKON TERRITORY.

The total amount collected up to March 31, 1908, for royalty on the gross output of placer mining claims in the Yukon Territory, after deducting the exemption at one time allowed under the regulations, is $3,623,140.08, of which amount $70,504.65 was collected during the last fiscal year.

The following statement shows the agencies at which the royalty was collected and the amount collected at each:—

Dawson	$69,012 05
Whitehorse	1,492 60

DREDGING.

Forty-eight leases to dredge for minerals, other than coal, in the submerged beds of rivers in the Yukon Territory are now in force, covering a total frontage of 303·83 miles. The total revenue derived from this source up to March 31, 1908, amounts to $169,400.02, of which amount $17,875.42 was collected during the fiscal year.

These leases are chiefly confined to the Yukon, Stewart, Fortymile, Klondike and Hootalinqua rivers. By an order in council, dated May 14, 1907, the regulations governing the issue of leases to dredge for minerals in the submerged beds of rivers in the Yukon Territory were rescinded and other regulations substituted therefor. These regulations define 'river' as a stream of water the bed of which is of an average width of 150 feet throughout the part sought to be leased, and 'river bed' is defined as the bed and bars of the river to the foot of its natural banks. The exclusive right is given to every lessee under these regulations, or under the regulations rescinded, to dredge the river bed within that portion of the river leased to

him. Under these regulations a lease shall not include more than 10 miles of a river, and not more than one lease shall be issued to an applicant. The term of the lease is 15 years and the rental $100 a mile for the first year and $10 a mile for each subsequent year, and provision is made that the lessee shall install and operate a dredge on his leasehold within three years from the date of the lease.

There are in operation in the Yukon Territory 12 dredges, nearly all of which have an indicated capacity of 3,000 cubic yards in 24 hours. Several additional dredges have been ordered and will be in operation during the present season.

Forty leases to dredge for minerals in the beds of rivers in the provinces of Alberta and Saskatchewan are in force, covering a total frontage of 199 miles. The total revenue derived from this source up to March 31, 1908, amounts to $38,539.03, of which amount $1,741.42 was collected during the fiscal year.

HYDRAULIC MINING.

The regulations for the disposal of mining locations in the Yukon Territory to be worked by the hydraulic mining process were withdrawn by order in council, dated February 2, 1904, such withdrawal, however, not to affect leases already granted. Thirteen hydraulic mining leases are still in force, covering a total frontage of 38·58 miles. These leaseholds are all situated in the Yukon Territory. Since the regulations were first established, in December, 1898, forty-seven hydraulic mining leases have been issued, all of which have now been cancelled with the exception of the above number. Under the grouping provisions of the Placer Mining Act operators can now acquire and group for operation a sufficient area to warrant the installation of efficient hydraulic machinery.

COAL MINING LANDS.

By an order in council, dated March 4, 1907, the regulations governing the sale of coal mining lands, the property of the Crown, which had been in force since the year 1883, were rescinded, and by an order in council, dated May 9 following, new regulations were established for the leasing of coal mining rights.

The regulations which were rescinded on the above date provided for the sale to one applicant of an area of coal mining lands not exceeding 320 acres, at the rate of $10 an acre for the surface and under rights, or $7 for the coal mining rights only. It was shown, however, that 320 acres of coal mining lands was not a sufficient area to warrant the large expenditure necessarily incurred by operators in opening up and equipping a mine, and the regulations of May 9, 1907, provided for the leasing to one applicant of the coal mining rights under 2,560 acres of land, either in surveyed or unsurveyed territory, for a term of twenty-one years at an annual rental of $1 an acre, and a royalty at the rate of five cents per ton upon the merchantable output of the mine. While the lease includes the coal mining rights only, the lessee may acquire, at the rate of $10 an acre, whatever area of the available surface rights may be necessary for the efficient and economical working of the mining rights. The lessee may also be required to commence active operations on his leasehold within two years from the date of the lease, and to produce at the pit's mouth, ready for shipment, a quantity of coal proportionate to the area included in his lease.

Under the provisions of these regulations, which came into effect on June 15, 1907, 380 applications were received during the balance of the fiscal year, covering an approximate area of 299,985 acres, and payment was made of the sum of $20,393.43 on account of rental.

The total number of applications for coal mining lands received during the year was 551. The revenue for the year derived from the sale of coal mining lands was $346,813.23, being greater than any previous year. The area sold was 84,612, acres, of which 83,712 acres are in the province of Alberta, 700 acres in the province of Sas-

katchewan and 200 acres in the Yukon Territory. The total area of coal lands disposed of by the Crown up to March 31, 1908, was 293,105·88 acres, and the total amount of revenue received for the sale thereof was $1,227,176.77.

The statement lettered 'D' at the end of this report shows the revenue derived from the sale of coal lands for each fiscal year since 1896.

As the late regulations for the sale of coal mining lands provided for the payment thereof in four equal annual instalments, with interest, the revenue now derived from the sale of such lands is on account of the unpaid balances of the purchase price and interest only.

The following is a statement showing the revenue collected in the western provinces and in the Yukon Territory on account of the sale of coal lands during the fiscal year:—

Province of Alberta	$334,635 58
Province of Saskatchewan	6,134 25
Railway belt in the province of British Columbia	1,120 00
Yukon Territory	4,923 40
Total	$346,813 23

Forty coal mining licenses, embracing a total area of 16,076 acres, within the Rocky Mountains Park of Canada, are now in force. The revenue derived from these licenses during the fiscal year amounted to $10,419.40, and was made up as follows:—

Rental	$5,608 20
Royalty on coal mined	4,811 20

The total amount of rental collected on account of such lands up to March 31 last was $14,089.27, and the total amount of royalty collected up to the same date was $16,106.50.

By an order in council, dated the 10th day of December, 1907, the annual rental of coal mining lands within the Rocky Mountains Park of Canada was increased from 30 cents to one dollar an acre per annum.

The following is a statement showing the revenue derived during the fiscal year from royalty on coal mined on Dominion lands in the western provinces (except lands in the Rocky Mountains Park), and in the Yukon Territory:—

In the province of Alberta	$ 2,459 47
In the province of Saskatchewan	355 30
In the Yukon Territory	1,543 38
Total	$4,358 15

The total amount of royalty collected on coal mined up to March 31, 1908, including that of the Rocky Mountains Park, is $24,460.59.

The following is a statement of the office work performed during the year:—

Letters received and recorded	5,609
Letters sent	19,796
Pages of memoranda and schedule	3,146
Plans and sketches prepared	328
Accounts kept posted	1,530
Accounts rendered	824
Assignments accepted and registered	191
Returns examined and posted	1,172
Receipts issued	475

Applications for coal locations received	551
New entries and renewals for mining locations granted in the western provinces and territories, not including the Yukon	97
Applications for stone, gypsum and clay	47
Applications for tar, asphalt and petroleum	50
Applications for quartz claims	102
Applications for iron claims	31
Applications for hydraulic locations	2
Applications for dredging leases	62*
Placer mining grants, renewals and relocations in the Yukon Territory	7,184
Quartz mining locations granted, Yukon Territory	1,054
Applications to dredge for sand and gravel	1
Applications to purchase or lease lands in the Yukon Territory	42
Applications for water frontage	11
Agricultural leases in force in the Yukon Territory, comprising an area of 389·4 acres	7
Leases for water frontage issued	1
Water front leases in existence	17
Stone quarrying leases in the Rocky Mountains Park of Canada issued, comprising a total area of 1,277·96 acres	5

I have the honour to be, sir,

Your obedient servant,

H. H. ROWATT,
Chief Clerk.

* Of which 46 were in the Yukon Territory and 16 in the western provinces.

REVENUE OF DOMINION LANDS

A.—STATEMENT of Receipts on account of Coal and Minerals in the Western Provinces Mining Fees, Rental of Agricultural Lands, Water Power and the Yukon for the

Months.	Improvements.	Gypsum.	Millsite.	Sale of Quartz Acreage.
1907.	$ cts.	$ cts.	$ cts.	$ cts.
April				17 00
May				196 30
June				191 30
July		57 90		
August				
September				
October				
November				
December			5 00	
1908.				
January	15 00			
February				
March				
Total	15 00	57 90	5 00	404 60

Months.	Free Certificates Export of Gold.	Rental Yukon.	Registration Fees.
1907.	$ cts.	$ cts.	$ cts.
April	4 00	4,371 00	6 50
May	4 50	426 13	2 00
June	19 00		
July	18 00	365 30	
August	20 00		17 00
September	59 50	12 91	18 00
October	28 08	51 17	6 00
November		50 50	
December	5 00		
1908.			
January	1 50	5 00	
February	50		
March	2 50		2 00
Total	162 50	5,282 00	51 50

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INCLUDING THE YUKON TERRITORY.

and Territories, also Timber, Hay, Coal, Hydraulic Mining, Dredging, Royalty on Gold, Water Fronts, Survey Fees, and Sale of Dominion Lands in Fiscal Year 1907-08.

Yukon Homestead Fees.	Yukon Timber Dues.	Coal Mining.	Mining Fees.	Yukon Hydraulic Leases.	Dredging Leases Alberta and Saskatchewan.	Dredging Leases Yukon.	Gold Export Tax.
$ cts.	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.
.....	4,171 49	2,050 31	12,551 50	1,090 02	.....	836 46	76 05
.....	2,326 91	294 25	7,601 50	750 00	51 00	9,605 99	13,401 23
.....	1,224 46	534 25	11,869 50	150 00	700 00	.....	11,775 08
.....	1,438 48	1,869 95	14,916 00	.....	.....	60	10,047 60
40 00	506 09	2,724 58	14,879 30	1,580 35	650 42	2,975 00	8,397 84
30 00	794 55	5,335 00	17,302 00	.....	200 00	1,000 00	12,419 94
.....	2,559 44	5,841 60	18,538 00	.....	.....	.....	13,346 48
10 00	1,295 07	1,491 72	8,704 00	1,191 15	.....	1,205 00	75 15
.....	921 28	4,020 26	8,420 50	.....	.....	403 00	19 81
10 00	620 39	4,429 98	6,272 50	225 00	.....	375 00	923 99
.....	928 65	9,068 76	4,346 50	4 55	.....	.....	17 73
.....	768 41	3,963 78	5,302 25	1,257 90	140 00	1,474 37	3 75
90 00	17,555 22	41,564 44	130,703 55	6,218 97	1,741 42	17,875 42	70,504 65

Survey Fees Yukon.	Hay. Yukon.	Water Power. Yukon.	Sale of Dominion Lands other than Coal. Yukon.	Stone Quarries.	Free Miner's Certificates.	Sale of Coal Lands.	Amount.
$ cts.	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.
200 00	.....	2,500 00	663 38	.....	.....	30,744 74	59,282 45
.....	29 00	.....	112 89	.....	11 75	16,943 37	51,756 82
.....	8 00	.....	1,108 12	246 80	19 25	60,008 20	87,853 96
100 00	70 00	.....	356 55	.....	26 75	57,151 54	86,358 67
100 00	27 00	.....	145 98	149 40	.....	47,674 55	79,887 51
.....	.....	.....	601 74	203 33	13 50	47,715 47	85,705 94
.....	.....	.....	512 38	14 11	5 00	8,293 54	49,195 72
.....	.....	.....	80 00	82 68	.....	25,503 46	39,688 73
.....	.....	.....	1,226 60	245 00	.....	15,996 60	31,263 05
.....	.....	.....	17 31	154 00	.....	15,777 90	28,827 57
.....	.....	.....	85 00	29 65	.....	12,395 26	26,876 60
.....	.....	.....	286 75	576 06	.....	8,608 60	22,386 37
400 00	134 00	2,500 00	5,196 70	1,701 03	76 25	346,813 23	649,083 39

H. H. ROWATT,
Chief Clerk.

B.—STATEMENT showing the Total Amount of Revenue Collected at each Agency.

Revenue received at Head Office, on account of the sale of coal lands in the Western Provinces.

Agency.	Improvements.	Gypsum.	Millsite.	Sale of Quartz Acreage.	Homestead Fees, Yukon.	Timber dues, Yukon.	Coal Mining.	Mining Fees.	Hydraulic Leases.	Dredging Leases Alta and Sask.	Dredging Leases, Yukon.
	$ cts.	$ cts.	$ c.	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.	$ cts
Battleford							25 00				
Calgary							447 95	132 50			
Dauphin								70 00			
Estevan							673 70				
Edmonton							2,264 17	40 00			
Kamloops		57 90					40 00				
Lethbridge							11,842 55	80 00			
New Westminster											
Prince Albert							15 00	15 00			
Red Deer							504 85				
Regina								65 00			
Rocky Mountains Park							8,272 75				
Winnipeg							3,599 05	680 00			
Moosejaw							45 70				
Ungava								125 00			
Ottawa			5 00				12,290 34	2,140 55	2,784 30	1,741 42	17,875 42
Dawson Gold Commissioner's Office								105,904 00	3,464 67		
Duncan Mining Recorder's Office								6,608 00			
Sixtymile Mining Recorder's Office								2,633 00			
Whitehorse Asst. Gold Commissioner's Office								5,546 00			
Klhahne Mining Recorder's Office								4,084 00			
Conrad Mining Recorder's Office								2,525 50			
Dawson Crown Timber Office						16,035 22	1,543 38				
Whitehorse Crown Timber Office						1,520 00					
Dawson Comptroller's Office											
Whitehorse Royalty Collector											
Fortymile Royalty Collector											
Dawson Dominion Lands Office	15 00			404 60	50 00			55 00			
Whitehorse Dominion Lands Office					40 00						
Total	15 00	57 90	5 00	404 60	90 00	17,555 22	41,564 44	130,703 55	6,248 97	1,741 42	17,875 42

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REVENUE.

including the Yukon Territory, for the Fiscal Year ending March 31, 1908.

is in this statement, credited to the several agencies in which the lands affected are situated.

Gold Export Tax.	Free Certificates Export of Gold.	Rental Yukon.	Registration Fees.	Survey Fees.	Hay, Yukon.	Water Power, Yukon.	Sale of Dominion Lands other than coal, Yukon.	Stone Quarries.	Free Miner's Certificates.	Sale of Coal Lands.	Amount.
$ cts.	$ cts.	$ cts.	$ cts.	$ cts	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.
											25 00
								246 80		47,084 09	47,911 34
										5,474 25	70 00
											6,147 95
								82 68		56,003 95	58,390 80
										1,120 00	1,217 90
										200,513 76	212,436 31
								25 00			25 00
											30 00
										31,033 78	31,538 63
											65 00
								5 25			8,278 00
											4,279 05
										660 00	705 70
											125 00
		1 00				2,500 00		1,341 30	5 00		40,684 33
									71 25		109,439 92
											6,608 00
											2,633 00
											5,546 00
											4,084 00
											2,525 50
					134 00						17,712 60
											1,520 00
69,011 30	156 50										69,167 80
1,492 60	6 00										1,498 60
75											75
		2,513 51	35 50	400 00			1,477 59			4,923 40	9,874 60
		2,767 50	16 00				3,719 11				6,542 61
70,504 65	162 50	5,282 01	51 50	400 00	134 00	2,500 00	5,196 70	1,701 03	76 25	346,813 23	649,083 39

H. H. ROWATT,
Chief Clerk.

C.—STATEMENT of Receipts from Timber, Hay, Coal, Hydraulic Mining, Dredging, Water Power, Survey Fees, and the Sale of Dominion

Month.	Improvements.	Hay.	Timber Dues.	Coal Mining.	Mining Fees.	Hydraulic Leases.	Water Power.	Dredging Leases.
1907.	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.
April			4,171 49		12,551 50	1,090 02	2,500 00	836 46
May		29 00	2,326 91	40 00	7,579 00	750 00		9,605 99
June		8 00	1,224 46	10 00	11,672 00	150 00		
July		70 00	1,438 48	39 05	14,193 50			60
August		27 00	506 09	275 48	14,514 00	1,580 35		2,975 00
September			794 55	1,006 90	16,734 50			1,000 00
October			2,559 44	126 90	18,385 50			
November			1,295 07	41 45	7,629 00	1,191 15		1,205 00
December			921 28	3 60	8,350 50			403 00
1908.								
January	15 00		620 39		6,227 50	225 00		375 00
February			928 65		4,299 00	4 55		
March			768 41		5,219 50	1,257 90		1,474 37
Total	15 00	134 00	17,555 22	1,543 38	127,355 50	6,248 97	2,500 00	17,875 42

SESSIONAL PAPER No. 25

YUKON TERRITORY.

Royalty on Gold, Mining Fees, Rental of Agricultural Lands, Water Fronts and Lands for the Fiscal Year 1907-1908.

Gold Export Tax.	Free Certificates Export of Gold.	Free Miner's Certificates.	Rental.	Registration Fees.	Survey Fees.	Homestead Fees.	Sale of Dominion Lands other than Coal.	Sale of Quartz Acreage	Sale of Coal Lands.	Amount.
$ cts.	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.
76 05	4 00	.....	4,371 00	6 50	200 00	.....	663 38	17 00	600 00	27,087 40
13,401 23	4 50	11 75	426 13	2 00	.....	.....	112 89	196 30	.....	34,485 70
11,775 08	19 00	19 25	.....	.....	.....	.....	1,108 12	191 30	100 00	26,277 21
10,047 60	18 00	26 75	365 30	.....	100 00	.....	356 55	.....	400 00	27,055 83
8,397 84	20 00	.....	.....	17 00	100 00	40 00	145 98	.....	3,478 99	32,077 73
12,419 94	59 50	13 50	12 91	18 00	.....	30 00	601 74	.....	.....	32,691 54
13,316 48	28 00	5 00	51 17	6 00	.....	.....	512 38	.....	.....	35,020 87
75 15	.....	.....	50 50	.....	.....	10 00	80 00	.....	54 41	11,631 73
19 81	5 00	.....	.....	.....	.....	.....	1,226 60	.....	.....	10,929 79
923 99	1 50	.....	5 00	.....	.....	10 00	17 31	.....	.....	8,420 69
17 73	50	.....	.....	.....	.....	.....	85 00	.....	.....	5,335 43
3 75	2 50	.....	.....	2 00	.....	.....	286 75	.....	290 00	9,305 18
70,504 65	162 50	76 25	5,282 01	51 50	400 00	90 00	5,196 70	404 60	4,923 40	260,319 10

H. H. ROWATT,
Chief Clerk.

D.—STATEMENT showing the total revenue derived from the sale of coal land for each fiscal year since 1896.

Fiscal Year.	Amount.
	$ cts.
1896-1897	75 76
1897-1898	1,833 74
1898-1899	350 00
1899-1900	5,650 33
1900-1901	101,772 00
1901-1902	16,270 32
1902-1903	31,055 38
1903-1904	68,949 75
1904-1905	35,695 00
1905-1906	125,754 12
For the nine months ending March 31, 1907	335,795 97
1907-1908	346,813 23

H. H. ROWATT,
Chief Clerk.

YUKON REVENUE.

E.—STATEMENT showing the total Gold Production, the total Exemption, the total subject to Royalty, and the total Royalty collected for each Fiscal Year from May 1, 1898, to March 31, 1908.

Fiscal Year.	Gold Production.	Exemption.	Subject to Royalty.	Royalty Collected.	Infringements.	Total Revenue.
	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.
1897-1898	3,072,773 20	339,845 00	2,732,928 20	273,292 82		273,292 82
1898-1899	7,582,283 02	1,699,657 02	5,882,626 00	588,262 37	1,681 15	589,943 52
1899-1900	9,809,464 64	2,501,744 64	7,307,720 00	730,771 99	2,269 05	733,041 04
1900-1901	9,162,082 79	1,927,666 62	7,234,416 17	592,660 98	3,707 05	596,368 03
1901-1902	9,566,340 52	1,199,114 64	8,367,225 88	331,436 79	95 25	331,532 04
1902-1903	12,113,015 34		12,113,015 34	302,893 48		302,893 48
1903-1904	10,790,663 12		10,790,663 12	272,217 96		272,217 96
1904-1905	8,222,053 91		8,222,053 91	206,760 87		206,760 87
1905-1906	6,540,007 09		6,540,007 09	163,963 25		163,963 25
1906-1907	3,304,791 05		3,304,791 05	82,622 42		82,622 42
1907-1908	2,820,161 60		2,820,161 60	70,504 65		70,504 65
Total	82,983,636 28	7,668,027 92	75,315,608 36	3,615,387 58	7,752 50	3,623,140 08

No. 20.

REPORT ON TIMBER, GRAZING AND IRRIGATION.

DEPARTMENT OF THE INTERIOR,
OTTAWA, July 29, 1908.

W. W. CORY, Esq.,
Deputy Minister of the Interior,
Ottawa.

SIR,—I have the honour to submit the report of the Timber, Grazing and Irrigation Branch for the fiscal year ending March 31, 1908.

During the year several new features of considerable importance in connection with the timber regulations have become operative, chief among which may be mentioned the change in the method of awarding timber berths. The practice of calling for tenders for a certain berth and awarding the berth to the highest tenderer has been discontinued. Henceforth before a berth is sold it is to be surveyed and then cruised by a competent timber cruiser in the employ of the department who will make his report to the Minister of the Interior under affidavit as to the quantity and value of the timber on the berth in question. With the cruiser's report for a basis the minister will fix an upset price below which the berth cannot be sold.

In connection with lumbering operations in British Columbia difficulty had been experienced in securing accurate returns of the mill-cut upon which to base royalty dues, owing to the fact that so many operators were cutting upon provincial as well as Dominion lands, and the logs becoming mixed on their way to the mill. It has therefore been decided that beginning with the fiscal year 1908-09 royalty at the rate of 50 cents per thousand ft. B.M. will be collected on the measurement shown by the culler's returns, in which the British Columbia log-scale is used. These returns are to be furnished once a year at the close of the season and the royalty due thereon paid in quarterly instalments.

Notices were sent during the year to all holders of timber berths granted prior to May 1, 1902, who had not erected a mill and operated their berths to the extent required by the regulations, namely, 60,000 ft. B.M. per year for each square mile held under license, that it would be necessary for them to comply with the regulations as regards operations. Provision was made in these notices whereby if the berth holder was prepared to cut at the minimum annual rate of 100,000 ft. B.M. per square mile his application to have the logs manufactured at a mill not his own property would be considered.

With a view to securing to settlers in outlying districts in Manitoba, Saskatchewan and Alberta a cheap supply of lumber, there was established last year, by order in council, a provision whereby owners of portable sawmills might secure on application a permit to cut over a tract of land not exceeding one square mile in extent, on payment of a fee at the rate of $100 per square mile per annum, such permit to be renewable for one year only. In addition to the above payment a royalty of 50 cents per thousand feet B.M. is charged. The success of this provision is amply attested by the fact that 32 of these permits have already been issued and approximately seven million feet of lumber has been cut thereunder.

There has also come into operation during the year a regulation which allows the issue of what is known as cordwood permits under which an applicant may, upon payment, in advance, of $25 receive a permit good for one year and renewable for one year to cut cordwood, fence posts, telegraph poles and mining timber over a tract not exceeding 160 acres, the usual Crown dues to be paid at the close of the period for which the permit is issued. Nineteen of such permits have been issued during the year.

The revenue derived from timber, grazing, hay and irrigation on Dominion lands for the fiscal year just ended, amounted to $510,244.10, an increase of $99,989.03, over the fiscal nine months ending March 31, 1907.

Statement 'A,' showing the total revenue of this branch from its various sources, will be found at the end of this report.

Reports received from the Crown Timber agents at Calgary, Edmonton, Prince Albert, Winnipeg and New Westminster, showing the revenue collected on Dominion lands within their respective agencies, and other information, are appended hereto. The report of the Inspector of Ranches is also attached. The report of the Commissioner of Irrigation will be found with the report of the Forestry Branch.

The total revenue from timber, grazing and irrigation received at the above Crown Timber agencies, together with the ruling price of lumber and the number of mills in each may be summarized as follows:—

Agency.	Total Revenue	Average price of Lumber per M. ft. B. M. at Mills.	No. of Mills operating under license.	No. of Portable Mills in operation.
	$ cts.	$ cts.		
Calgary	41,585 20	20 29	16	9
Edmonton	87,225 13	15 00	10	10
Prince Albert	40,733 83	20 90	6	2
Winnipeg	90,263 04	20 to 27 00	31	6
New Westminster	192,128 88	17 00	32	..

Sawmill returns received at this department give the following quantities of building material as having been manufactured and sold during the year in the above mentioned agencies:—

—	Manufactured.	Sold.
Sawn lumber, ft. B. M	243,493,881	167,916,665
Shingles	..	50,000
Shingle bolts, cords	9,158⅝	7,597⅝
Lath	29,119,988	16,623,038

The quantity of lumber manufactured and sold within each agency will be found in the agent's report appended hereto.

Licenses to the number of 770 were prepared in duplicate and issued.

The areas under license and permit respectively in the provinces of Manitoba, Saskatchewan and Alberta, and within the railway belt of the province of British Columbia on March 31, 1908, were as follows:—

—	Under License	Under Permit.
	Sq. Miles.	Sq. Miles.
Manitoba	1,279·05	522·19
Alberta	2,955·48	552·84
Saskatchewan	2,511·10	285·09
British Columbia	2,260·74	25·79
Total	9,006·37	1,385·91

The number of applications to cut timber received during the year was 596. The number of berths granted was 201. The total number of berths under license is 770. The number of berths covered by permits is 170. The number of portable sawmill berths existing under order in council of February 19, 1907, is 32.

GRAZING LANDS.

Provision was made by order in council, dated March 15, 1907, whereby the Minister of the Interior may grant a lessee of grazing lands permission to cultivate and crop such portion of his leasehold as may be considered necessary for the growing of fodder for his stock; provided, however, that the crops so raised shall be used exclusively as fodder and shall not be disposed of by barter or sale without the consent of the minister.

This legislation was designed to provide ranchers with a reserve of feed for their stock against severe winters, and to make possible the maintenance of a greater number of cattle on a given area than could be maintained otherwise.

The total number of leases in force is 939, including a total area of 3,259,271 acres, distributed as follows:—

	Acres.
Province of Manitoba	12,642
Province of Saskatchewan	632,493
Province of Alberta	2,132,718
Railway belt, British Columbia	481,418
Total	3,259,271

IRRIGATION.

A full account of irrigation matters dealt with by this branch will be found in the report of the Superintendent of Forestry.

OFFICE WORK.

The following is a partial statement of the office work performed at Ottawa for the fiscal year ending March 31, 1908 :—

Letters received and recorded	19,014
Letters sent	22,962
Plans and sketches prepared	1,328
Cash receipts issued in quadruplicate	2,074
Timber and grazing assignments registered	149

Timber.

Berths applied for	596
Berths granted	201
Licenses for timber berths prepared in duplicate	770
Instructions issued for survey of timber berths	256
Returns of survey of timber berths examined	68
Returns of operating sawmills verified and posted	387
Timber permits checked and entered	10,801
Ledger accounts kept posted	972
Seizures checked and entered	178
Fire-guarding accounts posted	972

Grazing.

Applications for grazing lands received	577
Leases of grazing lands issued	283
Applications for hay lands received	80
Ledger accounts kept posted—grazing	939
Ledger accounts kept posted—hay	2
Hay permits checked and entered	2,315

Your obedient servant,

B. L. YORK.
Chief Clerk.

REVENUE OF DOMINION LANDS.

A.—STATEMENT of Receipts on account of Timber, Grazing, Hay, and Irrigation for the fiscal year ending March 31, 1908.

Month.	Timber.	Grazing.	Hay.	Irrigation.	Total.
1907.	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.
April	34,124 06	1,820 62	1,004 05	3 25	36,951 98
May	47,674 02	5,988 68	1,037 95	40 50	54,741 15
June	43,758 65	3,463 18	755 85	32 25	48,009 93
July	145,248 67	2,528 94	1,352 95	30 25	149,155 81
August	25,321 10	5,373 68	519 65	40 25	31,254 68
September	21,504 95	5,631 40	89 05	85 00	27,310 40
October	31,237 76	7,337 84	47 80	30 75	38,654 15
November	14,894 73	4,959 03	1 95	53 25	19,908 96
December	28,874 72	3,253 19	5 80	30 25	32,163 96
1908.					
January	37,079 30	1,558 78	25 70	54 25	38,718 03
February	13,385 63	3,953 48	1 60	5 25	17,345 96
March	14,341 52	1,575 97	10	111 50	16,029 09
Totals	457,445 11	47,439 79	4,842 45	516 75	510,244 10

TIMBER DUES MADE UP AS FOLLOWS:

	$ cts.
Bonus	212,067 05
Rent	64,101 20
Royalty	97,615 19
Permits	66,582 74
Seizures	17,078 93
	457,445 11

F. LOYER,
Book-keeper Timber, Grazing and Irrigation Branch.

No. 21.

REPORT OF THE INSPECTOR OF CROWN TIMBER AGENCIES.

DEPARTMENT OF THE INTERIOR,
WINNIPEG, MANITOBA, June 23, 1908.

J. W. GREENWAY, Esq.,
Commissioner of Dominion Lands,
Ottawa, Ont.

SIR,—I beg to submit my annual report upon my work of inspection of the timber, grazing and mining branches of the department in Manitoba and the North-west provinces and in British Columbia, for the year ended March 31, 1908.

Between the date of my last previous report and the present I was called to Ottawa twice to confer upon timber matters. I also made inspection of a majority of the agencies (the more important ones), and in a number of instances made two inspections, my reports upon which were duly forwarded to you.

It was not found convenient for me to leave my duties at Winnipeg a sufficient length of time to make a tour of all the agencies, owing to having to assume active charge of the work of the Lands Branch for several months, on account of the long illness and death of my late assistant, Mr. J. W. E. Darby.

The position rendered vacant by his death was filled by the appointment of Mr. A. F. Crowe, who was transferred from the Timber and Mines Branch; his assistant, Mr. A. Freeman, was appointed to succeed him as assistant Crown timber agent.

The appointment recently of one additional forest ranger for the Edmonton district and two official scalers for British Columbia has filled a long needed requirement, and will add greatly to the efficiency of the inspection service.

In the round of my inspection duties I met these new officers and posted them on their work. I also met the other members of the forest ranger staff and discussed with them both new and unfinished work and advised with them in regard thereto.

While in some respects the year has shown an improvement in the manner the local officers are conducting the business of the Timber branch, still it is far from being efficiently dealt with, which applies more particularly to those offices exercising supervision over the operations of millmen operating under license and permit.

There are two reasons which may be assigned for this: namely, that the offices have been undermanned and preference has been given to Land branch work; and, secondly and mainly, the need of each clerk having a practical knowledge, in all its workings, of the lumber business.

Within the past few years the lumbering industry in the west has assumed large proportions, and is rapidly growing.

I took occasion to point out in my annual report for the year 1904-5 that a closer supervision than is at present maintained should be exercised over the operations of licensees and permittees operating upon Dominion lands.

Inspections should be made at least once a year of the books and stock of the respective lumbermen transacting business with the department. This is partially being done in some of the districts, but not fully or in a systematic manner.

This work should be laid upon the respective Crown timber agents, who could see that it is done, provided they had upon their office staff a practical timber man, who should also be an expert bookkeeper. The inspection of bush operations should be done by the forest ranger.

REVENUE.

The revenue from all sources collected on account of timber, grazing and mining at the agencies (exclusive of that paid in direct to the department at Ottawa) amounts to $329,330.04, which sum is shown in detail in statement 'A' appended. As the previous departmental year, as amended, only covered nine months' business, a comparative statement of revenue with present year could not satisfactorily be given, even on a basis of proportion. A large increase in revenue appears in favour of present year. Appended will be found another statement, marked 'B,' which shows the total manufacture of lumber and other products at the sawmills of the respective licensees and permittees.

It will be observed therefrom that no less than 267,532,730 feet of lumber was manufactured by licensees and 57,170,935 feet by holders of permits, making a total of 324,703,665 feet B.M.

The total quantity shown by sworn returns of licensees for departmental year ended June 30, 1906, was 114,756,083 feet, and for the nine months ended March 31, 1907, 141,050,292 feet.

It will thus be seen that the volume of business has more than doubled in the past two years.

The stock of logs taken out during the past winter was small in comparison with that of the previous winter; due to the decline in sales of lumber during the year 1907, consequent chiefly upon the depression in portions of the country over loss of crop, and to the large stock of lumber being carried over. While the sales amounted to 180,909,384 feet B.M., there was carried over in stock on March 31 last no less than 139,805,143 feet B.M. This lumber was held principally at points in Manitoba and Saskatchewan and in the railway belt in British Columbia.

The statement shows 1,540,674 pieces of tie timber to have been manufactured. Of this quantity 591,037 pieces were cut under free permits, by contractors for the Canadian Northern Railway, and upwards of 800,000 pieces in same manner for the Grand Trunk Pacific Railway. The remaining number of ties, on which dues were paid, went principally to the Canadian Pacific Railway Company.

I would draw special attention to the large amount of timber covered by permits granted to settlers, for the most part without payment of dues:—

Number of permits issued during the year under review, 10,801, covered thereby—57,170,935 ft. B.M. lumber, 1,654,940 pieces roof poles, 2,831,028 pieces fence posts, 6,522,425 pieces fence rails, 190.202¾ cords cordwood.

The demand for permits from settlers to cut timber on Dominion lands increases with each year. During the preceding year 1906-1907, the number issued was 6,971.

To my mind greater restrictions than are provided by the existing timber regulations should be placed upon the cutting of timber under permit by settlers and others.

Cutting, as far as practicable, should be restricted to mature trees and dead timber. The foregoing statement shows that permits issued authorized the cutting by settlers of 11,008,393 pieces of timber for purposes of roof poles, fence posts and rails. In the cutting of this class of timber young growing trees are taken, and as a tree is required to supply each piece, it would seem that that number of trees were cut, provided the permittees cut up to the allowance of their permits.

I would strongly recommend the withdrawal of the privilege of cutting green roof poles and fence rails. They are now very little used, having been replaced by the use of sawn lumber and wire fencing.

So long, however, as the regulations provide for the cutting of this class of material free of dues, settlers will apply for the right thereto and, as is the practice, the timber is taken and used for other purposes than that specified, generally for purposes of fuel. The cutting of cordwood should be restricted wholly to dry and fallen timber in districts where the same may be had in quantity sufficient to meet the requirements.

In my last annual report I gave particulars regarding the number of timber berths held under Dominion license, and the area of land comprised therein, also the number of berths upon which operations took place. As this same information was given in last year's report of the Timber Branch of the Department, Ottawa, it is assumed that like particulars will be given again this year. I will, therefore, omit it from my report.

According to official report dated December 31, 1907, the following is a statement of the extent of cutting which took place during the year 1907, upon Provincial Government lands in British Columbia, by leaseholders, and hand loggers, which is given as the main market therefor is found in Manitoba and the two provinces lying to the west, namely, 509,022,854 ft. B.M.

The total revenue derivable from timber sources during the year in British Columbia was $1,723,023.28, which sum is made up chiefly of rentals and license fees.

NORTHERN COUNTRY.

According to reliable information received, there are at present nine sawmills in operation at points on the Mackenzie, Peace and Athabaska rivers and at Lesser Slave lake and Lake Athabaska. The owners of these mills have not acquired timber berths, and the lumber manufactured by them for the most part is taken from the lands of the Crown without authority.

Special regulations for the granting of rights to cut on Dominion lands in Northern Alberta and in Athabaska were passed by order in council of August 10, 1905. These have only partially been enforced over a small district in the neighbourhood of Athabaska Landing and at Lesser Slave lake.

In the centre of all settlements are stationed police officers who could give enforcement to the regulations if it were deemed advisable to engage their services.

While I would not advocate charging dues on timber to be used by settlers engaged in farming or stock raising, I am of the opinion that timber taken for barter or sale or used in commercial enterprises should be paid for.

Respectfully submitted,

E. F. STEPHENSON,
Inspector of Crown Timber Agencies.

CROWN TIMBER AGENCIES.

STATEMENT 'A'—Summary of Work Performed during the year ended March 31, 1908, showing Number of Transactions under various heads and Amount of Revenue Collected.

Agency.	Bonus.	Ground Rent.	Royalty on Timber Sales.	Timber Permits.	Timber Seizures.	Hay Permits.	Grazing Rents.	Mining Fees.	Coal Lands Royalty, &c.	Stone Quarries.	School Lands Revenue.	Sundries.	Total Revenue for year ended 31 March, 1908.
													$ cts.
Alameda					3	222		21	16	11			1,562 09
Battleford				243	4	278	25	5				1	1,219 42
Brandon				307		24					165		1,522 72
Calgary		25	53	904	15	171	144	27	84		2		32,520 63
Dauphin				1,169	31	199	20	14					9,677 90
Edmonton	6	40	58	2,630	29	223	2	11	124		219		27,849 65
Humboldt				201		24					105		759 27
Kamloops						13	246		8				8,791 66
Lethbridge				496	6	102	213				not gi.		62,664 35
Moosejaw				670		196	39		1		100	2	2,523 58
New Westminster		250	117	61	4								63,670 77
Prince Albert		28	32	1,075	33	70	1	3	3		130		29,042 76
Red Deer				409		35	1	7	82				1,954 43
Regina				708	2	283	41	7					1,818 63
Yorkton				474	8	183	1					9	1,329 49
Winnipeg		105	127	1,451	43	292	7	66			343		82,422 69
	6	448	387	10,801	178	2,315	740	161	318	11	1,064	12	329,330 04

This statement does not account for revenue paid in direct to the Department at Ottawa, on account of business of the Agencies, which would mainly be on account of bonus and ground rent.

E. F. STEPHENSON,
Inspector.

SESSIONAL PAPER No. 25

STATEMENT B.—Statement showing Manufacture and sale of timber products by Licensees of timber berths on Dominion Lands during the twelve months ended March 31, 1908.

Agency.	Lumber ft. B.M. Manufactured.	Lumber ft. B. M. Sold.	Lumber ft. B.M. on Hand.	Lath Manufactured.	Lath Sold.
Calgary	24,377,364	12,328,701	8,901,939	431,851	431,851
Edmonton	20,947,566	12,241,419	8,706,147	431,858	431,858
New Westminster	74,081,680	51,141,393	30,743,265	4,349,900	2,552,650
Prince Albert	53,048,790	38,212,510	29,933,170	12,238,130	6,572,130
Winnipeg	95,077,330	66,985,361	61,520,622	12,100,100	7,071,400
	267,532,730	180,909,384	139,805,143	29,551,839	17,059,889

Agency.	Lath on Hand.	Railway Ties Manufactured.	Shingle Bolts Cords Manufactured.	Shingle Bolts Cords Sold.	Shingle Bolts Cords on Hand.
Calgary		108,907			
Edmonton		482,950			
New Westminster	1,870,450	94,243	9,519⅛	7,597⅛	7,390½
Prince Albert	8,212,410	43,000			
Winnipeg	12,279,000	811,574			
	22,361,860	1,540,674	9,519⅛	7,597⅛	7,390½

STATEMENT of timber material covered by Permits issued at the respective Agencies during the Year ended March 31, 1908.

Agency.	Lumber and Logs feet B.M.	Roof Poles.	Fence Posts.	Fence Rails.	Cordwood (Cords).
Alameda	2,780	900	950	700	28
Battleford	1,878,050	50,600	66,400	248,000	1,889
Brandon	393,466	4,700	4,050	2,400	4,563
Calgary	4,700,000	298,824	371,499	1,090,282	28,137¾
Dauphin	5,001,501	6,950	44,320	20,700	7,731
Edmonton	18,670,543	416,375	511,768	2,096,239	39,450
Humboldt	1,368,831	53,015	70,620	269,250	2,010
Lethbridge	3,721,430	173,378	865,702	196,157	4,915
Moosejaw	1,332,936	133,675	199,595	469,240	6,284
New Westminster	3,854,344				1,142
Prince Albert	6,450,156	192,184	256,267	1,060,599	22,814
Red Deer	3,155,002	110,821	140,741	563,818	7,902
Regina	1,224,000	100,033	110,610	82,700	7,699
Yorkton	3,332,439	77,600	110,530	327,705	1,716
Winnipeg	2,085,457	35,885	77,976	94,635	53,902
	57,170,935	1,654,940	2,831,028	6,522,425	190,202¾

E. F. STEPHENSON,
Inspector.

STATEMENT C.—Summary of work performed by Forest Rangers for the year ended March 31, 1908.

Name.	District.	Applications for timber permits.	Applications for hay permits.	No. of timber seizures.	Land inspections made.	Applications for patents taken.	No. of days at field work.	No. of days at Headquarters.	Miles travelled		Travelling and living expenses, self and horses.	Expenses for new and old travelling equipment.	Remarks.
									By wagon.	By rail.			
											$ cts.	$ cts.	
Adams, T. E.	Winnipeg	86		18	31		231	40	3,793	4,707	433 05	9 90	
Cameron, J. A. C.	Edmonton			6	84		220	66	5,781	276	723 40	258 05	
Davis, W. A.	Dauphin			8							48 00		Month spent at Department Ottawa; services transferred to Forestry Branch.
Lusted, John	Winnipeg			10	84		242	33	3,997	3,716	621 99	8 35	
Margach, W. J.	Calgary			9			224	90	3,297	8,699	1,192 91	10 50	
MacDonald, D. J.	N Westminster			1	1		73	171		4,007	169 30		Ass't. Crown Timber Agent Kamloops, no record of accounts for April and May, 1907; sent direct to Ottawa
McLaggan, J. W.	Edmonton			2	39		37	11	1,025	10	129 80	3 00	Months of February and March 1908 only.
Robertson, A. L.	Prince Albert	13		35			209	89	2,270	1,515	439 94	37 90	
Rutherford, John	Regina	28					162	23	3,034		333 28		To Oct. 31, '07 only; transferred to Forestry Branch.
Seale, John	Dauphin			16	1		18	8	387	330	86 75		Transferred from homestead inspection work to forest ranging March 1, 1908.
Sinclair, F.	Winnipeg	139		13	235		260	35	684	11,112	502 84		
Stauffer, J. E.	Calgary	18		10	162	76	76	28	1,539	1,696	358 41	6 15	Employed as homestead inspector from Aug. 1, '07.
Walkinshaw, C. A.	Winnipeg		3				123	9	1,893	364	403 51		To Oct. 31, '07 only; transferred to Forestry Branch.
		284	3	128	637	76	1,875	609	27,700	36,762	5,743 18	333 85	

No. 22.

REPORT OF THE CROWN TIMBER AGENT AT CALGARY.

STATEMENT A., showing the Revenue collected on account of Timber, Grazing and Hay on Dominion Lands at the Calgary Agency during the Fiscal Year ending March 31, 1908.

Month.	Timber.	Grazing.	Hay.	Fire Tax.	Total.
1907.	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.
April	990 28	2 52	3 00	.....	995 80
May	95 33	796 84	332 00	.....	1,224 17
June	1,523 82	8 00	252 50	15 86	1,800 18
July	1,815 05	586 51	255 00	.....	2,656 5
August	1,336 87	208 00	48 30	3 21	1,596 38
September	194 25	4 80	1 75	.....	200 80
October	2,358 20	631 89	19 90	.....	3,009 99
November	438 07	714 55	.....	.....	1,152 62
December	101 36	927 66	3 00	.....	1,032 02
1908.					
January	2,919 61	71 61	10 00	.....	3,001 22
February	313 63	3 90	.....	.....	317 53
March	237 84	26 85	.....	.....	264 69
	12,324 31	3,983 13	925 45	19 07	17,251 96
Head Office	24,333 24	.....	.....	.....	24,333 24
	36,657 55	3,983 13	925 45	19 07	41,585 20
Less Fire Tax	.....	.....	.....	19 07	.....
	36,657 55	3,983 13	925 45	.....	41,585 20

J. R. SUTHERLAND,
Crown Timber Agent.

SCHEDULE B.

STATEMENT showing Saw-Mills operated under Government license during the twelve months ending March 31, 1908, at Calgary Agency.

Name of Owner or Assignee.	Where Situated.	Kind of Power.	No. of Horse Power.	Commenced Operations.	Kind of Timber.	Logs Cut at	Lumber on Hand in Return March 31, 1907, Manufactured and Sold since that date and Quantity on Hand March 31, 1908.		Quantity of Shingles Manufactured and Sold.	Date of Last Return.	No. of Returns.	Remarks and No. of Berth.
								Feet.				
Eau Clair and Bow River Lumber Co.	Calgary	Steam	...	1887	Fir, spruce, cypress and pine.	Spray River	Quantity on hand March 31, 1907	3,080,052	Nil.	Mar. 31, 1908.	4	T. B. E., F., H., I. & J. 417
							" manufactured	4,000,000	"			
								7,080,052				
							" sold	3,555,579	"			
							" on hand March 31, 1908	3,524,473	"			
J. H. Wray	Mountain View.	Steam	...	1904	Spruce and pine.	Mill on Berth.	Quantity on hand March 31, 1907	Nil.	Nil	Sept. 30, 1907.	2	T. B. 583
							" manufactured	14,000	"			
							" sold	14,000	"			
							" on hand Sept. 30, 1907	Nil.	"			
The Lineham Lumber Co.	High River	Steam	...	1903	Fir and spruce	High River	Quantity on hand March 31, 1907	139,582	Nil.	Mar. 31, 1908.	4	T. B. 579
							" manufactured	3,146,314	"			
								3,285,896				
							" sold	3,156,798	"			
							" on hand March 31, 1908	Nil.	"			

G. H. Bawtenheimer or The Great West Lumber Co.	L'tle Red Deer	Steam	.....	1900	Fir and spruce	Tp. 32 R's. 5 and 6 W 5th.	Quantity on hand March 31, 1907.....	271,276	Nil.	Mar. 31, 1908.	4	T. B.	252
							" manufactured..	4,958,507	"				
								5,229,783					
							" sold.....	1,498,919	"				
							" on hand March 31, 1908.....	3,730,864	"				
The Lineham Lumber Co....	Okotoks, Alta.	Steam	50	1890	Fir and spruce	Sheep Creek....	Quantity on hand March 31, 1907.. ...	6,216	Nil.	Mar. 31, 1908.	4	T. B.	569
							" manufactured..	1,136,594	"				
								1,142,810					
							" sold...	1,142,810	"				
							" on hand March 31, 1908.. ...	Nil.	"				
The Lineham Lumber Co....	High River, Alta.	Steam	.....	1903	Fir and spruce	High River....	Quantity on hand March 31, 1907.....	Nil.	Nil.	Mar. 31, 1908.	3	T. B.	1124
							" manufactured..	433,837	"				
							" sold..	433,837	"				
							" on hand March 31, 1908.....	Nil.	"				
C. J. B. Anderson	Lyndon, Alta, 2-13-30-4.	Steam	40	1904	Fir and spruce	.....	Quantity on hand March 31, 1907.....	92,091	Nil.	Sept. 30, 1907.	2	T. B.	1200
							" manufactured..	471,976	"				
								564,067					
							" sold..... ..	539,067	"				
							" on hand Sept. 30, 1907.....	25,000	"				
Wm. Rutherford.....	Cypress, Hills Alta.	Steam	25	1905	Spruce.....	....	Quantity on hand March 31, 1907.....	Nil.	Nil.	Dec. 31, 1907.	3	T. B.	784
							" manufactured..	39,000	"				
							" sold.	39,000	"				
							" on hand Dec. 31, 1907.....	Nil.	"				

* The quantity returned as manufactured was by estimate and was returned 129,098 feet in excess of what the lumber measured out when sold from yards.

SCHEDULE B.—*Continued.*

STATEMENT showing Saw-Mills operated under Government license, &c., at the Calgary Agency.—*Continued.*

Name of Owner or Assignee.	Where Situated.	Kind of Power.	No. of Horse Power.	Commenced Operations.	Kind of Timber.	Logs Cut at.	Lumber on Hand in Return of Mar. 31, 1907, Manufactured and Sold since that Date and Quantity on hand Mar. 31, 1908.		Quantity of Shingles Manufactured and Sold.	Date of Last Return.	No. of Returns.	Remarks and No. of Berth.
								Feet.				
Hon. Peter McLaren	Blairmore, Alta.	Steam	10	1882	Fir and spruce	Berth . .	Quantity on hand Mar. 31, 1907. . . .	95,047	Nil.	Mar. 31, 1908..	4	T. B. 36 A.
							" manufactured..	4,563,224				
								1,658,274				
							" sold . . .	1,199,350				
							" on hand Mar. 31, 1908	458,924				
The Lineham Lumber Co. .	Sheep Creek..	Steam	40	1892	Spruce and pine.	Okotoks, Alta	Quantity on hand Mar. 31, 1907.....	Nil.	"	Mar. 31, 1908..	4	T. B. 594
							" manufactured..	1,164,852				
							" sold	1,164,852				
							" on hand Mar. 31, 1908....	Nil.				
Thos. Quigley.....	Mt. Royal, Alta.	Steam	30	1901	Spruce and fir.	Berth	Quantity on hand Mar. 31, 1907....	32,000	"	June 30, 1907..	1	T. B. 1165
							" manufactured..	112,000				
								144,000				
							" sold	144,000				
							" on hand June 30, 1907.....	Nil.				

Wm. Rutherford	10-8-34.	Steam	..	1903	Spruce and pine.	Berth. (10-8-34).	Quantity on hand Mar. 31, 1907.	Nil.	"	Dec. 30, 1907..	3	T. B. 1027
							" manufactured..	317,000				
							" sold.	125,000				
							" on hand Dec. 31, 1907.	194,000				
Piegan Indian Agency	Macleod, Alta.	Steam	40	1904	Spruce and fir.	Porcupine Hills.	Quantity on hand Mar. 31, 1907.	Nil.	"	Sept. 30, 1907.	2	T. B. 886, 115, 322 sold; 38, 921 used by Indians.
							" manufactured..	156,368				
							" sold	154,243				
							" on hand Sept, 30, 1907.	2,125				
F. R. Pettepher.	Red Deer, Alta	Steam	40	1903	Spruce	Berth	Quantity on hand Mar. 31, 1907.	Nil.	"	Mar. 31, 1908..	4	T. B. 1079
							" manufactured..	778,672				
							" sold	378,140				
							" on hand Mar. 31, 1908.	400,532				
Wm. C. McDougall	Medicine River	Steam	40	1900	Spruce.	Berth	Quantity on hand Mar. 31, 1907.	Nil.	"	June 30, 1907..	1	T. B. 863
							" manufactured..	50,000				
							" sold	20,000				
							" on hand June 30, 1907.	30,000				
Vernon De Mille	Priddis, 25-21-4-5.	Steam	25	1905	Spruce	Berth, 25-21-4-5	Quantity on hand Mar. 31, 1907	Nil.	"	Mar. 31, 1908..	4	T. B. 1218
							" manufactured..	179,650				
							" sold	179,650				
							" on hand Mar. 31, 1908.	Nil.				

Total quantity manufactured lumber ..... 21,521,994 ft. B.M.
" sold ..... 16,743,245 ft. B.M.

R. B. MATHESON,
Acting Crown Timber Agent.

No. 23.

REPORT OF THE CROWN TIMBER AGENT AT EDMONTON.

DEPARTMENT OF THE INTERIOR,
DOMINION LANDS AND CROWN TIMBER OFFICE,
EDMONTON, ALBERTA, July 28, 1908.

The Commissioner of Dominion Lands,
Ottawa, Ont.

SIR,—I have the honour to report with respect to the timber operations within this agency for the fiscal year ending March 31, 1908.

The amount cut by licensed berth owners was 16,104,087 feet B.M.

The amount cut under permit from portable mill permit berths was 2,183,367 feet B.M.

The amount cut by portable mills under settlers' permits was 6,703,765.

The average price at which the lumber was sold at the mills would appear to be $15 per thousand B.M.

A very considerable loss was sustained during the past year by some of the larger mill operators owing to the sudden rise of the waters of the Saskatchewan river.

The winter just passed was quite favourable for the lumber industry, and, as owing to the financial conditions there is, perhaps, less activity in building operations. mill men have a larger stock than usual on hand.

Your obedient servant,

K. W. MACKENZIE,
Agent of Dominion Lands.

SCHEDULE A.

Statement of receipts from Timber, Grazing and Hay at the Edmonton Office for the year ending March 31, 1908.

Month.	
1907.	
April	$1,614 92
May	1,200 36
June	740 15
July	1,427 49
August	1,676 68
September	102 08
October	271 60
November	828 47
December	520 53
1908.	
January	540 58
February	2,774 14
March	770 58
Total	$12,467 58
Head office	74,757 55
	$87,225 13

Certified correct.

K. W. MACKENZIE,
Agent of Dominion Lands.

SCHEDULE B.

RETURNS of Saw-Mills operating in Edmonton Crown Timber Agency under Government License during the year ending March 31, 1908.

Owner.	Location of Saw-Mill	Kind of Power.	Location of Limits	Operations began.	Berth No.	Lumber on hand, March 31, 1907.	Lumber Manufactured.	Lumber Sold.	Lumber on hand.	Lath Manufactured	Lath Sold.	Other Products Manufactured.	Other Products Sold.
							B. M.	B. M.					
D. R. Fraser & Co	Edmonton	Steam	In Tp. 52, Rge 3-4, W 5th	1899	788	1,266,017	Nil.	1,266,017	Nil.				
"	"		In Tp. 50, Rge 4, W 5th	1905	812	Nil.	70,056	70,056	"				
"	"			1906	1,002	"	242,309	Nil.	242,309				
"	"		Special permit Order in Council, 10-7-07			"	136,700	"	136,700				
John Walter	Strathcona		In Tp. 51, Rge 26, W 4th	1900	887	270,000	1,964,958	1,657,899	577,059				
"	"		In Tp. 50, Rge 4, W 4th	1907	,196	Nil.	63,395	63,395	Nil.				
"	"		Sec. 11-50, Rge 4, W 4th	1907	S.L.33	"	272,039	272,039	"				
"	"		In Tp. 49, Rge 3, W 4th	1907	1,287	"	52,482	52,482	"				
"	"		In Tp. 50, Rge 3, W 4th	1907	1,288	"	277,682	277,682	"				
"	"		" "	1907	1,289	"	768,779	Nil.	768,779				
"	"		Special permit Order in Council, 10-7-07			"	253,705	253,705	Nil.				
D. R. Fraser & Co. & John Walter	Edmonton&Strathcona		In Tp. 50-51, Rge 3, W 5th	1900	9	473,678	1,037,056	985,388	525,346	406,858	406,858		
" "	"		In Tp. 50, Rge 6, W 5th	1907	1,091	Nil.	383,066	228,414	154,652				
" "	"		In Tp. 47, Rge 4, W 5th	1907	1,211	"	1,393,356	996,446	396,910				
" "	"		In Tp. 49-50, Rge 6, W 5th	1907	1,242	"	1,745,954	1,273,338	472,616				

" "	"	....	In Tp. 46-47, Rge 4, W 5th..	1907	1,306	"	1,918,954	Nil.	1,918,954	.....	.....	.. ....	.....
D. R. Fraser and John Walter and Edmonton Lumber Co.	"	....	Unmarked Logs ..	....	....	"	144,292	144,292	Nil.	.....	.....	.... ..	....
J. J. Anderson.....	Berth...	...	In Tp. 60, Rge 18, W 4th.....	1906	1,185	194,150	223,834	194,150	223,834	.....	.....	. . ..	.....
Edmonton Lumber Co...	Edmonton..... ..	.....	In Tp. 50, Rge 5, W 5th	1906	1,104	12,960	324,980	245,961	91,979	.....	.....	.....	.....
" ...	"	.....	In Tp. 49, Rge 7, W 5th..	1906	1,156	Nil.	985,957	985,957	Nil.	.... ..	.....	....	.....
" ...	"	...	In Tp. 50, Rge 4, W 5th.....	1906	1,204	35,998	72,633	108,631	"	.....	.....	.....	.....
" ...	"	.....	In Tp. 50, Rge 5, W 5th..	1907	1,262	Nil.	133,186	133,186	"	.... ..	.....	.....	...
" ...	"	.....	Special permit Order in Council, 10-7-07.....	.....	.....	"	1,116	1,116	"	.....	.....	.....	....
Huff & Carter.....	"	.....	In Tp. 59, Rge 23, W 4th..	1905	1,213	"	Nil.	Nil.	"	.....	.....	*2,100	*2,100
"	"	....	In Tp. 57, Rge 22, W 4th.....	1905	1,249	"	"	"	"	.....	....	*400	*400
North West Lumber Co	Pigeon Lake...	Steam	In Tp. 45, 46 & 47, Rge 5, W 5th ..	1901	949	"	1,412,730	275,856	1,136,874	.....	.....	.....	.....
J. Featherstonhaugh...	Fort Saskatchewan ...	"	In Tp. 50, Rge 6, W 5th.	1901	956	"	1,165,792	677,174	188,618	25,000	25,000	.....	...
W. B. McPherson. ...	Beatley...	"	In Tp. 40, Rge 2-3, W 5th....	1903	1,065	293,147	401,350	307,569	386,928	.....	.....	‖ 11,464 ‡400	‖1,464 ‡400
R. T. Telford...	Berth.....	"	W ½ 36, Tp. 48, Rge 2, W 5th.....	1907	1,084	54,000	Nil.	54,000	Nil.	.....	.....	.....	.....
Ed. Lyons...	"	"	In Tp. 58, Rge 26, W 4th.....	1905	1,131	60,162	488,762	548,924	"	....	.....	... .	...
D. J. Dunn.....	Pickardville	"	In Tp. 59, Rge 27, W 4th ..	1908	1,394	Nil.	168,964	100,479	68,485	....	.....	.....	.....
Total operations of Saw-Mills operating under License..						2,660,112	16,104,087	1,174,156	7,590,043	431,858	431,858	*2,500 ‖ 11,464 ‡400	*2,500 ‖11,464 ‡400

* Railway ties. ‖ Piling. ‡ Fence posts.

SCHEDULE B.—*Continued.*

RETURN of Saw-Mills operating in the Edmonton Crown Timber Agency under Portable Saw-Mill Permits during the year ending March 31, 1908.

Owner.	Location of Saw-Mill	Kind of Power.	Location of Limits	Operations began.	Berth No.	Lumber on hand, March 31, 1907.	Lumber Manufactured.	Lumber Sold.	Lumber on hand.	Lath Manufactured.	Lath Sold.	Other Products Manufactured.	Other Products Sold.
							B. M.	B. M.					
Isaac Gagnon	Athabaska Ldg	Steam		1907	1,298	Nil.	130,000	64,000	66,000				
Hy. Meyers	Berth	"		1907	1,308	"	352,673	177,193	175,480				
J. A. L. McDougall	"	"		1907	1,309	"	128,956	58,956	70,000			11,245	11,245
J. H. Wood	"	"		1907	1,328	"	49,500	49,500	Nil.				
F. C. Papineau	"	"		1907	1,337	"	402,220	267,220	135,000				
A. D. McDiarmid	"	"		1907	1,347	"	479,089	237,241	241,848				
R. A. McDonald	"	"		1907	1,357	"	206,764	71,344	135,420				
J. E. Gibeault	"	"		1907	1,381	"	40,985	17,629	23,356				
R. Telford	"	"		1908	1,386	"	293,000	25,000	268,000				
Can. Society of Equity				1907	1,378	"	100,180	99,180	1,000				
Total operations under Portable Mill Permit						Nil.	2,183,367	1,067,263	1,116,104			11,245	11,245
" " License						2,660,112	16,104,087	11,174,156	7,590,043	431,858	431,858	*2,500 †1,464	*2,500 †1,464
												‡400	‡400
Total operations of Portable Mill Permits and Licenses						2,660,112	18,287,454	12,241,419	8,706,147	431,858	431,858	*2,500 †2,709	*2,500 †2,409
												‡400	‡400

† Piling. * Railway ties. ‡ Fence posts.

Certified correct,

K. W. MACKENZIE,
Crown Timber Agent.

No. 24.

REPORT OF THE CROWN TIMBER AGENT AT PRINCE ALBERT.

DEPARTMENT OF THE INTERIOR,
DOMINION LANDS AND CROWN TIMBER OFFICE,
PRINCE ALBERT, SAKATCHEWAN, April 2, 1908.

The Commissioner of Dominion Lands,
Ottawa, Ont.

SIR,—I have the honour to submit herewith my report for the twelve months ending March 31, 1908.

The total receipts amount to $29,012.76. Schedule B is a statement of lumber and lath manufactured under license during the same period. The total number of feet B.M. of lumber manufactured is 50,208,790, and the sales amount to 35,372,510 feet and the average selling price is $20.90 per M. The six mills operating under license have now on hand 687,244 spruce logs, which is not as large a cut as I had anticipated, but owing to the financial depression the lumbermen all curtailed their operations. The small portable mills scattered throughout the district have manufactured some 2,500,000 feet for settlers under free permits. The cut of cordwood amounted to about 12,000 cords, and some 60,000 ties were manufactured. The lumbermen all report a good demand for lumber since April 1.

Your obedient servant,

R. S. COOK,
Crown Timber Agent.

SCHEDULE A.

STATEMENT of receipts, Crown Timber Office, Prince Albert, for twelve months ending March 31, 1908.

Month.	Ground Rent.	Royalty.	Permit Dues.	Seizure Dues.	School Lands, Timber, Grazing and Hay.	Dominion Lands, Grazing and Hay.	Total.
1907.	$ cts	$ cts	$ cts	$ cts.	$ cts.	$ cts	$ cts.
April	602 14	2,894 95	605 45	221 62	63 20	78 80	4,466 16
May	5,036 42	302 30	586 24	10 13	77 40	10 80	6,023 29
June	27 81	...	217 40	9 00	120 10	30 50	304 81
July	43 24	6,657 32	55 76	50 35	169 15	51 90	6,427 72
August	45 65		231 71	.....	25 70	13 25	316 31
September	110 74	.....	29 50	59 62	9 40	25 50	234 76
October		5,660 76	132 75	.....	57 55	.....	5,851 06
November		25	554 98	1 00	41 51	.....	597 74
December			1,123 29		8 15	1 20	1,132 64
1908.							
January	62 50	1,336 35	1,078 25	6 00	13 80	.....	2,496 90
February	.....		396 89	22 00	61 20	1 00	481 09
March	.....		582 33	66 09	31 86	.....	680 28
	5,928 50	16,251 93	5,494 55	445 81	679 02	212 95	29,012 76
Paid at Head Office	.....	.....	.....	.....	.....	.....	11,721 07
							40,733 83

R. S. COOK,
Crown Timber Agent.

CROWN TIMBER OFFICE,
PRINCE ALBERT, April 29, 1908.

SCHEDULE B.

STATEMENT showing Saw-Mills in the Prince Albert district operating under Government License during the twelve months ending March 31, 1908.

Name of Owner.	Horse-power and kind.	Capacity per 10 hours.	Commenced operations.	Description of Timber.	Where cut.	Lumber.		Lath.		Average Price for year.		Logs on hand.	Date of last return. Total number received.
						Manufactured	Sold.	Manufactured	Sold	Lumber.	Lth		
	Steam.	Feet.				Feet.	Feet.	M.	M.				March 31, 1908.
The Prince Albert Lbr. Co..	1,200 H.P.	160,000	1905	Spruce.	On Sturgeon and Little Red Rivers.	37,609,794	24,938,734	9,925,780	4,502,600	20 90	3 90	433,014	" "
The Sturgeon Lake Lbr. Co..	200 "	35,000	1899	"	North of Sturgeon Lake.	1,251,822	2,610,908	406,180	321,300	25 60	4 50	.....	" "
Wm. Cowan & Co	145 "	30,000	1890	"	On Little Red River	4,502,255	3,479,927	605,050	263,600	20 13	4 05	58,826	" "
The Saskatchewan Lbr. Co..	250 "	35,000	1905	"	Crooked River.....	6,634,709	4,234,441	1,707,300	2,105,800	20 34	3 60	173,858	" "
A. Marcelin	25 "	15,000	1907	"	Shell River	210,210	108,500	....	....	18 33	....	.....	" "
The Carrol Lbr. Co.. Ltd....	25 "	10,000	1907	"	Tisdale....	.....	.....	.....	....	....	....	18,510	" "
						50,208,790	35,372,510	12,644,310	7,193,300	20 90	3 90	687,244	207

CROWN TIMBER OFFICE,
PRINCE ALBERT, April 29, 1908.

R. S COOK,
Crown Timber Agent.

No. 25.

REPORT OF THE CROWN TIMBER AGENT AT WINNIPEG.

DEPARTMENT OF THE INTERIOR,
CROWN TIMBER OFFICE,
WINNIPEG, MANITOBA, April 1, 1908.

The Commissioner of Dominion Lands,
Ottawa, Ont.

SIR,—I have the honour to submit my report upon the Timber, Mines and Grazing Branch of the department for the year ending March 31, 1908, to which are appended the following tabulated statements:—

A.—Classified statement showing revenue collected on account of Dominion lands for timber, grazing and mines during the year.

Aa.—Classified statement showing revenue collected on account of school lands for timber, grazing and mines during the year.

B.—Schedule giving list of names of the respective holders of timber berths held under license and permit who are conducting operations, and the extent thereof.

LUMBER SALES.

The statement given hereunder, showing the amount of lumber and other products of timber sold within this district, was compiled from particulars procured from reliable sources, and is as nearly correct as can be obtained:—

From province of Ontario, west of Lake Superior—	Ft., B.M.
From Canadian logs	58,000,000
From American logs	50,000,000
From province of British Columbia	92,000,000
Imported from United States	2,642,076
From mills operating under Dominion license	53,485,361
From mills operating under Dominion permit	13,500,000
Total	269,627,437

Owing to the active demand throughout the country for lumber material and shortage in supply, prices were increased early in the year and were maintained until this spring, when a reduction was made of from two to five dollars per thousand feet. For purposes of comparison, I give hereunder the selling price of the different classes of lumber during the nine months ended March 31, 1907, with that for the year ended March 31, 1908:—

Pine, Cedar and Fir.	1907.	1908.
Dimension lumber	$23 00 to $30 00	$20 00 to $27 00
Fir for interior finishing	40 00 to 50 00	40 00 to 50 00
Flooring, siding and ceiling	35 00 to 45 00	33 00 to 40 00
Shiplap and common boards	23 00 to 26 00	21 00 to 23 00
Spruce.		
Dimension lumber	22 00 to 28 00	18 00 to 25 00
Siding, flooring and ceiling	23 00 to 28 00	23 00 to 28 00
Shiplap and common boards	20 00 to 26 00	18 00 to 24 00
Lath	4 00 to 5 00	4 00 to 5 00
Shingles	3 35 to 3 75	3 00 to 3 65

REVENUE.

The total revenue collected on account of this branch from all sources during the year amounts to $90,263.04 from Dominion lands and $3,591.04 from school lands, the details of which are shown in statements A and Aa appended.

TIMBER PERMITS.

The number of timber permits issued at this office to settlers during the year amounted to 1,435 (including 106 on school lands), covering the following quantity of timber:—

Dominion lands—

Building logs (lineal feet)	318,071
Lumber (feet, B.M.)	1,131,244
Roof poles	35,885
Fence rails	94,635
Fence posts	77,976
Cordwood	51,082

School lands—

Building logs (lineal feet)	600
Cordwood	2,820

SEIZURES.

During the year forty-nine seizures were made, thirty-nine of which covered material cut on Dominion lands and ten on school lands, as follows:—

Dominion lands—

Building logs (lineal feet)	8,436
Lumber (feet, B.M.)	205,365
Railway ties	4,285
Fence posts	700
Cordwood	1,673

School lands—

Lumber (feet, B.M.)	1,000
Railway ties	1,423
Fence posts	350
Cordwood	193
Telegraph poles	185

FUEL.

The figures given hereunder give approximately the sales of coal and wood during the same years:—

	1906-7.	1907-8.
American anthracite	115,000 tons.	140,000 tons.
American bituminous	105,000 "	150,000 "
Canadian anthracite	40,000 "	40,000 "
Canadian bituminous	62,200 "	61,731 "
Canadian lignite	68,796 "	120,000 "
Total	390,996 "	511,731 "

These figures are exclusive of coal used in connection with the operations of the railroads.

The following retail prices were obtained at Winnipeg:—

	1906-7.	1907-8.
American anthracite	$10.50 to $11.00	$10.50
American bituminous	8.00 to 9.00	8.00 to $8.50
Canadian anthracite	10.00	10.00
Canadian bituminous	8.00 to 9.00	8.00 to 9.00
Canadian lignite	5.00	5.00 to 5.50

CORDWOOD.

The sales of cordwood in the city of Winnipeg and town of St. Boniface during the year amount to about 105,000 cords. The retail price charged per cord was, for poplar, $3.50 to $4.50; spruce and jackpine, from $4 to $5, and tamarack, from $5 to $6.

This wood, excepting 14,970 cords imported from the United States was principally taken from Dominion and provincial lands under permits.

HAY.

The hay crop of 1907 was excellent. The number of settlers acquiring permits to cut hay upon Dominion and school lands was 738, aggregating 16,108 tons.

FOREST FIRES.

The damage to timber resulting from forest fires in this district was very small.

Your obedient servant,

E. F. STEPHENSON,
Crown Timber Agent.

SCHEDULE A.

STATEMENT of Receipts from Timber, Grazing and Hay Lands, collected at the Winnipeg Agency, for the fiscal year ending March 31, 1908.

DOMINION LANDS.

Month.	Bonus.	Timber Dues.				Grazing Fees.	Mining Fees.	Hay Permits.	Totals.
		Ground Rent.	Royalty.	Permits.	Seizures.				
1907.	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.
April		653 46	1,911 69	996 73	169 00			319 75	4,050 63
May		1,429 79	1,839 32	1,688 56	15 00		17 50	117 30	5,107 47
June		3,074 34	611 98	639 28	496 72	6 18	32 50	95 60	4,956 60
July		399 09	4,306 07	1,105 81	264 75	4 45	107 50	235 70	6,423 37
August		921 19	817 89	5,419 44	211 26		112 50	108 70	7,590 98
September		1 90	989 59	793 40	4 50	1 60	235 00	36 50	2,062 49
October			4,271 03	1,380 63	26 66	7 36	107 50	1 00	5,794 18
November		146 84	1,850 52	3,235 49					5,232 85
December		19 35	4,387 66	12,669 51	885 03		17 50		17,979 05
1908.									
January		7 93	6,857 96	1,334 35		4 45	30 00	20	8,234 89
February			1,931 68	6,560 91	123 60		22 50		8,638 69
March			104 34	2,201 20	411 52		2 50		2,749 56
		6,653 89	29,879 73	38,025 31	2,638 04	24 04	685 00	914 75	78,820 76
Collected at H.O.	8,552 00	2,691 14	3 89	25	195 00				11,442 28
Total	8,552 00	9,345 03	29,883 62	38,025 56	2,833 04	24 04	685 00	914 75	90,263 04

E. F. STEPHENSON,
Crown Timber Agent.

SCHEDULE B.

SHOWING Quantity of Lumber, &c., Manufactured at Saw-Mills operating under Government License in the Winnipeg Crown Timber Agency, for 12 months ending March 31, 1908.

Name	Location of Mill.	Location of Limit.	LUMBER.			SHINGLES.			LATH.		
			Manufactured.	Sold.	On hand.	Manufact'r'd	Sold.	On hand	Manufactured.	Sold.	On hand.
			Ft.	Ft.	Ft.	Cds.	Cds.	Cds.	M.	M.	M.
Ashdown&Bossons, L'd	Swan River	Swan River	2,144,032	1,149,846	1,140,506				58,700	54,250	4,450
Burrows, T. A	Grandview	Duck Mountain	11,420,207	10,081,834	3,906,844					85,550	
Bank of Toronto	Winnipeg	Rossean River	267,117	915,480	1,988,680						
Bank of Ottawa	Durban & Mafeking	Mafeking	354,565	293,124	479,910						
Beaver Lumber Co	Tp. 25—4 E 1	Lake Winnipeg	850,000		850,000						
Bjornson, Halli	Icelandic River	Icelandic River	8,030	8,030							
Caverly, Jefferson	Moody River	Tp. 38—29 W 1	1,581,720	1,931,200	1,981,120						
Davis, Hon. T. O	Erwood	" 42—2 W 2	1,065,000	475,154	589,846						
Finnson, K	Icelandic River	" 23—4 E 1	329,000	329,000							
Halliday, Robert	Punk Island	Punk Island	501,921	106,874	395,047						
Hanbury, John	Brandon	Duck Mountains	3,500,550	1,880,579	3,587,681						
			830,111	83,795	746,316						
Jefferson, W. D	Tp. 20—1 E 1	Lakes W'peg & Man.	289,578	190,000	179,578						
Mutchenbacker Bros	Mafeking	Tp. 35, R. 25 & 26 W.	6,584,580	3,918,742	4,573,073				480,900	480,900	
Matthews, B. J	The Narrows	Lake Manitoba		125,312							
McArthur & Co., L'd., J. D	Lac du Bonnet	Winnipeg River	4,719,664	2,268,307	2,763,859						
McArthur, Peter	Winnipegosis	Lake Winnipegosis	2,282,000	2,381,269	972,756						
McClure, J. H	Tp. 19—2 E 1	Tp. 19—2 E 1	330,003	155,000	385,343						
Peden, Wm	Rossburn	Riding Mountain	186,283	202,283	4,000						
Red Deer Lumber Co.	Red Deer Lake	East Saskatchewan	27,726,487	15,622,430	29,461,039				7,478,200	4,771,350	9,393,250
Ritchie Bros	Ochre River	Ochre River		19,500	9,950						
Robinson, Wm	Selkirk	Lake Winnipeg	1,395,110	1,395,110							
Shaw Bros	Dauphin	Riding Mt. & E. Sask.	10,906,389	6,380,390	6,197,798				3,920,100	1,444,500	2,881,300
Sigurdson & Thorvaldson	Big Island	Big Island	200,000		200,000						
Sinnott, John	Grandview	Duck Mountain	1,350,651	1,147,593	296,912				162,200	162,200	
Stuart, James	Bad Throat River	Lake Winnipeg	1,007,857	1,007,857							
Swan River Lumber Co	Minitonas	Tp. 36—24 W 1		60,541						72,650	
Thomas & Co	10—18—3 E	Lake Winnipeg	40,366	40,366							
Traders Bank of Canada	Bad Throat River	"	829,742	330,672	199,070						
Wills, A. L	Grindstone Point	"	647,973	647,973							
Williams, W. J. F	Lake Dauphin	Tp. 28 & 29—17 W.		35,000	85,000		50,000	40,000			
Rutley, Jos	Ochre River	Ochre River	228,394	2,100	226,294						
			81,577,330	53,485,361	61,520,622		50,000	40,000	12,100,100	7,071,400	12,279,000

E. F. STEPHENSON,
Crown Timber Agent.

No. 26.

REPORT OF THE CROWN TIMBER AGENT AT NEW WESTMINSTER.

DEPARTMENT OF THE INTERIOR,
DOMINION LANDS AND CROWN TIMBER OFFICE,
NEW WESTMINSTER, B.C., May 15, 1908.

The Commissioner of Dominion Lands,
Ottawa, Ont.

SIR,—I have the honour to submit herewith my annual report for the fiscal year ended March 31, last. I also inclose a schedule containing the list of the saw-mills situated within the railway belt in this province and statistics of the lumber trade for the period mentioned.

The lumber business in this province up to the month of September last was in a very healthy condition, but a lull came over the financial world about that time, that had its effect upon this most important branch of industry, and while at the present time the trade can hardly be said to have recovered from its setback there are prospects of a fairly prosperous season.

During the year about 72,000,000 feet of saw logs were manufactured within the railway belt in this province; out of this amount and what was on hand from the previous year, approximately 49,000,000 feet were sold, leaving at the end of the fiscal year about 30,000,000 feet on hand. As there were only nine months in the fiscal year ended March 31, 1907, it would be impossible for me to draw a comparison, but taking the year of 1906 as an example, there was in that year 21,000,000 feet of timber manufactured in the railway belt, and a similar amount sold. The receipts of this office for that year were $33,627.27, while the receipts for the year ending March 31 last, were $65,670.77, to which please add amount collected at head office on account of this agency.

Your obedient servant,

JAMES LEAMY,
Crown Timber Agent.

SCHEDULE A.

STATEMENT of Receipts, British Columbia Crown Timber Agency, for the fiscal year ended March 31, 1908.

Month.	Ground Rent.	Royalty Dues.	Permit Dues.	Seizure Dues.	Total.
1907.	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.
April	2,822 80	5,455 29	400 26		8,678 35
May	7,090 23	3,110 89	2,965 06	321 80	13,487 98
June	1,316 77	2,097 02	250 25		3,664 04
July	33 38	6,097 52	768 23		6,899 13
August	54 10	2,840 47	276 82	2,902 86	6,074 25
September	304 89	1,506 37	703 78		2,515 04
October	174 59	5,186 59	44 60		5,405 78
November	60 33	1,746 88	5 25		1,812 46
December	1 18	3,760 26	373 00		4,134 44
1908.					
January		2,551 35	519 95	5,396 94	8,468 24
February	8 00	166 29	119 02		293 31
March	08	1,442 49	795 18		2,237 75
Totals	11,866 35	35,961 42	7,221 40	8,621 60	63,670 77
Head Office					128,458 11
Total					192,128 88

List of Mills operating in Dominion Railway Belt in British Columbia and on hand during the fiscal

Name of Owner.	Where situated.	Capacity of Mill.	Power.	Operating on Limit Nos.
		Ft.		
Palliser Lumber Co	Palliser, B.C	40,000	Steam	29 and 3
Columbia River Lumber Co	Golden, B.C	100,000	"	258, 257 and 422
" "	Beaver, B.C	100,000	"	17, 277 and 278
" "	Kualt, B.C	50,000	"	45, 72 and 305
" "	Carlin, B.C	40,000	"	129,421, 241, 239 and 256
Bowman Lumber Co	Revelstoke, B.C	50,000	"	88 and 207
"	Comaplix, B.C	100,000	"	366, 113 and 114, 112
Lee Lumber Co	Wigwam, B.C	30,000	"	118
Big Bend Lumber Co	Arrowhead, B.C	100,000	"	316 and 392
Arrowhead Lumber Co	"	125,000	"	333
Three Valley Lumber Co	Three Valley, B.C	50,000	"	285, 326, 363, 365 and 457
"	Crazy Creek, B.C	100,000	"	Not operating
Rothesay Lumber Co	Mara, B.C	20,000	"	402
A. R. Rogers Lumber Co	Enderby, B.C	40,000	"	237
Lamb-Watson Lumber Co	Kamloops	30,000	"	" on Dom. Lands.
Monarch Lumber Co	Savona, B.C	20,000	"	" "
Harrison River Mills T. & T. Co	Harrison River, B.C	50,000	"	63
E. H. Heaps & Co	Ruskin, B.C	25,000	"	33, 185 and 268
Can. Pacific Lumber Co	Port Moody, B.C	100,000	"	" on Dom. Lands.
Emerson Lumber Co	"	75,000	"	" "
North Pacific Lumber Co	Barnet, B.C	100,000	"	" "
Hastings Shingle Mfg. Co	Vancouver, B.C	* 40,000	"	52
Pacific Coast Lumber Co	"	100,000	"	" on Dom. Lands.
B. C. Mills T. & T. Co	"	100,000	"	" "
"	New Westminster, B.C	40,000	"	86
E. J. Farrer	Vancouver, B.C	No mill		433 and 468
K. Mikuni	"	"		246
Spencer & Daison	"	"		209
N. G. Elliott	"	"		429
Vancouver Power Co	"	"		O
Brunette Saw Mill Co	Sapperton, B. C	75,000	Steam	33
L. A. Lewis	"	No mill		77
Small & Bucklin	New Westminster, B.C	75,000	Steam	" on Dom. Lands.
Fraser River Saw Mills	"	125,000	"	" "
Grant & Kerr	Ladner, B.C	25,000	"	293
Manitoba Lumber Co	Eburne, B.C	25,000	"	290
Fraser River Lumber Co	New Westminster, B.C	25,000	"	" on Dom. Lands.
George E. Drew	"	No mill		323
Neil Mitchell	"	"		453
Kwong Man, Fai & Co	"	"		223
E. J. Fader	"	"		Permit Claim 430
Abbotsford Lumber Co	Abbotsford, B.C	25,000	Steam	332

* Shingle Mill.

and Statement showing Quantity of Timber Manufactured, sold year ended March 31, 1908.

Locality of Limits.	Quantity of lumber manufactured.	Quantity of lumber sold from quantity manufactured and quantity on hand from previous year.	Quantity of lumber on hand.	Quantity of shingle bolts manufactured.
	Ft.	Ft.	Ft.	Cords.
Beaver Foot and Kicking Horse	6,686,211	4,663,467	2,463,760	Nil
Columbia River	4,815,619	1,579,917	4,815,742	"
"	1,019,316	54,918	985,434	"
Shuswap River	8,491,653	3,393,487	4,120,864	"
"	5,101,705	3,537,893	1,563,812	"
Columbia River	7,883,555	7,185,745	1,199,564	"
"	2,948,151	2,948,151		1,016
Wigwam River	1,777,996	134,107	1,643,889	593
Columbia River	2,593,924	2,266,349	327,575	Nil
Arrowhead	3,052,911	3,052,911	Nil.	"
Three Valley Lake	11,056,106	5,321,352	9,752,814	736
Mara	453,371	221,900	231,471	Nil.
Mabel Lake	3,323,444	Nil	3,323,444	"
Harrison Lake	581,450	581,450	Nil	Nil.
Stave River and Lake	442,574	127,678	314,896	4,856½
Burrard Inlet	268,115	268,115	Nil	647½
Coquitlam	1,062,907	1,062,907	Nil	Nil.
Burrard Inlet	1,064,499	1,064,499	"	"
"				560
"	363,061	363,061	Nil.	Nil
"	313,060	313,060	"	"
"	Nil.	2,218,374	"	"
Stave River	23,680	23,680	"	"
Coquitlam	1,708,102	1,708,102	"	"
Elgin	2,531,789	2,531,789	Nil	Nil
Pitt Lake	467,846	467,846	"	"
Harrison Lake	2,761,815	2,761,815	Nil.	
	Nil	Nil	"	831½
Burrard Inlet	"	"	"	279
Pitt Lake	1,656,814	1,656,814	"	Nil
Abbotsford	1,632,006	1,632,006	"	"
	74,081,680	51,141,393	30,743,265	9,519½

LIST of Mills operating in Dominion Railway

Name of Owner.	Quantity of shingle bolts sold cut of quantity manufactured, and quantity on hand from previous year.	Quantity of shingle bolts on hand.	Quantity of lath manufactured.
	Cords.	Cords.	M.
Palliser Lumber Co	Nil.	Nil.	502,250
Columbia River Lumber Co.	"	"	Nil
" "	"	"	"
" "	"	"	"
" "	"	"	"
Bowman Lumber Co	"	"	1,166,950
"	1,016	"	Nil.
Lee Lumber Co	568	65	"
Big Bend Lumber Co.	Nil	Nil	"
Arrowhead Lumber Co.	"	"	"
Three Valley Lumber Co	650	558	2,680,700
" "			
Rothesay Lumber Co	Nil	Nil.	Nil.
A. R. Rogers Lumber Co	"	"	"
Lamb-Watson Lumber Co.			
Monarch Lumber Co.			
Harrison River Mills T. & T. Co	Nil	Nil.	Nil.
E. H. Heaps & Co	3,313¾	5,710¾	"
Can. Pacific Lumber Co.			
Emerson Lumber Co			
North Pacific Lumber Co			
Hastings Shingle Mfg. Co	647½	Nil.	Nil.
Pacific Coast Lumber Co			
B. C. Mills T. & T. Co			
" "	Nil.	Nil.	Nil.
E. J. Farrer	"	"	"
K. Mikuni	487	90¾	"
Spencer & Daison	Nil	Nil	"
N. G. Elliott	"	"	"
Vancouver Power Co	"	"	"
Brunette Saw Mill Co	"	"	"
L. A. Lewis	"	"	"
Small & Bucklin			
Fraser River Saw Mills			
Grant & Kerr	Nil	Nil.	Nil
Manitoba Lumber Co.	"	"	"
Fraser River Lumber Co			
George E. Drew			
Neil Mitchell	713	490	Nil.
Kwong Man. Fai & Co	202¾	676¾	"
E. J. Fader	Nil.	Nil.	"
Abbotsford Lumber Co.	"	"	"
	7,597½	7,390½	4,349,900

Belt in British Columbia, &c.—*Concluded.*

Quantity of lath sold.	Quantity of lath on hand.	Quantity of railway ties manufactured.	Quantity of railway ties sold.	Quantity of railway ties on hand.	No. of mill returns received.	Date of last return.
M.	M.	Pieces.	Pieces.	Pieces.		
325,800	176,450				4	March 31, 1908
Nil	Nil.	8,889	8,889	Nil.	4	" 31, 1908
"	"	1,176	1,176	"	4	" 31, 1908
"	"	48,350	48,350	"	4	" 31, 1908
"	"	6,844	6,844	"	4	" 31, 1908
764,850	474,100	27,884	27,884	"	4	" 31, 1908
Nil.	Nil.	Nil.	Nil.	"	4	" 31, 1908
"	"	"	"	"	4	" 31, 1908
"	"	"	"	"	4	" 31, 1908
"	"	"	"	"	4	" 31, 1908
1,462,000	1,219,900	"	"	"	4	" 31, 1908
Nil.	Nil.	1,100	1,100	Nil.	4	March 31, 1908
"	"	Nil	Nil	"	4	" 31, 1908
		"	"			
Nil.	Nil.	Nil	Nil	Nil.	4	March 31, 1908
"	"	"	"	"	4	" 31, 1908
Nil.	Nil.	Nil	Nil	Nil.	4	March 31, 1908
Nil.	Nil.	Nil.	Nil	Nil	4	March 31, 1908
"	"	"	"	"	4	" 31, 1908
"	"	"	"	"	4	" 31, 1908
"	"	"	"	"	4	" 31, 1908
"	"	"	"	"	4	" 31, 1908
"	"	"	"	"	4	" 31, 1908
"	"	"	"	"	4	" 31, 1908
"	"	"	"	"	4	" 31, 1908
Nil.	Nil.	Nil.	Nil.	Nil.	4	March 31, 1908
"	"	"	"	"	3	Dec. 31, 1907
					4	March 31, 1908
Nil.	Nil.	Nil.	Nil.	Nil.	3	Dec. 31, 1907
"	"	"	"	"	4	March 31, 1908
"	"	"	"	"	†	May 1, 1908
"	"	"	"	"	4	March 31, 1908
2,552,650	1,870,450	94,243	94,243	Nil.		

† 5 permits issued.

No. 27.

REPORT OF THE INSPECTOR OF RANCHES.

OFFICE OF THE INSPECTOR OF RANCHES,
CALGARY, ALBERTA, March 31, 1908.

The Commissioner of Dominion Lands,
Ottawa, Ont.

SIR,—I have the honour to submit my report of the transactions of this office for the fiscal year ending March 31, 1908.

During the year 4,473 inspections have been made of grazing leases, stock watering reserves and applications to purchase, and requests for permission to be allowed to cultivate part of leases for growing fodder crops. In the discharge of these duties 10,844 miles have been driven by team and 21,247 miles travelled by rail.

Conditions on the range have been almost perfect during the past fall and winter; light snows, mild weather and few, if any, storms which could be called severe and these only of short duration have prevailed. Yet, as the department is aware, lessees of grazing lands have, in many cases, relinquished their holdings wholly or in part. In my opinion this state of affairs is caused partly by the dread of a provincial tax on leased lands, partly on account of the winter losses of the season of 1906-07, but chiefly because the stockman no longer fears the encroachment of other ranchers, as the ranching business does not appear to present the same attractions to the new investor as formerly. The established rancher is not abandoning the business, but appears to be taking advantage of these conditions in order to curtail expenses.

Inspections are now pretty well up to date.

Your obedient servant,

ALBERT HELMER,
Inspector of Ranches.

No. 28.

REPORT OF THE ACCOUNTANT.

DEPARTMENT OF THE INTERIOR,
OTTAWA, July 15, 1908.

W. W. CORY, Esq.,
Deputy Minister of the Interior,
Ottawa.

SIR,—I have the honour to submit herewith statements of revenue collected from various sources during the fiscal year ended March 31, 1908, as follows:—

A.—Dominion lands, including Yukon Territory ...	$1,979,499 13
B.—Ordnance lands	8,674 95
C.—School lands	708,045 83
D.—Registration fees	2,256 65
E.—Fines under the Immigration Act	1,650 00
F.—Casual revenue	20,069 03
G.—Seed grain repayments..	12,899 84
	$2,733,095 43

A statement of revenue on account of Dominion lands (marked H.) shows the receipts monthly, classified under subheads. Statement (marked I.) shows a comparison between the receipts on account of Dominion lands for the fiscal year ended March 31, 1908, as compared with the revenue of the previous twelve months.

Your obedient servant,

P. MARCHAND,
Acting Accountant.

A.—Dominion Lands Revenue (cash and scrip) for the fiscal period ended March 31, 1908.

Agencies.	Cash.	Scrip.	Total.
YUKON TERRITORY.	$ cts.	$ cts.	$ cts.
Sale of lands	10,524 70		
Rental of land	5,282 01		
Map sales, office fees, &c	51 50		
Survey fees	400 00		
Timber dues	17,555 22		
Hay permits	134 00		
Mining fees	127,355 50		
Export tax on gold	70,504 65		
Free Miners' certificates	76 25		
Free certificates for export of gold	162 50		
Hydraulic leases	6,198 97		
Dredging leases	17,925 42		
Homestead fees	90 00		
Improvements	15 00		
Coal lands	1,543 38		
Rent of water power	2,500 00		
Suspense account	407 00		
Miscellaneous	11 00		
	260,737 10		260,737 10
DOMINION LANDS AGENCIES.			
Battleford	60,669 35	560 00	61,229 35
Brandon	10,604 39	760 00	11,364 39
Calgary	95,224 90		95,224 90
Dauphin	11,709 54		11,709 54
Edmonton	106,082 32		106,082 32
Estevan	17,730 56		17,730 56
Humboldt	35,148 41		35,148 41
Kamloops	12,254 62	3,254 53	15,509 15
Lethbridge	371,060 03	1,760 00	372,820 03
Moosejaw	74,923 40	1,282 29	76,205 69
New Westminster	3,446 30		3,446 30
Prince Albert	23,383 87	1,199 58	24,583 45
Red Deer	57,665 28		57,665 28
Regina	52,175 45	78,463 61	130,639 06
Winnipeg	18,503 56	4,871 23	23,374 79
Yorkton	39,800 00	160 00	39,960 00
	990,381 98	92,311 24	1,082,693 22
CROWN TIMBER AGENCIES.			
Battleford	106 95		
Brandon	774 27		
Calgary	36,657 55		
Dauphin	9,305 95		
Edmonton	86,606 03		
Estevan	75		
Humboldt	82 65		
Lethbridge	716 84		
Moosejaw	201 35		
New Westminster	192,128 88		
Prince Albert	39,841 86		
Red Deer	190 20		
Regina	224 50		
Winnipeg	88,639 25		
Yorkton	576 69		
	456,053 72		456,053 72

SESSIONAL PAPER No. 25

A.—Dominion Lands Revenue (cash and scrip) for the fiscal period ended March 31, 1908.—*Continued.*

Agencies.	Cash.	Scrip.	Total
	$ cts.	$ cts.	$ cts.
Rocky Mountains Park	27,232 87		27,232 87
Irrigation fees	516 75		516 75
Survey fees	140,855 35		140,855 35
Patent fees and interchange fees	768 50		768 50
Map sales, office fees, &c	6,467 50		6,467 50
Fees, *re* Board of Examiners, D.L.S	690 00		690 00
Mining fees	3,348 05		3,348 05
Grazing lands	43,211 78	4,048 01	47,259 79
Hay permits	4,842 45		4,842 45
Coal lands	28,154 26		28,154 26
Stone quarries	1,270 93		1,270 93
Dredging leases	1,741 42		1,741 42
Refund of refunds	682 77		682 77
Suspense account	978 35		978 35
Sale of land	29,844 11		29,844 11
Homestead fees	29 73		29 73
Rent of water power	140 78		140 78
Miscellaneous	271 52		271 52
	291,047 12	4,048 01	295,095 13
	1,998,219 92	96,359 25	2,094,579 17
Refunds	114,600 04	480 00	115,080 04
	1,883,619 88	95,879 25	1,979,499 13

P. MARCHAND,
Acting Accountant.

Department of the Interior,
Accounts Branch,
Ottawa, July 15, 1908.

B.—Statement of Ordnance Lands Revenue for the Fiscal Year ended March 31, 1908.

Month.	Amount.
1907—April	$ 676 52
" May	483 82
" June	2,269 01
" July	1,365 54
" August	280 20
" September	1,080 24
" October	437 39
" November	399 13
" December	91 86
1908—January	852 63
" February	399 80
" March	338 81
Total	$ 8,674 95

P. MARCHAND,
Acting Accountant.

Department of the Interior,
Accounts Branch,
Ottawa, July 15, 1908.

SCHOOL LANDS.

C.—STATEMENT of Receipts on account of School Lands for the fiscal year ended March 31, 1908.

Month.	Manitoba School Lands.	Saskatchewan School Lands.	Alberta School Lands.	Total.
1907.	$ cts.	$ cts.	$ cts.	$ cts.
April	6,137 89	12,252 59	6,174 16	24,564 64
May	22,156 86	25,454 36	3,509 30	51,120 52
June	32,944 12	28,323 08	1,728 50	62,995 70
July	48,122 15	33,034 05	2,092 39	83,248 59
August	45,282 45	7,513 95	1,632 65	54,429 05
September	4,210 04	15,205 99	6,519 65	25,935 68
October	29,037 95	21,852 43	15,393 11	66,283 49
November	101,494 16	32,987 42	35,610 70	170,092 28
December	45,073 70	15,845 44	31,041 50	91,960 64
1908.				
January	11,964 64	6,054 36	7,422 96	25,441 96
February	13,288 38	7,339 96	4,816 60	25,444 94
March	8,421 66	10,865 04	7,241 64	26,528 34
	368,134 00	216,728 67	123,183 16	708,045 83
Transfer to Alberta School Lands of amount wrongly credited to Saskatchewan School Lands in 1906-1907	.....	25 60	25 60	.....
	368,134 00	216,703 07	123,208 76	708,045 83

P. MARCHAND.
Acting Accountant.

DEPARTMENT OF THE INTERIOR,
ACCOUNTS BRANCH,
OTTAWA, July 15, 1908.

D.—STATEMENT of Registration Fees for the fiscal year ended March 31, 1908.

District.	Registrar.	Total.
		$ cts.
*North Alberta	Geo. Roy	100 00
Yukon Territory	J. E. Girouard	2,156 65
		2,256 65

* Revenue collected previous to 8th September, 1905.

P. MARCHAND,
Acting Accountant.

DEPARTMENT OF THE INTERIOR,
ACCOUNTS BRANCH,
OTTAWA, July 15, 1908.

SESSIONAL PAPER No. 25

E.—STATEMENT of Fines Collected under the Immigration Act for the fiscal year ended March 31, 1908.

Month.	From Whom Received.	Total.
1907.		$ cts.
August	Dr. A. S. Monroe *re* S. S. Jaurequiberry	400 00
September	Dr. G. L. Milne *re* S. S. Wangard	350 00
October	E. R. Stephan *re* N. Y. & K. Co E. B. Marvin & Co. *re* S. S. Indiana	900 00
		1,650 00

P. MARCHAND,
Acting Accountant.

DEPARTMENT OF THE INTERIOR,
ACCOUNTS BRANCH,
OTTAWA, July 15, 1908.

F.—STATEMENT of Casual Revenue for the fiscal year ended March 31, 1908.

Name.	Particulars.	Amount.
		$ cts.
Immigration Com., Winnipeg	Tents sold by J. R. Bunn	9 25
J. T. Lithgow	Unclaimed estates in the Yukon Territory	1,363 54
Howard Douglas	Refund of overpayment to C. H. Deutchman	71
James White	Refund acct. travelling expenses	25
J. B. Harkin	" travelling expenses	21 95
F. T. Congdon	" travelling expenses	57 20
J. M. Macoun	" expenses	141 95
J. A. Bannerman	Proceeds sale of team of horses	125 00
D. J. McDonald	Refund acct. expenses *re* Genelle vs. The King	20 75
Dr. J. E. Woodman	Refund travelling expenses	5 10
Hon. Frank Oliver	" travelling expenses	450 00
Otto J. Klotz	" travelling expenses	16 76
Dr. W. L. Ellis	" expenses	50 00
E. J. O'Connell	" expenses	11 10
James White	" expenses	10 00
Grand Trunk Railway Co.	" of double payments for freight	1 11
Alex. Ayotte	" of salary 15 to 31 Aug., 1905, not used	41 13
Kilroy, Morgan & Co.	" of overcharge on towels *re* Vancouver Hospital	60 00
A. F. Jury	Proceeds sale of old bonus forms	2 13
J. B. Challies	Refund acct. travelling expenses	30 65
F. T. Congdon	" travelling expenses	25
Geo. L. Dempster	Proceeds sale of old office furniture	8 00
Immigration Com., Winnipeg	" " of sheaves of barley to D. Wood	3 00
" " "	" " of hard tack by C. W. Speers	29 50
Public Works Dept	Refund acct. freight paid G. T. Ry. Co., Royal Observatory	3 91
A. R. Wade	Refund acct. travelling expenses	46 45
G. R. Lancefield	" travelling expenses	25 00
C. A. Bigger	" trigonometrical surveys of 1906	491 23
R. M. Ogilvie	" travelling expenses	24 31
C. A. Bigger	" trigonometrical surveys of 1906	2 99
E. O'Kelly	" travelling expenses	50 85
A. D. L., Calgary	" of cheque *re* extinguishing fire not used	100 00
J. W. E. Darby	" travelling expenses	42 48
Miss Sarah Doyle	" of cheque acct. services *re* Doukhobors	20 00
Markham & Dracup	" of cheque acct. livery *re* Doukhobor pilgrimage	2 00
W. A. J. Baker	" services and expenses *re* insane in Keewatin	20 00
W. S. Davis	" services and expenses *re* insane in Keewatin	14 00

F.—STATEMENT of Casual Revenue for the fiscal year ended March 31, 1908.—*Con.*

Name.	Particulars.		Amount.
			$ cts.
Immigration Comr., Winnipeg	" A. E. Rogers railway fare		1 85
J. W. E. Darby	" of Dom. Lands cheque No. 17132 of Aug. 29, 1906, not used		100 00
Immigration Comr., Winnipeg	Proceeds sale of fittings, &c., of old Selkirk Hall		72 00
Imperial Government	Share of Alaska Boundary Arbitration		13,789 94
			$17,266 34
	Refunds		18 75
Casual Revenue, Northwest Territories.			$17,247 59
Hudson's Bay Co	Liquor permit	$ 8 00	
"	"	16 00	
"	"	29 25	
"	"	4 00	
"	"	4 00	
K. and L. McLeod	"	5 00	
Supt. J. D. Moodie	"	2 00	
Inspr. E. A. Pelletier	"	2 00	
Robert Kane	Fine for taking liquor into Northwest Territories	25 00	
J. McKay	Liquor permit	2 00	
Hudson's Bay Co.	"	28 00	
"	"	30 00	
"	"	2 00	
F. Fisher	"	2 00	
Hudson's Bay Co.	"	83 00	
"	"	6 00	
			248 25
		2,554 44	
Casual Revenue, Relief Advances.	Refunds	34 85	2,519 59
	1876	1,503 31	
Relief mortgages	1894	1,812 19	
Seed grain advances	1896	425 10	
"	1900	51 98	
"	1901	1,018 42	
"	1905	4,233 53	9,044 53
"			29,059 96

DEPARTMENT OF THE INTERIOR,
ACCOUNTS BRANCH,
OTTAWA, July 15, 1908.

P. MARCHAND,
Acting Accountant.

G.—STATEMENT showing Seed Grain and Relief Mortgages for the fiscal year ended March 31, 1908.

—	Seed Grain Advances, 1905.	Seed Grain Advances, 1901.	Seed Grain Advances, 1900.	Seed Grain Advances, 1896.	Seed Grain Advances, 1895.	Seed Grain Advances, 1894.	Seed Grain to Settlers Account, 1890.	Territorial Accounts, 1886-87-88.	Relief Mortgages of 1876.	Total.
	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.
	4,336 31	1,062 97	52 45	446 94	1,826 13	1,907 88	790 79	973 06	1,503 31	12,899 84
Refunds	102 78	44 55	47	21 84	19 38	95 69	27 33	62 15	.....	374 19
	1,233 53	1,018 42	51 98	425 10	1,806 75	1,812 19	763 46	910 91	1,503 31	12,525 65

P. MARCHAND,
Acting Accountant.

DEPARTMENT OF THE INTERIOR,
ACCOUNTS BRANCH,
OTTAWA, July 15, 1908.

H.—Statement of Gross Receipts on account of Dominion Lands for the fiscal year ended March 31, 1908.

Month.	Homestead Fees.	Improvements.	General Sales of Land.	Timber Dues.	Rental from Grazing Lands.	Export Tax on Gold, Mining Fees, Hay and Coal Lands, &c.	Rocky Mountains Park of Canada.	Map Sales, Office Fees, Sundry Fees.	Survey Fees.	Rental of Lands and Miscellaneous.	Total.
1907.	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.
April	25,851 73	3,188 78	51,500 29	38,295 55	1,755 62	18,501 64	2,291 20	872 12	3,132 88	4,386 00	149,775 81
May	31,170 00	5,628 10	29,006 19	49,337 50	5,803 68	32,642 67	1,670 87	867 55	31 80	632 37	156,730 73
June	45,560 00	6,396 25	103,531 21	44,838 76	3,223 18	26,077 73	1,294 55	717 35	8,182 79	85 00	239,906 82
July	36,800 00	5,780 21	84,330 85	146,649 78	2,423 94	26,732 25	4,909 62	560 45	100 00	423 55	308,810 65
August	28,090 00	6,831 80	60,369 38	25,786 94	5 133 53	31,827 04	2,417 42	778 98	100 00	270 75	161,505 99
September	23,820 00	5,966 73	58,797 40	22,286 25	4,911 40	36,130 65	1,427 87	666 66	.....	313 66	154,320 62
October	22,410 00	6,926 00	19,969 25	33,730 70	6,845 59	35,283 54	3,787 70	470 08	10,303 21	164 69	139,890 76
November	22,515 00	7,307 50	44,550 20	16,183 55	4,513 86	12,483 15	1,010 75	663 77	3,000 00	85 00	112,312 78
December	18,325 00	6,790 84	27,061 45	29,637 38	2,855 19	13,264 37	893 87	626 60	77,585 07	695 25	177,744 52
1908.											
January	14,435 00	4,768 51	126,458 94	37,667 82	1,238 78	9,682 32	3,084 72	509 78	37,998 80	121 00	235,956 17
February	14,085 00	4,773 95	23,986 48	14,284 28	3,603 48	13,259 24	599 80	1,481 85	820 80	252 35	77,147 23
March	18,632 00	6,780 80	26,741 39	14,910 43	903 38	10,013 96	3,844 50	2,062 35	.....	229 03	84,117 84
	301,693 73	71,139 47	656,303 03	473,608 94	43,211 78	265,898 56	27,232 87	10,217 54	141,255 35	7,658 65	1,998,219 92
Scrip	.....	.....	92,311 24	.....	4,048 01	.....	.....	.....	.....	.....	96,359 25
	301,693 73	71,139 47	748,614 27	473,608 94	47,259 79	265,898 56	27,232 87	10,217 54	141,255 35	7,658 65	2,094,579 17

P. MARCHAND,
Acting Accountant.

Department of the Interior,
Accounts Branch,
Ottawa, July 15, 1908.

DOMINION LANDS REVENUE.

STATEMENT of Gross Receipts (Cash and Scrip) on account of Dominion Lands Revenue for the fiscal year ended March 31, 1908, compared with the period of twelve months ended March 31, 1907.

Particulars.	Fiscal year ended March 31, 1908. Twelve months.	Twelve months ended March 31, 1907.	Increase.	Decrease.	Net decrease
	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.
Dominion Lands Agencies	1,082,693 22	1,157,227 80		74,534 58	
Crown Timber Agencies	456,053 72	458,285 37		2,231 65	
Rocky Mountains Park of Canada	27,232 87	21,683 24	5,549 63		
Hay, mining, coal, grazing, &c	87,274 43	71,235 74	16,038 69		
Miscellaneous	180,587 83	105,455 42	75,132 41		
	1,833,842 07	1,813,887 57	96,720 73	76,766 23	
Yukon Territory	260,737 10	326,909 66		66,172 56	
	2,094,579 17	2,140,797 23	96,720 73	142,938 79	46,218 06

NOTE—Increase in Dominion Lands Revenue $19,954 50
Decrease in Yukon Revenue 66,172 56

P. MARCHAND,
Acting Accountant.

DEPARTMENT OF THE INTERIOR,
ACCOUNTS BRANCH,
OTTAWA, July 15, 1908.

No. 29.

REPORT OF THE ORDNANCE AND ADMIRALTY LANDS BRANCH.

DEPARTMENT OF THE INTERIOR,
OTTAWA, June 15, 1908.

W. W. CORY, Esq.,
Deputy Minister of the Interior,
Ottawa.

SIR,—I have the honour to submit the following report upon the work in connection with this branch of the department for the fiscal year ending March 31, 1908.

Within the period covered by this report two sales of ordnance land were held, namely, in the city of Toronto and in the town of Niagara-on-the-Lake, and which are fully reported on under these respective localities.

In reference to lands previously sold or held under leases issued by the Imperial authorities with the privilege of having such leasehold property converted into freehold upon payment in cash of the amount of consideration money placed thereon, 38 whole lots, 6 half lots and one small island (Commissary Island), situated in the various localities mentioned hereunder, and in the accompanying statement marked 'A,' have been redeemed and letters-patent issued:—

(1.) Chambly, P.Q.—Four lots, forming part of the ordnance reserve at this point which were sold in 1905 for the sum of $780, and this amount having been paid in full, letters-patent were issued for these lots. The sum of $390, being the balance of purchase money, was received during the past fiscal year.

(2.) Edmunston, N.B.—Four lots, being part of the ordnance reserve in this locality, and previously sold for the sum of $310, were fully redeemed and letters-patent issued. The balance of purchase money received within the last year was $96.03.

(3.) Grand Falls, N.B.—Twenty lots, embraced within the limits of the reserve near this town which were sold at various dates for the total sum of $1,040, have been paid for in full and letters-patent issued therefor. The balance of purchase money received within the past fiscal year amounts to $494.15.

(4.) Nepean.—One lot, forming part of a sub-division of part of lot K, concession C, being a portion of the land in this township acquired for the purposes of the Rideau canal, and which was sold at public auction in 1898 for the sum of $270, was paid for in full and letters-patent issued. The balance of purchase money received during the year was $216.

(5.) Niagara-on-the-Lake.—Six lots in this historic town, being a sub-division of what is known as 'The Hospital Lots,' were offered for sale by public auction within the fiscal year. These lots were put up en bloc, but as only one bid was received and that slightly in advance of the upset price, it was considered advisable to offer them separately. Lot 'A' was then started at the upset price, namely, $250 and was sold for the sum of $268, an advance of $18 on the upset price, and one-fifth of the purchase money, or $53.60, was paid down.

Owing to the indifference shown on the part of prospective purchasers to acquire these lots, and the small advance on the upset price obtained for lot 'A,' it was deemed expedient and in the interest of the department to withdraw from sale the remaining five lots, it being confidently anticipated that at a more favourable time these lots could be readily disposed of at a considerable advance on the upset price.

(6.) Ottawa.—The lots in this locality are held by tenants under the provisions contained in the original leases granted by the Imperial authorities with the option of purchasing their leaseholds upon payment in cash of the amount of consideration money placed thereon. During the last fiscal year four whole lots and six half lots were redeemed and patents issued, the total amount of consideration money received therefor being $1,141.99.

(7.) Quebec.—Five lots, forming part of the sub-division of the 'Cove Field,' which were sold in 1900 for the sum of $3,375. This amount having been paid in full, letters-patent were issued covering these lots.

(8.) Shelburne.—A small island, situated in Shelburne Harbour and known as 'Commissary Island' which was held under lease for upwards of 14 years and upon which the lessee had made extensive improvements, was, in accordance with the provisions of the Ordnance Lands Act, Chapter 58, Revised Statutes of Canada, 1906, sold at a valuation. The island in question was valued at $650, and payment of this amount having been made in cash, letters-patent were issued for this property.

(9.) Toronto.—A sale of ordnance land by public auction was held in this city within the fiscal year. The property offered for sale consisted of one small lot situated on the north side of Clifford street, upon which an upset price of $250 was placed. This lot was sold for the sum of $510, more than double the upset price, and the first instalment of the purchase money amounting to $102, was paid down at the time of sale.

The following statements are hereto annexed:—

(A.) Statement showing the number of lots sold or redeemed; the amounts for which such lots were originally sold and the sums received during the fiscal year as instalments or balances of purchase money.

(B.) Statement giving the several localities where ordnance lands are situated on account of which moneys have been received during the fiscal year, the net revenue received amounting to $8,652.95.

(C.) Statement showing the amounts received each month of the fiscal year, classified as fees, rent or interest equivalent to rent, and principal.

(D.) Statement showing the amounts due and unpaid on account of purchase money and rent or interest. The total amount shown to be due and unpaid is $60,166.36, or $853.70 less than last year.

The correspondence and general office work in connection with this branch show a marked increase during the last year. The number of letters received, registered and filed was 460; number of letters written, copied, indexed and mailed, 475; and 74 reports upon various properties and matters pertaining to this branch were prepared and submitted.

In addition to the number of letters written there were 281 circulars mailed from this office, and 215 accounts open in the books of this branch with purchasers and tenants of ordnance lands prepared and rendered.

The accounts open in the ledgers have been carefully and regularly posted; the receipt book, cash book and monthly statement book have been carefully kept, and a monthly return of all moneys received in this branch regularly furnished the Accountant of the department.

There were 23 assignments received, examined and registered, an increase of 9 over the previous fiscal period; 26 draft letters-patent prepared, an increase of 3 compared with the report for 1906-7.

Within the last fiscal period two new leases and one renewal lease were issued; and one piece of ordnance land situated in the city of Kingston transferred by order in council from class two to class one and placed under the control of the Minister of Militia and Defence.

In addition to the foregoing report upon the work appertaining to the Ordnance Lands Branch, the work in connection with the recording, copying, indexing, printing and filing of copies of all orders in council passed from time to time relating to this department is likewise faithfully and efficiently carried on under my supervision.

The number of orders in council dealing with the administration of this department in its various branches is annually increasing, owing no doubt to the many, varied and important questions with which the department is called upon to deal.

A conception may be formed of the rapid increase in this branch of departmental work when attention is drawn to the fact that the records in this office show that 94 more orders in council affecting this department were passed in 1907 than in the preceding year, or an increase of over 30 per cent.

I may also point out that many of the orders in council passed each year have long schedules accompanying them which must be copied and carefully compared and the proof copy thereof read and corrected before the printed copies are struck off. Other orders in council have plans attached for the purpose of illustrating the point or points which the order is intended to cover; these plans must be ordered on requisition and lithograph copies obtained and attached to the printed copies of the order in council before the same are filed.

The bound volumes of the orders in council intended for departmental use only, and for the purpose of a permanent record likewise, received earnest attention. During the past year two additional volumes covering the years 1903 and 1904 have, with their very full indexes been completed, the volumes for 1903 have been distributed among the several branches of the department, and those for 1904 have been in the hands of the binder at the Printing Bureau for some time and delivery of the same at an early date has been promised.

I have the honour to be, sir,

Your obedient servant,

JOS. P. DUNNE,

Clerk in charge of Ordnance and Admiralty Lands Branch.

SESSIONAL PAPER No. 25

A.—STATEMENT showing the number of Lots sold or redeemed, the amounts for which such redeemed lots were originally sold, and the amounts of purchase money received during the fiscal year ending March 31, 1908.

Locality.	Number of Lots sold or redeemed.	Amount of consideration or purchase.	Amount received on account during fiscal year.	Remarks.
		$ cts.	$ cts.	
Chambly	4 lots	780 00	390 00	Balance of purchase money.
Edmundston	4 lots	310 00	96 03	" "
Grand Falls	20 lots	1,040 00	494 15	" "
Nepean	1 lot	270 00	216 00	" "
Niagara-on-the-Lake	1 lot	268 00	53 60	1st instalment.
Ottawa	4 lots and 6 half-lots	1,141 99	1,141 99	Consideration money.
Quebec	5 lots	3,375 00	Nil.	Balance of purchase money paid prior to period covered by this report.
Shelburne	1 Island	650 00	650 00	Amount of valuation.
Toronto	1 lot	510 00	102 00	1st instalment.
Total		8,344 99	3,143 77	

JOS. P. DUNNE,
Clerk in Charge of Ordnance and Admiralty Lands Branch.

B.—STATEMENT showing the several localities on account of which moneys have been received during the fiscal year ending March 31, 1908.

Locality.	Amount.
Amherstburg	$ 2 00
Burlington Beach	100 00
Chambly	673 77
Edmundston	110 52
Elmsley	9 70
Fort Cumberland	50 00
Fort Erie	22 00
Gloucester	215 70
Grand Falls	888 53
Grenville	2 00
Kingston	202 25
Longueuil	142 00
Marlborough	30 00
Montreal	1 00
Nepean	322 98
Niagara	63 60
Ottawa	2,177 16
Owen Sound	42 00
Oxford	14 20
Point Pelee	1 00
Quebec	830 00
Queenston	1 00
Sarnia	200 00
Shelburne	650 00
Sorel	48 54

Locality.	Amount.
Brought forward	$6,759 95
St. Croix River	2 00
St. Joseph's Island	18 10
Toronto	1,662 00
Wolford	102 40
Registration fees	90 50
	$ 8,674 95
Less refund	22 00
	$ 8,652 95

JOS. P. DUNNE,
Clerk in Charge of Ordnance and Admiralty Lands Branch.

C.—STATEMENT of Receipts on account of Ordnance and Admiralty Lands for each of the fiscal twelve months ending March 31, 1908.

Month.	Fees.	Rent or Interest.	Principal.	Total.
1907.	$ cts.	$ cts.	$ cts.	$ cts.
April	12 00	169 52	495 00	676 52
May	12 00	173 66	298 16	483 82
June	6 00	2,034 26	226 25	2,266 51
July	2 00	1,067 21	296 33	1,365 54
August	4 00	276 20	.....	280 20
September	12 60	344 54	720 60	1,077 74
October	2 00	83 11	352 28	437 39
November	12 50	78 13	306 00	396 63
December	...	58 35	31 01	89 36
1908.				
January	8 00	142 63	699 50	850 13
February	2 00	338 30	50 00	390 30
March	13 50	96 41	228 90	338 81
Total	83 10	4,862 32	3,704 03	8,652 95

JOS. P. DUNNE,
Clerk in Charge of Ordnance and Admiralty Lands Branch.

D.—Money due by Purchasers and Tenants up to March 31, 1908.

Locality.	Rent or Interest.	Principal.	Total.
	$ cts.	$ cts.	$ cts.
Beaver Harbour	6 00		6 00
Burlington Beach	240 00		240 00
Carillon	5 00		5 00
Chambly	256 62	347 00	603 62
Dalhousie	9 66	23 00	32 66
Edmundston	32 78	38 40	71 18
Elmsley	50		50
Fort Cumberland	92 00		92 00
Grand Falls	393 96	1,201 90	1,595 86
Kingston	56 08	50 96	107 04
Longueuil	100 00		100 00
Nepean	51 00		51 00
Oromocto	25		25
Ottawa	2,903 08		2,903 08
Owen Sound	40 50		40 50
Oxford	11 60		11 60
Prescott	1 00		1 00
Presqu'isle	1 00		1 00
Quebec	30 00		30 00
Shelburne	2 00		2 00
Sorel	1,397 00		1,397 00
St. Croix River	1 00		1 00
Toronto	780 00	52,000 00	52,780 00
Township of Tay	4 00		4 00
Turkey Point	18 67		18 67
Wolford	71 40		71 40
	6,505 10	53,661 26	60,166 36

JOS. P. DUNNE,
Clerk in Charge of Ordnance and Admiralty Lands Branch.

No. 30.

REPORT OF THE REGISTRAR OF CORRESPONDENCE.

DEPARTMENT OF THE INTERIOR,
CORRESPONDENCE REGISTRATION BRANCH,
OTTAWA, May 11, 1908.

W. W. CORY, Esq.,
Deputy Minister of the Interior,
Ottawa.

SIR,—I have the honour to place before you statement 'A' showing the number of letters filed during the fiscal year ended March 31, 1908, and the amount of money received, registered and sent to the accountant; also statement 'B' showing the number of letters and the amount of money received during each fiscal year from 1900 to March 31, 1908.

Your obedient servant,

J. M. ROBERTS,
Chief Clerk.

A.—STATEMENT showing the Number of Letters received and recorded and the Money received during the fiscal year ended March 31, 1908.

	Letters Received.	Daily Average.	Registered Letters		Money Received.
			Received.	Sent.	
1907.					$ cts
April	14,250	570	794	3,271	150,136 65
May	13,410	536	697	3,177	99,225 94
June	16,630	665	805	2,615	142,635 47
July	17,180	661	888	2,511	206,148 83
August	17,116	658	946	2,966	77,116 88
September	15,302	638	784	2,529	86,489 43
October	14,100	542	936	3,988	87,207 06
November	15,123	605	998	3,652	319,082 32
December	16,820	673	957	3,004	185,821 63
1908.					
January	16,025	641	1,019	3,115	86,247 19
February	15,500	620	1,315	3,670	44,685 40
March	16,232	650	958	2,772	73,433 52
Total	187,688		11,097	37,270	1,558,230 32

J. M. ROBERTS.
Chief Clerk

DEPARTMENT OF THE INTERIOR,
CORRESPONDENCE REGISTRATION BRANCH,
OTTAWA, May 11, 1908.

B.—STATEMENT showing the Number of Letters received and recorded and the Money received during each fiscal year from 1900 to March 31, 1908.

Fiscal Year.	Letters Received and Recorded.	Money Received.
		$ cts.
1900	48,663	200,831 71
1901	67,860	333,534 02
1902	67,722	382,999 87
1903	87,851	629,585 47
1904	113,074	630,355 44
1905	135,908	528,219 76
1906	176,729	875,933 54
1907 (nine months)	150,462	1,337,780 94
1908	187,684	1,558,230 32

J. M. ROBERTS,
Chief Clerk.

DEPARTMENT OF THE INTERIOR,
CORRESPONDENCE REGISTRATION BRANCH,
OTTAWA, May 11, 1908

No. 31.

REPORT OF THE SCHOOL LANDS BRANCH.

DEPARTMENT OF THE INTERIOR,
SCHOOL LANDS BRANCH,
OTTAWA, July 14, 1908.

W. W. CORY, Esq.,
Deputy Minister of the Interior,
Ottawa.

SIR,—I have the honour to submit the following report on the business of the School Lands Branch of the department for the fiscal year ending March 31, 1908.

SALES.

In consequence of the success of the series of auction sales of school lands held in Manitoba during the autumn of 1906, it was decided to hold another series in the following spring. These lands had been previously valued by Inspectors Ingram and Potts, and sales were accordingly held at a number of points in Manitoba after they had been well advertised, both through the newspapers and by means of posters.

The result of the sales was as follows :—

Place of Sale.	Date of Sale.	Area in acres sold.	Amount realized	Average price per acre.
	1907.		$ cts.	$ cts.
Pilot Mound	May 28	7,499·46	74,712 72	9 96
Manitou	" 30	5,226·45	48,513 46	9 21
Somerset	June 4	5,688·39	56,212 25	9 88
Holland	" 6	2,616·38	20,461 16	7 82
Carman	" 8	16,637·33	160,977 54	9 67
Portage la Prairie	" 11	6,505·52	56,422 64	8 67
McGregor	" 13	2,240·36	17,922 52	8 00
Carberry	" 15	640·00	4,480 00	7 00
Neepawa	" 18	3,021 00	28,636 00	9 44
Gladstone	" 20	4,399·52	37,992 02	8 63
Gimli	" 25	3,854·87	40,797 96	9 48
Winnipeg	" 28	28,182·22	355,496 44	12 61
Total		86,511·50	902,624 71	10 42

As it was found in the case of several parcels offered at the Winnipeg and Gimli sales that the land was more or less timbered, it was made a condition of these particular sales that the purchaser would have to take out a permit to remove the timber from the land subject to the payment of the usual dues, but that the amount so received would be applied on the purchase price of the land, the object being to prevent the purchaser stripping the land of valuable timber and then abandoning the sale after paying possibly only the first instalment.

While it was not considered advisable to hold any general auction sales during the following autumn, it was decided, in consequence of the number of applications received for school lands in the vicinity of Russell and Rossburn, to hold auction

sales at these points, and after the lands had been duly valued sales were held with the following results :—

Place of Sale.	Date of Sale.	Area in acres sold.	Amount realized.	Average price per acre.
	1907.		$ cts.	$ cts.
Russell	November 5	9,114·00	90,668·05	9 95
Rossburn	" 7	7,136·20	69,865·22	9 79
Total		16,159·20	160,533·27	9 87

The total area sold at public auction during the fiscal year in the province of Manitoba was 102,761·50 acres for $1,063,157.98, an average price of $10.35 per acre.

In addition to this there were a number of small sales to railway companies for right of way and other purposes of the railway, comprising 329·77 acres for $3,701.96, or an average of $11.22 per acre.

Upon the recommendation of the Honourable Mr. Motherwell, Commissioner of Agriculture for Saskatchewan, it had been decided to hold auction sales of school lands at Abernethy and Esterhazy in that province during the autumn of 1907, and the lands were valued and the necessary arrangements made for the sale.

In view, however, of the unfavourable season, and of the unusual financial stringency, it was found necessary to postpone them, and in consequence no general auction sales were held in that province during the fiscal year.

Several small parcels were, however, sold for school sites, and upon the application of the Canadian Pacific Railway Company, and as they agreed to pay one-half the expenses in connection with the sale, section 11, in township 25, range 5 west of the 3rd meridian, and the northeast quarter of section 29, in township 39, range 27 west of the 3rd meridian, were put up at public auction after being advertised in the usual way. The first mentioned parcel, section 11, in township 25, range 5 west of the 3rd meridian, was put up at Davidson on October 13, 1907, and was sold for $13,200, or an average price of $20.62, and the northeast quarter of section 29, in township 39, range 27 west of the 3rd meridian, was sold at Battleford for $25 per acre, half the expenses being paid by the Canadian Pacific Railway Company as previously arranged.

As an evidence of the keenness of the competition at some of the sales, I may quote that of a parcel of three acres of land near Humboldt, which was offered in order to afford the board of school trustees an opportunity of acquiring it, and which was put up at an upset price of $7 per acre and sold at $501 per acre.

The total area sold by public auction in the province during the fiscal year was 806 acres for $18,724.75, an average price of $15.21 per acre.

There were 582·44 acres sold under the Railway Act to the railway companies for right of way and other purposes of the railway for $7,604.98, an average of $13.06 per acre.

In Alberta, auction sales were held at Calgary and Cardston on November 13, 1907, with the following results :—

Place of Sale.	Date of Sale.	Area in acres sold.	Amount realized.	Average price per acre.
	1907.		$ cts.	$ cts.
Calgary	November 13....	4,779·52	41,106 69	8 06
Cardston	" 16 ...	5,261 33	55,958 54	10 62
Total		10,040 85	97,065 23	9 34

Several small parcels were also sold for school sites and cemetery purposes.

The total area sold at auction in the province during the fiscal year was 10,057·85 acres for $97,134.23, or an average price of $9.66 per acre.

In addition to this, 180·94 acres were sold to railway companies, under the Railway Act for right of way and other purposes of the railway for the sum of $2,350.85, an average of $12.99 per acre.

The total area sold by public auction during the fiscal year in the three provinces was 113,625·35 acres for $1,179,016.96, an average price of $10.38 per acre.

In addition to this, 1,093·15 acres were sold in the three provinces to railway companies, under the provisions of the Railway Act, for right of way and other purposes of the railway for the sum of $13,657.79, or an average price of $12.50 per acre, making the total area disposed of 114,712·07 acres, for $1,192,615.85, or an average price of $10.40 per acre.

LEASES.

The number of grazing leases issued during the current year was as follows:—

Manitoba	23
Saskatchewan	226
Alberta	162
Total	411

The total revenue from grazing leases during the same period was as follows:—

Manitoba	$1,717 75
Saskatchewan	8,518 10
Alberta	10,887 47

Seventeen leases were issued for coal mining purposes during the fiscal year, all of which were in Alberta.

The revenue from coal leases was as follows:—

Saskatchewan	$1,160 82
Alberta	3,303 02

Appended hereto are three statements, lettered 'A,' 'B,' and 'C,' showing the total net revenue, duly classified, from all sources during the fiscal year, from school lands in the provinces of Manitoba, Saskatchewan and Alberta respectively, and showing separately the revenue collected at head office and at the different agencies.

It will be seen from these statements that the gross revenue received at head office from the school lands in the three provinces during the fiscal year was $672,025.39, and at the agencies $37,048.69, making a gross total of $709,074.08, or, after deducting all refunds, a net total of $703,692.99.

Statement 'D,' hereto appended, shows the revenue collected from school lands by each agency during the fiscal year.

Statements 'E,' 'F,' and 'G' show the revenue and expenditure for each province, and the balance standing to its credit on the 1st of April, 1908, the balance being as follows:—

Manitoba	$1,935,791 84
Saskatchewan	736,703 75
Alberta	369,763 43

These figures represent only the principal moneys collected on account of sales, all revenue from other sources, after deducting the cost of management, having been paid over at the end of the fiscal year to the governments of the three provinces. The amount so paid to the provinces for the past fiscal year was as follows:—

Manitoba	$59,038 14
Saskatchewan	51,053 25
Alberta	43,633 93

In addition to the above amounts the following sums were paid to the provinces of Manitoba, Saskatchewan and Alberta by the Finance Department, being the interest on the school lands funds, namely: to Manitoba, $69,147.25; Saskatchewan, $32,352.23; Alberta, $16,392.17, making the total sum paid to each province as follows:—

Manitoba	$128,185 39
Saskatchewan	83,405 48
Alberta	60,026 10

The revenue for the past fiscal year shows a slight falling off as compared with that for the prvious fiscal period ending March 31, 1907, being $703,692.99, as against $721,864.88 for the previous year.

This is chiefly due to the fact that owing to the partial failure of last season's crop, and the financial stringency, many purchasers were unable to meet their instalments, and also owing to the same cause fewer auction sales were held.

The business of the branch, however, continues to increase in volume, as applications to purchase and lease school lands become more numerous each year.

The following is a statement of the clerical work of the School Lands Branch for the past fiscal year:—

Letters received	9,955
Letters sent	18,682
Notices, statements of accounts, &c.	6,000
Leases prepared and issued	428
Cultivation permits	26
Receipts issued	2,542
Accounts kept posted	8,758
Assignments registered	192

I have the honour to be, sir,

Your obedient servant,

FRANK S. CHECKLEY,
Chief Clerk.

STATEMENT A.—MANITOBA SCHOOL LANDS

REVENUE from April 1, 1907, to March 31, 1908, both dates inclusive.

Months.	Sales.		Total.	Cultivation Permits.	Grazing Ranches.	Timber.	Hay.	Registration Fees of Assignments.	Total.
	Principal.	Interest.							
1907.	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.
April	4,461 18	1,033 56	5,494 74	55 00	149 20				5,698 94
May	16,668 66	5,034 15	21,702 81		83 05				21,785 86
June	26,870 53	1,143 56	28,014 09	12 00	198 14	495 10			28,719 33
July	42,081 64	1,668 79	43,750 43		149 47		5 00		43,905 90
August	43,705 60	966 91	44,672 51		72 29	5 00	299 10		45,048 90
September	3,339 78	633 79	3,973 57	20 00			3 00		3,996 57
October	22,034 43	6,193 75	28,233 18		144 34				28,377 52
November	74,417 11	23,293 24	97,710 35	45 00	59 55				97,814 90
December	28,464 66	13,697 37	42,162 03		67 20	34 56			42,263 79
1908.									
January	7,868 51	3,612 43	11,480 94	54 00	19 20				11,554 14
February	10,966 24	2,035 24	13,001 48	5 50	112 75				13,119 73
March	5,318 46	2,452 94	7,771 40	21 00	96 30				7,888 70
	286,196 80	61,770 73	347,967 53	242 50	1,151 49	534 66	307 10		350,173 28
Agencies	10,403 33	3,171 95	13,575 28	7 75	695 66	2,562 03	1,295 00		18,135 72
	296,600 13	64,942 68	361,542 81	220 25	1,847 15	3,096 69	1,602 10		368,309 00
Registration fees								155 00	155 00
	296,600 13	64,942 68	361,542 81	220 25	1,847 15	3,096 69	1,602 10		368,464 00
Transfer fees to Dominion Lands						48 50	281 50		330 00
	296,600 13	64,942 68	361,542 81	220 25	1,847 15	3,048 19	1,320 60		368,134 00
Refunds	1,498 05	3 05	1,501 10	50 00	129 40	560 81	231 83		2,473 14
	295,102 08	64,939 63	360,041 71	170 25	1,717 75	2,487 38	1,088 77	155 00	365,660 86

DEPARTMENT OF THE INTERIOR,
SCHOOL LANDS BRANCH,
OTTAWA, June 10, 1908.

FRANK S. CHECKLEY,
Chief Clerk.

STATEMENT B. SASKATCHEWAN SCHOOL LANDS.

REVENUE from April 1, 1907, to March 31, 1908, both dates inclusive.

Months.	Sales. Principal.	Sales. Interest.	Total.	Cultivation Permits.	Grazing Ranches.	Timber.	Hay.	Coal.	Registration Fees.	Total.
1907.	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.
April	9,064 79	1,611 23	10,676 02		556 02					11,232 04
May	20,189 92	3,347 71	23,537 63	25 00	588 62					24,151 25
June	19,734 81	6,164 91	25,899 72		1,179 24			209 52		27,288 48
July	24,966 71	5,036 21	30,002 92	3 25	867 79		5 00			30,878 96
August	4,370 64	1,952 40	6,323 04	18 40	701 12		3 00			7,045 56
September	13,752 26	1,043 34	14,795 60		279 39		2 00			15,076 99
October	19,591 14	1,717 99	21,309 13	8 00	330 48					21,647 61
November	20,686 03	10,927 23	31,613 26	7 50	288 05			224 27		32,133 08
December	9,538 45	5,390 31	14,928 76		282 17			158 95		15,369 88
1908.										
January	2,714 55	2,802 22	5,516 77	22 50	334 16					5,873 43
February	4,460 83	2,446 68	6,907 51		192 40					7,099 91
March	7,291 08	2,513 96	9,805 04	20 00	483 45			568 08		10,876 57
	156,361 21	44,954 19	201,315 40	104 65	6,082 89		10 00	1,160 82		208,673 76
Transfer to Alta. Sch. Lds. A. J. H. Koch, Rec. 8,832					25 60					25 60
	156,361 21	44,954 19	201,315 40	104 65	6,057 29		10 00	1,160 82		208,648 16
Agencies	2,019 07	1,142 54	3,161 61	10 00	2,545 30	112 70	2,659 80			8,489 41
	158,380 28	46,096 73	204,477 01	114 65	8,602 59	112 70	2,669 80	1,160 82		217,137 57
Registration fees									58 00	58 00
	158,380 28	46,096 73	204,477 01	114 65	8,602 59	112 70	2,669 80	1,160 82		217,195 57
Less transfer of fees to Dom. Lds.						3 00	489 50			492 50
	158,380 28	46,096 73	204,477 01	114 65	8,602 59	109 70	2,180 30	1,160 82		216,703 07
Refunds	1,114 92		1,114 92	28 25	84 49		92 05			1,319 71
	157,265 36	46,096 73	203,362 09	86 40	8,518 10	109 70	2,088 25	1,160 82	58 00	215,383 36

DEPARTMENT OF THE INTERIOR,
SCHOOL LANDS BRANCH,
OTTAWA, June 10, 1908.

FRANK S. CHECKLEY,
Chief Clerk.

STATEMENT C.—ALBERTA SCHOOL LANDS.

REVENUE from April 1, 1907, to March 31, 1908, both dates inclusive.

Months.	Sales.		Total.	Cultivation Permits.	Grazing Ranches.	Timber.	Hay.	Coal.	Registration Fees.	Total.
	Principal.	Interest.								
1907.	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.
April	3,016 49	1,504 15	4,520 64		87 44			288 00		5,679 08
May	588 38	336 50	924 88		774 49			432 00		2,131 37
June	117 55	151 95	269 50		693 33			36 00		998 83
July	423 52	325 42	748 94		751 22			53 00		1,553 16
August	197 12	192 18	389 30		402 72	128 56		432 00		1,352 58
September	4,997 66	420 24	5,417 90		302 91			144 00		5,864 81
October	9,581 67	4,829 37	14,411 04		628 05					15,039 09
November	19,958 54	12,718 24	32,676 78		375 92			127 20		33,179 90
December	20,360 33	9,090 91	29,451 24		374 60			173 00		29,998 84
1908.										
January	3,139 93	2,329 46	5,469 39	3 25	593 18			162 00		6,227 82
February	3,034 64	596 49	3,631 13		366 10	25		144 00		4,141 48
March	3,371 30	2,185 70	5,557 00		367 39	25 00		722 00		6,671 39
A. J. H. Koch, Rec. 8,832, by transfer from Saskatchewan	68,787 13	34,680 61	103,467 74	3 25	6,500 35	153 81		2,713 20		112,838 35
					25 60					25 60
Transfer from Dominion Lands	68,787 13	34,680 61	103,467 74	3 25	6,525 95	153 81		2,713 20		112,863 95
								5 00		5 00
Agencies	68,787 13	34,680 61	103,467 74	3 25	6,525 95	153 81		2,718 20		112,868 95
	2,013 42	1,201 09	3,214 51	14 50	4,796 39	525 10	1,198 39	674 67		10,423 56
Transfer from Dominion Lands	70,800 55	35,881 70	106,682 25	17 75	11,322 34	678 91	1,198 39	3,392 87		123,292 51
							9 50			9 50
Registration fees	70,800 55	35,881 70	106,682 25	17 75	11,322 34	678 91	1,207 89	3,392 87		123,302 01
									112 50	112 50
Less transfer of fees to Dom. Lds.	70,800 55	35,881 70	106,682 25	17 75	11,322 34	678 91	1,207 89	3,392 87		123,414 51
						3 75	202 00			205 75
Refunds	70,800 55	35,881 70	106,682 25	17 75	11,322 34	675 16	1,005 89	3,392 87		123,208 76
	10 52		10 52		434 87	25	23 50	90 85		559 99
	70,790 03	35,881 70	106,671 73	17 75	10,887 47	674 91	982 39	3,302 02	112 50	122,648 77

DEPARTMENT OF THE INTERIOR,
SCHOOL LANDS BRANCH,
OTTAWA, June 10, 1908.

FRANK S. CHECKLEY,
Chief Clerk.

STATEMENT D.

School Lands Revenue collected through Dominion Lands Agencies during the fiscal year ending March 31, 1908.

Agencies.	Sales.			Cultivation Permits.	Grazing.	Timber	Hay.	Coal.	Total.
	Principal.	Interest.	Total.						
	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.
Winnipeg	359 12	74 65	433 77	.....	219 86	2,446 78	784 00	.....	3,884 41
Dauphin	1,611 76	234 48	1,846 24	.....	187 10	115 25	300 10	.....	2,448 69
Brandon	8,432 45	2,862 82	11,295 27	7 75	349 50	.....	329 70	.....	11,982 22
Estevan	.....	.....	.....	.....	253 79	.....	528 30	.....	782 09
Regina	1,092 95	335 75	1,428 70	.....	662 86	9 25	694 40	.....	2,795 21
Yorkton	603 37	806 79	1,410 16	.....	180 60	61 20	316 20	.....	1,968 16
Prince Albert	.....	.....	.....	10 00	322 07	42 25	304 70	.....	679 02
Battleford	.....	.....	.....	.....	303 62	.....	321 50	.....	625 12
Humboldt	322 75	.....	322 75	.....	451 07	.....	165 30	.....	939 12
Moosejaw	.....	.....	.....	.....	310 49	.....	210 60	.....	521 09
Lethbridge	.....	.....	.....	1 25	2,554 35	.....	35 50	181 80	2,772 90
Calgary	1,792 27	1,068 24	2,860 51	.....	1,615 08	11 25	361 00	102 25	4,953 09
Red Deer	124 15	131 85	256 00	.....	451 26	.....	344 20	293 60	1,345 06
Edmonton	97 00	1 00	98 00	13 25	175 70	513 85	454 69	97 02	1,352 51
	14,435 82	5,515 58	19,951 40	32 25	8,037 35	3,199 83	5,153 19	674 67	37,048 69

Department of the Interior,
School Lands Branch,
Ottawa, June 10, 1908.

FRANK S. CHECKLEY,
Chief Clerk.

STATEMENT E.

Revenue and Expenditure on account of Manitoba School Lands for the fiscal year ended March 31, 1908.

Particulars.	Period.	Dr.	Cr.
		$ cts.	$ cts.
By balance on April 1, 1907	.....	.....	1,640,689 76
By sales	12 months to March 31, 1908	.....	360,041 71
By cultivation permits	" "	.....	170 25
By timber, hay, grazing, etc	" "	.....	5,448 90
By interest on fund	On account	.....	28,000 00
By interest on fund	9 months to March 31, 1908	.....	41,147 25
To cost of management at Ottawa	12 months to March 31, 1908	1,395 83	.....
To salaries, printing, advertising, etc	" "	10,124 81	.....
To interest on fund paid to Manitoba Government	On account	28,000 00	.....
To interest and revenue paid to Manitoba Government	12 months to March 31, 1908	59,038 14	.....
To interest on fund, paid Manitoba Government	9 months to March 31, 1908	41,147 25	.....
To balance on March 31, 1908	.....	1,935,791 84	.....
		2,075,497 87	2,075,497 87

FRANK S. CHECKLEY,
Chief Clerk.

Department of the Interior,
School Lands Branch,
Ottawa, June 10, 1908.

STATEMENT F.

Revenue and Expenditure on account of Saskatchewan School Lands for the fiscal year ended March 31, 1908.

Particulars.	Period.	Dr.	Cr.
		$ cts.	$ cts.
By balance on April 1, 1907			579,438 39
By sales	12 months to March 31, 1908.		203,362 09
By cultivation permits	" "		86 40
By timber, hay, grazing, coal, etc.	" "		11 934 87
By interest on fund	12 months to June 30, 1907		16,203 34
By interest on fund	Amount short paid to June 30, 1907		42 37
By interest on fund	12 months to March 31, 1908.		16,106 52
To cost of management at Ottawa	" "	1,395 83	
To salaries, printing, advertising, etc	" "	5,668 92	
To interest on fund paid to Saskatchewan Government	12 months to June 30, 1907	16,203 34	
To interest on fund paid to Saskatchewan Government	Amount short paid to June 30, 1907	42 37	
To interest on fund paid to Saskatchewan Government	12 months to March 31, 1908.	16,106 52	
To interest and revenue paid to Saskatchewan Government	" "	51,053 25	
To balance on March 31, 1908	" "	736,703 75	
		827,173 98	827,173 98

DEPARTMENT OF THE INTERIOR,
SCHOOL LANDS BRANCH,
OTTAWA, June 10, 1908.

FRANK S. CHECKLEY,
Chief Clerk.

STATEMENT G.

Revenue and Expenditure on account of Alberta School Lands for the fiscal year ended March 31, 1908.

Particulars.	Period.	Dr.	Cr.
		$ cts.	$ cts.
By balance on April 1, 1907			298,973 40
By sales	12 months to March 31, 1908.		106,671 73
By cultivation permits	" "		17 75
By timber, hay, grazing, coal, etc.	" "		15,959 29
By interest on fund	12 months to June 30, 1907		8,615 56
By interest on fund	9 months to March 31, 1908.		7,776 61
To cost of management at Ottawa	12 months to March 31, 1908.	1,395 84	
To salaries, printing, advertising, etc	" "	6,828 97	
To interest on fund paid to Alberta Government	12 months to June 30, 1907	8,615 56	
To interest and revenue paid to Alberta Government	12 months to March 31, 1908.	43,633 93	
To interest on fund paid to Alberta Government	9 months to March 31, 1908.	7,776 61	
To balance on March 31, 1908		369,763 43	
		438,014 34	438,014 34

DEPARTMENT OF THE INTERIOR,
SCHOOL LANDS BRANCH,
OTTAWA, June 10, 1908.

FRANK S. CHECKLEY,
Chief Clerk.

No. 32.

REPORT OF THE CORRESPONDENCE MAILING OFFICE.

DEPARTMENT OF THE INTERIOR,
CORRESPONDENCE COMPARING AND MAILING OFFICE,
OTTAWA, May 18, 1908.

W. W. CORY, Esq.,
Deputy Minister of the Interior,
Ottawa.

SIR,—I have the honour to submit to you herewith a statement showing in part the work done in the comparing and mailing office of the Department of the Interior during the fiscal year ending March 31, 1908.

I have the honour to be, sir,
Your obedient servant

CHAS. C. PELLETIER,
Clerk in Charge.

STATEMENT of the work done in the Comparing and Mailing Room during the fiscal year ending March 31, 1908.

From April 1, 1907, to March 31, 1908.	Letters sent.	Registered letters sent.	Telegrams sent.	Totals.
1907.				
April	24,730	3,271	102	28,103
May	26,326	3,177	127	29,630
June	23,559	2,615	136	26,310
July	25,655	2,511	71	28,237
August	22,641	2,966	70	25,677
September	23,246	2,529	68	25,843
October	25,317	3,988	83	29,388
November	23,630	3,652	125	27,407
December	22,600	3,004	81	25,685
1908.				
January	24,959	3,115	62	28,136
February	23,102	3,670	63	26,835
March	25,261	2,772	74	27,607
Total for fiscal year ending March 31, 1908.	291,026	37,270	1,062	329,358

These outgoing letters were copied in 135 1000-paged letter-books.

Besides the verifying of each letter, the checking of the thousands of inclosures accompanying them, there were 1,095 pages of documents, &c., compared during the year.

The number of pages of letter-book indexed was 131,367; almost every page was indexed in double entry.

The daily average of letters sent out was 965, compared with 950 last year, and the grand total for this office during the fiscal year was 329,358, or an estimated increase of over 17,300 letters.

CHAS. C. PELLETIER,
Clerk in Charge.

No. 33.

REPORT OF THE GEOGRAPHER.

DEPARTMENT OF THE INTERIOR,
OFFICE OF THE GEOGRAPHER,
OTTAWA, March 31, 1908.

W. W. CORY, Esq.,
Deputy Minister of the Interior,
Ottawa.

SIR,—I have the honour to report as follows on the work of my office for the past year :—

The staff at present is as follows :—

J. E. Chalifour, chief draughtsman.
H. E. Baine, draughtsman.
H. Taché, draughtsman.
W. Anderson, draughtsman.
J. Beveridge, draughtsman.
F. Inkster, draughtsman.
E. D. Bryant, draughtsman.
H. M. Blatchly, draughtsman.
G. E. Dumouchel, draughtsman.
Jas. K. Bennie, draughtsman.
R. W. Craig, draughtsman.
C. G. Wood, draughtsman.
A. M. Darrach, draughtsman
H. W. Wilson, draughtsman.
J. P. McElligott, draughtsman
A. Groulx, draughtsman.
W. Blue, draughtsman.
S. Chandler, draughtsman.
Jules Pigeon, draughtsman.
A. Akerlindh, in charge of maps and plans.
J. S. Gagnon, clerk.
Mrs. D. E. Waine, stenographer
Miss M. P. Martin, stenographer.
J. L. Merrifield, messenger.

Mr. E. D. Bryant was appointed on May 5, 1908, to undertake the compilation of northeastern Ontario sheets of the Standard Topographical map.

Mr. J. P. McElligott, who resigned September 11, 1906, to accept a position on the National Transcontinental Railway, was reappointed on May 2, 1907.

Mr. Jules Pigeon was appointed on May 17, 1907, to assist in the preparation of preliminary compilations, &c.

Miss M. Perley Martin was transferred from the Immigration Branch on July 3, 1907, to assist in the stenographic work and typewriting.

The routine work of the office has been carried on and good progress has been made with the Standard Topographic sheets. By the end of the next fiscal year, we will have sheets covering the whole of southern Ontario, New Brunswick and Nova Scotia, east of Halifax. In northern Ontario two sheets—27 and 29—have been

printed, and the engraving of a third, No. 25, is well advanced, the compilation of Nos. 30 and 31, is nearly completed and the ywill be engraved during the coming winter. As soon as an additional draughtsman is appointed, a beginning will be made on the sheets of northern British Columbia, and, before the Grand Trunk Pacific is opened for traffic, we will have completed sheets covering the whole territory traversed by it between the Pacific and Quebec. At present the best map of northern British Columbia is that compiled in 1879, under the direction of the late Dr. G. M. Dawson.

Additions and corrections have been made to the copper plates of the southern British Columbia, Manitoba, Saskatchewan and Alberta, Peace River, the 100-mile map of Canada and the 35-mile map of the Dominion. By making these corrections to the plates, these maps are kept up to date and new editions can be prepared in a very short time and at a minimum of cost. Thus, three editions of the western province map were published during the year, two for the homestead map and one for the Odd-section map. Extensions of the western and northern portions of the Alberta sheet have been engraved, so that we now have a complete map of that province on the scale of 12½ miles to 1 inch.

Upwards of 6,000 copies of the atlas of Canada have been bound and an extensive distribution made to the higher educational institutions, public libraries, banks, newspapers, &c., in Canada. In Great Britain, 760 copies have been sent to the most important public libraries, clubs, newspapers, government offices, scientific societies, &c. The distribution in Great Britain was made under the instructions of His Excellency Earl Grey who, in the circular letter of notification sent with each atlas, stated that he did 'not know of any work of equal merit published in any other country.' I need not say that His Excellency's kindly interest in, and appreciatory remarks on my work are highly appreciated by me.

On August 11, I left Ottawa for the maritime provinces, and, during the three weeks following, the following places were visited:—St. John, Fredericton, Digby, Moncton, Halifax, Sydney, North Sydney and Charlottetown. The time at my disposal did not permit a lengthy stay at any point, except St. John, but I was enabled to acquire a general knowledge of the developments, &c., which was of material assistance later.

On September 16, I received instructions to prepare information respecting trans-Atlantic steamship navigation, particularly between Canada and Great Britain. In connection therewith visits were made to a number of points in Canada and, on October 15, I left for England to complete the information required. While in England a set of fog charts—one for each month in the year—based on the inset maps in the North Atlantic Pilot charts, published monthly, by the United States Hydrographic Office, were prepared and a small preliminary edition printed. These charts showed conclusively that the number of days in each and every month in the year in which fog may be expected on the New York route is much greater than in the same month and in the same longitude on the Canadian route. These charts were defective inasmuch as they did not show the fog data for the Belleisle route except in the immediate vicinity of the strait, but since my return, the Director of the British Meteorological Office, London, has courteously had this information compiled so that it is now possible to compile complete 'fog' charts of the routes from Great Britain to the Atlantic ports of Canada and to New York. Having completed the work on which I was engaged, I left London December 13, arriving in Ottawa on the 21st. On January 19, I left for Washington to procure information respecting the disputed boundary between Labrador and Canada. While in Washington I examined in the library of Congress, upwards of two hundred maps and made notes respecting the information contained in them that bore directly or indirectly upon the subject of my mission. Much information that will be valuable in the preparation of the case for submission to the tribunal, was obtained but much remains to be done and the

work cannot be considered to be complete till the maps in that great storehouse, the British Museum, have been examined.

During the past year 4,036 letters were received and 4,322 sent out, also 98,548 maps were received and 80,781 sent out.

I have the honour to be, sir,

Your obedient servant,

JAMES WHITE,
Geographer.

MAPS PUBLISHED.

Railway map of the Dominion of Canada and Newfoundland, eight sheets, each 25 inches by 26 inches; extends from the Atlantic to the Pacific and from Maryland and Oregon on the south, to Cumberland sound and Herschell island, on the north. Scale, 35 miles to 1 inch. Price, mounted with rollers, $3.

Dominion of Canada and Newfoundland, railway edition, 16 inches by 36 inches. Scale, 100 miles to 1 inch.

Dominion of Canada. Scale, 58 miles to 1 inch.

Relief map of Canada. Scale, 100 miles to 1 inch.

Resource map of Canada. Scale, 100 miles to 1 inch.

Water-power map, average rainfall at principal points in Canada. Scale, 100 miles to 1 inch.

National Transcontinental Railway map, shows route of the National Transcontinental Railway, Moncton to Pacific. Scale, 100 miles to 1 inch.

Explorations in northern Canada and adjacent portions of Greenland and Alaska. Scale, 75 miles to 1 inch.

Rocky Mountains—Banff sheet—contoured map of mountains in the vicinity of Banff. Scale, 2 miles to 1 inch.

Rocky Mountains—Lake Louise sheet—contoured map of mountains in the vicinity of Laggan and Field. Scale, 2 miles to 1 inch.

Manitoba, Saskatchewan, Alberta and southwestern portion of Keewatin; three sheets, each 25 inches by 36 inches. Scale, 12½ miles to 1 inch.

Index map showing townships in Manitoba, Saskatchewan and Alberta, plans of which have been printed. Scale, 35 miles to 1 inch.

General map of the northwestern part of the Dominion of Canada. Edition of 1898. In 2 sheets. Scale, 35 miles to 1 inch.

Map showing railways in Manitoba, Alberta and Saskatchewan. Scale, 35 miles to 1 inch.

Manitoba. Scale, 12½ miles to 1 inch.

Regina land district. Scale, 12½ miles to 1 inch.

Red Deer land district. Scale, 12½ miles to 1 inch.

Calgary land district. Scale, 12½ miles to 1 inch.

Estevan land district. Scale, 12½ miles to 1 inch.

Winnipeg land district. Scale, 12½ miles to 1 inch.

Lethbridge land district. Scale, 12½ miles to 1 inch.

Edmonton land district. Scale, 12½ miles to 1 inch.

Dauphin land district. Scale, 12½ miles to 1 inch.

Yorkton land district. Scale, 12½ miles to 1 inch.

Prince Albert land district. Scale, 12½ miles to 1 inch.

Battleford land district. Scale, 12½ miles to 1 inch.

Moosejaw land district. Scale, 12½ miles to 1 inch.

Brandon land district. Scale, 12½ miles to 1 inch.

Peace River district—Northern Alberta—includes the country between Wetaskiwin and Lake Athabaska, and between Athabaska river and the eastern boundary of British Columbia. Scale, $\frac{1}{800000}$ or 12·63 miles to 1 inch.

Map showing electoral divisions (for provincial legislature) in southern Saskatchewan. Scale, 12½ miles to 1 inch.

Map showing electoral divisions (for provincial legislature) in southern Alberta. Scale, 12½ miles to 1 inch.

Map showing all the even-numbered sections patented to January 1, 1908, and all even-numbered sections homesteaded and unpatented or finally allotted to railway companies to that date, in Manitoba, Saskatchewan and Alberta. 3 sheets. Scale, 12½ miles to 1 inch.

Odd-section map—Manitoba, Saskatchewan and Alberta—shows odd-numbered sections in these provinces that have been alienated as railway land grants, &c. Scale, 12½ miles to 1 inch.

British Columbia 'Railway Belt' map, including the 'Railway Belt' and the portion of the province lying south of it. Scale, $\frac{1}{500000}$ or 7·89 miles to 1 inch.

British Columbia Railway Belt Homestead map—includes southern portion of the province between longitude 116° and 123° W. Shows lands in the 'railway belt' that have been alienated by homesteading, sale, &c. Scale, $\frac{1}{500000}$, or 7·89 miles to 1 inch.

Southeastern Alaska and portion of British Columbia. Edition of 1897. Scale, $\frac{1}{960000}$.

Southeastern Alaska and portion of British Columbia, showing award of Alaska Boundary tribunal, October 20, 1903. Scale, $\frac{1}{960000}$.

Yukon—extends from Lynn canal on the south, to Eagle on the north, and from the Pacific to the Frances river. Scale, $\frac{1}{750000}$ or 11·82 miles to 1 inch.

White, Alsek and Kluane rivers district, southwestern Yukon. Scale, $\frac{1}{400000}$, or 6·31 miles to 1 inch.

Timiskaming sheet, Pontiac county, Quebec and Nipissing district, Ontario. Scale, $\frac{1}{750000}$, or 11·83 miles to 1 inch.

Sheet 1 S.W. Ontario—Windsor sheet—Essex, Kent and Lambton and portions of Elgin, Middlesex and Huron counties. Scale, $\frac{1}{250000}$, or 3·95 miles to 1 inch.

Sheet 1 S.E. Ontario—London sheet—Norfolk, Oxford, Brant and portions of Elgin, Middlesex, Huron, Perth, Waterloo and Wentworth counties. Scale, $\frac{1}{250000}$, or 3·95 miles to 1 inch.

Sheets 1 N.W. and 1 N.E. Ontario—Guelph sheet—Wellington, Grey, Bruce and portions of Huron, Perth, Waterloo, Halton, Dufferin and Simcoe counties. Scale, $\frac{1}{250000}$, or 3·95 miles to 1 inch.

Sheet 2 S.W. Ontario—Hamilton sheet—Lincoln, Welland, Haldimand and portions of Wentworth and Halton counties. Scale, $\frac{1}{250000}$, or 3·95 miles to 1 inch.

Sheet 2 N.W. and 9 S.W. (part) Ontario—Toronto and Muskoka sheet—Peel, York, Ontario and Victoria and portions of Halton, Simcoe, Dufferin, Muskoka, Parry Sound, Haliburton, Durham and Peterborough. Scale, $\frac{1}{250000}$, or 3·95 miles to 1 inch.

Sheet 9 N.W.—Timiskaming sheet—includes the country between Lake Nipissing and the height of land. Scale, $\frac{1}{250000}$, or 3·95 miles to 1 inch.

Sheet 13 includes whole of New Brunswick, with exception of Madawaska and portions of Westmoreland and Albert counties. Scale, $\frac{1}{500000}$, or 7·89 miles to 1 inch.

Sheet 15—Cape Breton island and portions of Antigonish and Guysborough counties, N.S. Scale, $\frac{1}{250000}$, or 3·95 miles to 1 inch.

Sheet 27, Ontario—Lake of the Woods sheet—Rainy river district and portions of Thunder bay district and Keewatin. Scale, $\frac{1}{500000}$ or 7·89 miles to 1 inch.

Sheet 29, Ontario—Lake Nipigon sheet—includes central portion of Thunder bay district. Scale, $\frac{1}{500000}$, or 7·89 miles to 1 inch.

MAPS IN PROGRESS.

Sheet 2 N.E. Ontario—Belleville sheet—Northumberland and Prince Edward and portions of Durham, Peterborough, Hastings and Lennox and Addington counties. Scale 1/250000, or 3·95 miles to 1 inch.

Sheet 3 N.W. Ontario—Kingston sheet—includes Leeds and Grenville and portions of Hastings, Addington, Renfrew, Frontenac and Lanark counties. Scale 1/250000, or 3·95 miles to 1 inch.

Sheet 7 N.E.—Sault Ste. Marie sheet—includes part of Algoma district. Scale 1/250000, or 3·95 miles to 1 inch.

Sheet 8 N.W.—Sudbury sheet—includes part of Algoma and Nipissing districts. Scale 1/250000, or 3·95 miles to 1 inch

Sheet 9 S.E. Ontario and Quebec—Pembroke sheet—includes portions of Hastings, Addington, Renfrew, Haliburton and Nipissing, Ont., and of Pontiac county, Quebec. Scale 1/250000, or 3·95 miles to 1 inch.

Sheet 10 S.E.—Cornwall sheet—includes Dundas, Prescott and Russell counties, Ont., and Vaudreuil and Soulanges and portions of Argenteuil and Ottawa counties, Que. Scale 1/250000, or 3·95 miles to 1 inch.

Sheet 10 S.W. Ontario and Quebec—Ottawa sheet—includes portions of Carleton, Lanark, Frontenac and Renfrew counties, Ont., and of Ottawa and Pontiac counties, Quebec. Scale 1/250000, or 3·95 miles to 1 inch.

Sheet 11, Montreal sheet—includes the country between Quebec and Vaudreuil and between the international boundary line and latitude 48° N. Scale 1/500000, or 7·89 miles to 1 inch.

Sheet 14 S.E.—Truro sheet—includes Pictou, N.S., King's and Queen's, P.E.I., and portions of Halifax, Guysborough and Colchester, N.S. Scale 1/250000, or 3·95 miles to 1 inch.

Sheet 28, Ontario—Thunder Bay sheet—includes portions of Thunder Bay and Rainy River districts. Scale 1/500000, or 7·89 miles to 1 inch.

Sheet 30, Ontario—White River sheet—includes portions of Algoma and Thunder Bay districts. Scale 1/500000, or 7·89 miles to 1 inch.

Sheet 31, Ontario—Abitibi sheet—includes portions of Algoma and Nipissing districts. Scale 1/500000, or 7·89 miles to 1 inch.

Sheet 41, British Columbia—Prince Rupert sheet—includes portions of the province between longitude 128° W. and 131° W., and between latitude 52° N. and 55° N. Scale 1/500000, or 7·89 miles to 1 inch.

Sheet 42, British Columbia—Babine Lake sheet—includes portion of the province between longitude 125° W. and 128° W., and between latitude 52° N. and 55° N. Scale 1/500000, or 7·89 miles to 1 inch.

Sheet 43, British Columbia—Fort George sheet—includes portion of the province between longitude 125° W. and 128° W., and between latitude 52° N. and 55° N. Scale 1/500000, or 7:89 miles to 1 inch.

Sheet 44, British Columbia—Tete Jaune Cache sheet—includes portions of the province between longitude 119° W. and 122° W., and between latitude 52° N. and 55° N. Scale 1/500000, or 7:89 miles to 1 inch.

Sheet 45, British Columbia—Jasper House sheet—includes portions of the province between longitude 116° W. and 119° W., and between latitude 52° N. and 55° N. Scale 1/500000, or 7·89 miles to 1 inch.

Rocky Mountains between the Canadian Pacific Railway and the North Saskatchewan. Scale 4 miles to 1 inch

Atlas of Canada—Price, half leather.... .. ..$ 3 00
Atlas of Canada—Price, full morocco.. .. .. 5 00

ATLAS OF CANADA—MAPS.

1. Territorial divisions.
2. Relief map, west sheet.
3. Relief map, east sheet.
4. Geology, west sheet.
5. Geology, east sheet.
6. Minerals, west sheet.
7. Minerals, east sheet.
8. Forests.
9. Limits of trees.
10. Telegraphs—Quebec and maritime provinces.
11. Telegraphs—Ontario and Quebec.
12. Telegraphs—Manitoba, Saskatchewan and Alberta.
13. Telegraphs—British Columbia, Yukon and Alberta.
14. Telephones—Maritime provinces and Quebec.
15. Telephones—Ontario and Quebec.
16. Telephones—Manitoba, Saskatchewan, Alberta, British Columbia.
17. Railways—Quebec and maritime provinces.
18. Railways—Ontario and Quebec.
19. Railways—Manitoba, Saskatchewan and Alberta.
20. Railways—British Columbia, Alberta and Yukon.
21. Transcontinental railways.
22. Canals, lighthouses and sailing routes—St. Lawrence and Great Lakes.
23. Lighthouses and sailing routes—Pacific coast.
24. Lighthouses and sailing routes—Atlantic coast.
25. Isotherms for months of year.
26. Isotherms for summer and year; precipitation, snowfall and isobars.
26a. Average possible hours of sunshine in summer months and temperature maps.
27. Density of population—Maritime provinces and Quebec.
27a. Density of population—Ontario and Quebec.
28. Density of population—Manitoba and Saskatchewan.
28a. Density of population—British Columbia and Alberta.
29. Aborigines of Canada, Alaska and Greenland.
29a. Origins of the people—Maritime provinces and Quebec.
29b. Origins of the people—Ontario and Quebec.
29c. Origins of the people—Manitoba and Saskatchewan.
29d. Origins of the people—British Columbia and Alberta.
30. International and interprovincial boundaries (a) eastern Canada-United states; (b) New Brunswick-Quebec; (c) Quebec-Labrador.
31. Interprovincial boundary—Ontario-Manitoba.
31a. International boundary—British Columbia and Yukon-Alaska.
32. Routes of explorers.
33. Drainage basins.
34. Montreal.
35. Toronto.
36. Quebec, St. John.
37. Winnipeg.
38. Vancouver, Ottawa.
39. Hamilton, London, Halifax.

DIAGRAMS.

40. Trade and Commerce—Exports.
41. Trade and Commerce—Imports

42. Trade and Commerce—Exports, principal items.
43. Trade and Commerce—Imports, principal items.
44. Trade and Commerce—Imports per head, duty, increase of trade.
45. Minerals, telegraphs.
46. Population according to (a) age and sex; (b) sex and conjugal condition.
47. Population according to age, sex and conjugal condition.
48. Population (a) proportion of British and foreign born; (b) birthplace of native population; (c) areas of provinces and territories.
49. Population (a) origins; (b) religions; (c) birthplaces.
50. Population (a) interprovincial immigration; (b) proportion of population; (c) density of population; (d) rural and urban.
51. Population, from earliest records to 1901, in Ontario, Manitoba, British Columbia, Alberta, Saskatchewan, other territories.
52. Population, from earliest records to 1901, in Quebec, Nova Scotia, New Brunswick, Prince Edward Island.
53. Population—Cities and towns with a population of upward of 7,000.
54. Population—Cities and towns with a population of upward 7,000.
55. Population—Cities and towns with a population of upward of 7,000.
56. Agriculture—Value of land, &c.; of farm products; number of farmers and classification of farm area.
57. Agriculture—Improved and unimproved area; value of farm property.
58. Agriculture—Size of farms; number of farms; value of agricultural products.
59. Agriculture—Number of (a) sheep, (b) horses, (c) cattle.
60. Agriculture—Value of crops, live stock, dairy produce, &c.
61. Agriculture—Productions of grain, &c.
62. Agriculture—Principal crops of Ontario.
63. Agriculture—Principal crops of Manitoba.
64. Manufactures—Capital invested; number of wage-earners; value of products.
65. Manufactures—Proportion of population; value of product, by provinces.
66. Vital statistics—(a) blind (b) deaths.
67. Vital statistics—(a) insane, (b) deaf and dumb.
68. Finance—Revenue.
69. Finance—Expenditure.
70. Finance—Debt; expenditure for public works; assets.
71. Currency and Banking—Savings banks, deposits and withdrawals.
72. Currency and Banking—Chartered banks, liabilities, assets, deposits, loan and reserve fund.
73. Currency and Banking—Chartered banks, capital, deposits, liabilities and assets.
74. Marine—Light stations, &c., vessels entered, 1903.
75. Marine—Vessels arrived and departed; coasting vessels.
76. Marine—Sea-going shipping; vessels on inland waters.
77. Marine—Vessels in coasting trade, by provinces.
78. Fisheries—Yield; fishermen; value of vessels, &c.; fish exports.
79. Railways—Capital; passengers; freight; mileage.
80. Railways—Earnings; working expenses; receipts; expenditure.
81. Railways—Train mileage; rolling stock; passengers; freight.
82. Government railways—Expenditure and revenue; earnings and operating expenses; receipts.
83. Education, Immigration—Literate and illiterate; schools, teachers, pupils; expenditure ; number of immigrants.

Altitudes in the Dominion of Canada. With a relief map of North America. 8vo. pp. 226.

Dictionary of Altitudes in the Dominion of Canada. With a relief map of Canada. 8vo., pp. 143.

No. 34.

REPORT OF THE LAND PATENTS BRANCH.

DEPARTMENT OF THE INTERIOR,
LAND PATENTS BRANCH,
OTTAWA, July 30, 1908.

W. W. CORY, Esq.,
Deputy Minister of the Interior,
Ottawa.

SIR,—I have the honour to submit for your information the statements hereinafter enumerated for the year ended March 31, 1908.

A.—Statement showing the number of homestead entries as compared with the corresponding period of the previous year.

B.—Abstract of letters patent covering Dominion lands situate in Manitoba, Saskatchewan, Alberta, British Columbia and the Yukon Territory.

C.—Statement showing the number of acres of swamp lands in Manitoba transferred by order in council to the province of Manitoba.

D.—Statement showing the number of patents forwarded to the several registrars of the land registration districts of the provinces of Alberta, Saskatchewan and the Yukon Territory; and the number of notifications mailed to the patentees.

E.—Statement showing the number of entries cancelled; also the year in which such entries were made.

F.—Statement showing the number of assignments recorded in the Land Patents Branch.

G.—Statement of entries affecting Dominion lands which were made at head office.

I have the honour to be, sir,
Your obedient servant,

N. O. COTE,
Chief Clerk.

SESSIONAL PAPER No. 25

A.—STATEMENT showing the number of homestead entries made during the year ended March 31, 1908, as compared with the year ended March 31, 1907.

Agency.	1907-08.	1906-07.	Increase.	Decrease.
Battleford	4,535	6,699	.....	2,164
Brandon	90	110	.....	20
Calgary	1,278	1,494	.....	216
Dauphin	772	582	190	.....
Edmonton	4,055	4,598	.....	543
Estevan	502	1,936	.....	1,434
Humboldt	2,493	751	1,742	.....
Kamloops	195	70	125	.....
Lethbridge	2,456	1,988	468	.....
Minnedosa	.....	152	.....	152
Moosejaw	5,181	57	5,124	.....
New Westminster	42	32	10	.....
Prince Albert	1,622	1,701	.....	79
Regina	1,653	10,342	.....	8,689
Red Deer	1,825	3,189	.....	1,364
Winnipeg	886	1,034	.....	148
Yorkton	2,839	3,053	.....	214
Total	30,424	37,788	7,659	15,023

Month.	1907-08	1906-07	Increase.	Decrease.	Net decrease.
April	2,594	6,189	.....	3,595	
May	3,253	4,583	.....	1,330	
June	4,574	5,369	.....	795	
July	3,690	4,174	.....	484	
August	2,814	3,388	.....	574	
September	2,395	2,595	.....	200	
October	2,252	3,389	.....	1,137	
November	2,261	2,966	.....	705	
December	1,849	1,402	447	.....	
January	1,453	1,111	342	.....	
February	1,420	1,033	387	.....	
March	1,869	1,589	280	.....	
Total	30,424	37,788	1,456	8,820	7,364

N. O. COTE,
Chief Clerk.

DEPARTMENT OF THE INTERIOR,
LAND PATENTS BRANCH,
OTTAWA, July 30, 1908.

B.—Abstract of Letters Patent covering Dominion Lands situate in Manitoba, Saskatchewan, Alberta, British Columbia and the Yukon Territory, issued from the Department of the Interior, during the fiscal year (twelve months) ending March 31, 1908, as compared with the fiscal year (nine months) ending March 31, 1907.

Number.	Nature of Grant.	From April 1, 1907, to March 31, 1908. (Twelve months.)		From July 1, 1906, to March 31, 1907. (Nine months.)	
		Patents.	Acres.	Patents.	Acres.
1	Alberta Railway and Irrigation Co.'s sales	29	17,932	.....	.....
2	British Columbia homesteads	102	14,783	25	3,829
3	British Columbia sales	49	2,739	32	2,919
4	Coal lands sales	36	7,903	2	632
5	Commutation grants	6	281	2	251
6	Half-breed allotments	1	240	.....	.....
7	Homesteads	14,506	2,300,706	8,894	1,417,541
8	Hudson's Bay Co.	3	1,761	25	20,111
9	Leases	3	.....	.....	.....
10	License of occupation	6	.....	.....	.....
11	Manitoba Act grants	4	117	.....	.....
12	Military Bounty grants	.....	.....	1	160
13	Military homesteads	9	2,872	3	959
14	Mineral rights (7,574 acres)	39	.....	4	.....
15	Mining lands sales	6	102	2	400
16	North west half-breed grants	220	37,255	333	67,381
17	Parish sales	6	1,546	8	770
18	Quit claim, special grants (1,842 acres)	12	.....	9	.....
	Railways:—				
19	Alberta Railway and Coal Co.	.....	.....	1	160
20	Calgary and Edmonton Railway Co	93	85,975	.....	.....
21	Calgary and Edmonton Railway Co., Under rights (2,001 acres)	9	.....	2	.....
22	Canadian Northern Railway Co.	1,330	2,138,422	332	284,662
23	Canadian Pacific Railway grants	246	377,427	140	237,861
24	Canadian Pacific Railway grants, Souris Branch	50	94,611	66	195,692
25	Canadian Pacific Railway roadbed and station grounds	76	1,062	6	117
26	Grand Trunk Pacific Railway grants	33	361	.....	.....
27	Manitoba and Southeastern Railway Co	471	676,160	.....	.....
28	Manitoba and Northwestern Railway Co.	34	29,421	18	271
29	Manitoba Southwestern Colonization Railway Co	192	52,779	99	37,592
30	Qu'Appelle, Long Lake and Saskatchewan Railroad and Steamboat Co.	10	5,911	41	22,910
31	Saskatchewan and Western Railway	43	98,886	.....	.....
32	Sales	607	159,050	361	50,161
33	School lands sales	189	21,949	105	15,382
34	Special grants	204	6,579	65	726
35	Yukon Territory sales	65	2,147	20	843
36	Yukon Territory specials	1	.....	.....	.....
	Totals	18,690	6,138,977	10,596	2,361,330

N. O. COTE,
Chief Clerk.

Department of the Interior,
Land Patents Branch,
Ottawa, July 30, 1908.

SESSIONAL PAPER No. 25

C.—STATEMENT showing the number of acres of swamp lands in Manitoba transferred by order in council to the province of Manitoba, up to March 31, 1908.

	Acres.
Total area transferred to March 31, 1907	1,413,244·21
August 1, 1907	3,192·00
September 26, 1907	160·00
December 4, 1907	247,607·82
" 20, 1907	16,332·85
" 24, 1907	141,107·41
" 24, 1907	77,494·70
January 29, 1908	7,502·70
March 9, 1908	11,167·00
Total	1,917,808·69

N. O. COTE,
Chief Clerk.

DEPARTMENT OF THE INTERIOR,
LAND PATENTS BRANCH,
OTTAWA, July 30, 1908.

D.—STATEMENT showing the number of patents forwarded to the several registrars of the land registration districts of the provinces of Alberta, Saskatchewan and Yukon Territory, and the number of notifications mailed to patentees during the year, April 30, 1907-March 31, 1908.

Registration District.	Number of Patents sent to Registrars.	Number of notifications mailed to Patentees.
Yukon Territory	68	85
Assiniboia	7,943	7,547
South Alberta	2,522	2,470
North Alberta	2,981	3,008
West Saskatchewan	841	831
East Saskatchewan	2,182	2,013
Yorkton	654	602

N. O. COTE,
Chief Clerk.

DEPARTMENT OF THE INTERIOR,
LAND PATENTS BRANCH,
OTTAWA, July 30, 1908.

E.—STATEMENT showing the number of entries cancelled during the year ended March 31, 1908; also the year in which such entries were made.

Year.	Homesteads.	Pre-emptions.	Time Sales.	Sales.
1877		1		
1878				
1879				
1880				
1881				
1882		4		
1883	5	6		
1884	1	5		
1885	2	2		
1886	2	3		
1887		1		1
1888	1	3		
1889	2	3		
1890				
1891	2			
1892	2		1	
1893				
1894				
1895	1			
1896	1			
1897	1			
1898	10			
1899	14			
1900	15	2	1	
1901	52			
1902	144			
1903	518		1	
1904	656	2	1	
1905	2,331		3	
1906	8,035		2	
1907	3,848		3	3
1908	25			
	15,668	32	12	4

N. O. COTE,
Chief Clerk.

DEPARTMENT OF THE INTERIOR,
LAND PATENTS BRANCH,
OTTAWA, July 30, 1908.

SESSIONAL PAPER No. 25

F.—STATEMENT showing the number of assignments recorded in the Land Patents Branch during the year ended March 31, 1908.

Number of deeds registered	853
Fees received in connection therewith	$1,752.50

N. O. COTE,
Chief Clerk.

DEPARTMENT OF THE INTERIOR,
LAND PATENTS BRANCH,
OTTAWA, July 30, 1908.

G.—STATEMENT of entries affecting Dominion lands which were made at head office for the year ended March 31, 1908.

Name of grant.	No. of grants.	Acres.
Special grants	210	6,474·00
Alberta Railway and Irrigation Company	...	9,774·02
Calgary and Edmonton Railway Company	...	88,199·14
Canadian Northern Railway Company	...	2,152,054·69
Canadian Pacific Railway Company, main line	...	355,403·72
" " " Souris branch	...	93,808·70
" " " Pipestone extension	...	642·00
Manitoba and Southeastern Railway Company	...	676,202·30
Manitoba Southwestern Colonization Railway Company	...	50,222·83
Qu'Appelle, Long Lake and Saskatchewan Railroad and Steamboat Company	..	5,757·72
Saskatchewan and Western Railway Company	...	98,880·00
Railway right of way	153	2,301·00
Hudson's Bay Company's grants	10	370,089·00
		3,909,800·12

N. O. COTE,
Chief Clerk.

DEPARTMENT OF THE INTERIOR,
LAND PATENTS BRANCH,
OTTAWA, July 30, 1908.

PART II

IMMIGRATION

IMMIGRATION

REPORT OF THE SUPERINTENDENT OF IMMIGRATION.

DEPARTMENT OF THE INTERIOR,
OTTAWA, May 1, 1908.

W. W. CORY, Esq.,
Deputy Minister of the Interior,
Ottawa.

SIR,—I beg leave to transmit to you herewith the annual reports of the principal officers engaged in the immigration service, together with a report from the High Commissioner for Canada in London, and reports appended thereto from British and continental agents, &c. These reports have reference to the fiscal year ending March 31, 1908.

The following statistical tables for the same period have been compiled in my office :—

IMMIGRANT ARRIVALS.

SUMMARY for the Fiscal Year 1907-8.

Per ocean travel—			
Quebec		112,324	
Halifax		28,319	
St. John		17,894	
Vancouver		6,566	
Victoria		6,024	
North Sydney		3,722	
New York	22,379		
Portland	3,650		
Boston	1,987		
Philadelphia	898		
Baltimore	394		
		29,308	
			204,157
From the United States (direct)			58,312
Total			262,469

COMPARATIVE STATEMENT.

TOTAL Immigrants arriving for Canada, by months, for the Fiscal Year ending March 31, 1908, and for the twelve months ending March 31, 1907.

	Twelve months ending March 31, 1907.				Fiscal Year 1907 1908.			
	Males.	Females.	Children.	Totals.	Males.	Females.	Children.	Totals.
April	23,143	6,031	6,139	35,313	30,103	7,155	6,793	44,051
May	22,701	7,425	7,065	37,191	28,493	8,675	8,509	45,677
June	13,657	5,849	6,025	25,531	20,913	8,450	8,280	37,643
July	9,850	4,420	4,087	18,357	14,601	6,150	5,590	26,341
August	9,641	3,792	3,590	17,023	10,744	5,508	4,760	21,012
September	7,345	3,817	3,173	14,335	10,039	5,074	3,944	19,057
October	6,993	3,558	3,251	13,802	9,374	4,779	4,090	18,243
November	6,395	2,689	2,370	11,454	7,516	3,583	3,166	14,265
December	4,109	1,851	1,688	7,648	5,513	1,899	1,624	9,036
January	3,604	1,177	892	5,673	3,174	1,274	1,119	5,567
February	5,371	1,340	1,034	7,745	3,609	1,434	1,121	6,164
March	20,230	4,312	4,088	28,630	9,749	2,931	2,733	15,413
Totals	133,039	46,261	43,402	222,702	153,828	56,912	51,729	262,469

COMPARATIVE STATEMENT.

TOTAL Immigrants arriving for Canada, by ports, for the Fiscal Year ending March 31, 1908, and for the twelve months ending March, 31, 1907.

	Twelve months ending March 31, 1907.				Fiscal Year 1907 1908.			
	Males.	Females.	Children.	Totals.	Males.	Females.	Children.	Totals.
North Sydney	845	122	45	1,012	2,726	618	378	3,722
Halifax	19,290	4,862	4,460	28,612	17,857	5,514	4,948	28,319
St. John	13,199	3,128	2,593	18,920	11,913	3,454	2,527	17,894
Quebec	43,498	20,908	19,498	83,904	57,218	28,708	26,398	112,324
Vancouver	2,948	235	118	3,301	6,218	208	140	6,566
Victoria	2,516	269	57	2,842	5,401	187	136	6,024
Via United States Ports (New York, Portland, Boston, Baltimore and Philadelphia)	17,146	3,914	3,788	24,848	20,960	4,552	3,796	29,308
From the United States	33,597	12,823	12,843	59,263	31,535	13,371	13,406	58,312
Totals	133,039	46,261	43,402	222,702	153,828	56,912	51,729	262,469

SESSIONAL PAPER No. 25

COMPARATIVE STATEMENT.

TOTAL Immigrants arriving from the United States, direct, by months, for the Fiscal Year ending March 31, 1908, and for the twelve months ending March 31, 1907.

	TWELVE MONTHS ENDING MARCH 31, 1907.				FISCAL YEAR 1907-1908.			
	Males.	Females.	Children.	Totals.	Males.	Females.	Children.	Totals.
April	7,005	2,542	2,809	12,356	5,131	2,103	2,379	9,613
May	4,085	1,592	1,677	7,354	3,749	1,522	1,651	6,922
June	2,844	1,044	1,006	4,894	2,806	1,279	1,239	5,324
July	2,967	1,164	1,019	5,150	2,760	1,455	1,180	5,395
August	2,463	870	834	4,167	2,160	1,077	839	4,076
September	2,531	892	829	4,052	1,954	1,019	880	3,853
October	2,857	1,135	1,103	5,095	2,435	1,139	1,072	4,646
November	2,306	963	960	4,229	2,140	951	1,065	4,156
December	1,298	533	509	2,340	1,627	615	695	2,937
January	973	381	321	1,675	1,542	606	614	2,762
February	896	329	295	1,520	1,446	525	495	2,466
March	3,572	1,378	1,481	6,431	3,785	1,080	1,297	6,162
Totals	33,597	12,823	12,843	59,263	31,535	13,371	13,406	58,312

Sex, Occupation and Destination of total Immigrant arrivals for Canada for the Fiscal Year ending March 31, 1908.

	Sex.				Trade or Occupation.											
					Farmers or Farm Labourers Class.			General Labourers.			Mechanics.			Clerks, Traders, &c.		
	Males.	Females.	Children.	Totals.	Males.	Females.	Children.	Males.	Females.	Children.	Males.	Females.	Children.	Males.	Females.	Children.
Per ocean travel	122,293	43,541	38,323	204,157	27,388	6,192	8,286	49,656	5,670	7,846	29,706	12,878	13,751	9,485	3,614	2,831
From the United States.	31,535	13,371	13,406	58,312	23,219	12,133	12,509	4,472	338	274	1,893	341	273	958	244	213
Totals.	153,828	56,912	51,729	262,469	50,607	18,325	20,795	54,128	6,008	8,120	31,599	13,219	14,024	10,443	3,858	3,044

	Trade or Occupation.							Destination.								
	Miners.			Female Servants.	Not Classified.			Maritime Provinces.	Quebec.	Ontario.	Manitoba.	Saskatchewan.	Alberta.	British Columbia.	Yukon.	Not given.
	Males.	Females.	Children.		Males.	Females.	Children.									
Per ocean travel	2,818	710	1,034	10,499	3,240	3,978	4,575	10,309	43,286	74,328	34,436	10,209	9,405	22,171	13	.....
From the United States.	851	69	73	66	142	180	64	51	871	805	5,353	20,381	22,072	8,597	19	163
Totals	3,669	779	1,107	10,565	3,382	4,158	4,639	10,360	44,157	75,133	39,789	30,590	31,477	30,768	32	163

COMPARATIVE STATEMENT.

IMMIGRANTS arriving for Canada, by nationalities, for the Fiscal Year 1907-8, and for the twelve months ending March 31, 1907, showing increase or decrease of each nationality.

	Twelve months ending March 31, 1907.	Fiscal year, 1907-8.	Increase.	Decrease.
English	76,298	90,380	14,082	
Welsh	870	1,032	162	
Scotch	20,729	22,223	1,494	
Irish	6,069	6,547	478	
Total British	103,966	120,182	16,216	
African, South	32	76	44	
Australian	293	180		113
Austrian, N.E.S.	1,537	1,899	362	
Bohemian	163	102		61
Bukowinian	1,429	2,145	716	
Croatian	273	224		49
Dalmatian	51	10		41
Galician	6,313	14,268	7,955	
Hungarian, N.E.S.	850	1,307	457	
Magyar	435	321		114
Ruthenian	482	912	430	
Slovak	216	188		28
Belgian	1,216	1,214		2
Bulgarian	221	2,529	2,308	
Brazilian	7	1		6
Chinese	97	1,884	1,787	
Dutch	658	1,212	554	
French	2,129	2,671	542	
German, N.E.S.	2,801	2,363		438
Alsatian	1	2	1	
Bavarian	4	7	3	
Prussian	24	5		19
West Indian	176	134		42
Bermudian	13	43	30	
Jamaican	18	101	83	
Greek	702	1,053	351	
Hebrew, N.E.S.	736	1,679	943	
" Russian	8,128	5,738		2,390
" Polish	62	46		16
" Austrian	215	195		20
" German	51	54	3	
Italian	10,584	11,212	628	
Japanese	3,244	7,601	4,357	
Newfoundland	1,121	3,374	2,253	
New Zealand	62	70	8	
Portuguese	5	2		3
Polish, N.E.S.	231	255	24	
" Austrian	470	586	116	
" German	24	16		8
" Russian	652	736	84	
Persian	33	7		26
Roumanian	637	949	312	
Russian, N.E.S.	3,609	6,281	2,672	
Finnish	1,444	1,212		232
Spanish	34	61	27	
Swiss	203	195		8
Servian	8	48	40	
Danish	481	290		191
Icelandic	94	97	3	
Swedish	1,888	2,132	244	
Norwegian	1,636	1,554		82

COMPARATIVE STATEMENT—Immigrants arriving for Canada, by Nationalities—*Con.*

	Twelve months ending March 31, 1907.	Fiscal year, 1907-8.	Increase.	Decrease.
Turkish	445	489	44	
Armenian	231	563	332	
Egyptian	10	8	.....	2
Syrian	337	732	395	
Arabian	36	50	14	
U. S. A. Citizens (through ocean ports)	143	133	.....	10
Negro	149	136	.....	13
Hindoo	2,329	2,623	294	
Total Continental, &c.	59,473	83,975	24,502	
United States (direct)	59,263	58,312	.....	951
Total Immigration	222,702	262,469	39,767	

ARRIVALS AT OCEAN PORTS.

For the fiscal year 1907-8 there arrived, via Canadian and United States ocean ports, 269,503 passengers, of whom 15,995 travelled saloon and 253,508 steerage. Of the saloon passengers 13,575 were destined to Canada and 2,420 to the United States. Of the steerage passengers 227,272 were for Canada and 26,236 for the United States. Included in the steerage passengers for Canada were 17,652 returned Canadians and 5,463 tourists, leaving the immigration proper via ocean ports at 204,157 souls, which, together with the 58,312 settlers direct from the United States, brings the total immigration to 262,469, an increase over the twelve months ending March 31, 1907, of 39,767 persons.

The following further statistical information will be of interest: Table I. deals with the total arrivals of saloon passengers, Table II. with the total arrivals of steerage passengers, Table III. with the monthly arrivals of immigrants for Canada, and Tables IV. and V. give summaries of the information obtained from immigrants for Canada upon arrival.

TABLE I.

NATIONALITY and Sex of Saloon Passengers arriving at Ocean Ports for the Fiscal Year ending March 31, 1908.

	CANADA.				UNITED STATES.				CANADA AND UNITED STATES			
	Males.	Females.	Children.	Totals.	Males.	Females.	Children.	Totals.	Males.	Females.	Children.	Totals.
African, South	5	1		6					5	1		6
Australian	62	65	18	145	25	27	7	59	87	92	25	204
Austrian	7	5		12	2			2	9	5		14
Hungarian	5			5					5			5
Belgian	21	4	2	27	3	1		4	24	5	2	31
Chinese	15	9	4	28	9	3	1	13	24	12	5	41
Dutch	7	1		8		1		1	7	2		9
French	179	124	46	349	19	25	10	54	198	149	56	403
German	51	14		65	19	2		21	70	16		86
English	2,799	1,515	251	4,565	110	67	14	191	2,909	1,582	265	4,756
Welsh	28	9	3	40		1		1	28	10	3	41
Scotch	488	245	25	758	26	15	1	42	514	260	26	800
Irish	132	75	7	214	11	6		17	143	81	7	231
West Indian	35	25	19	79	1	1		2	36	26	19	81
Bermudian	48	64	31	143					48	64	31	143
Jamaican	7	6	1	14					7	6	1	14
Hebrew	1	1		2					1	1		2
Italian	11	3		14	2	1		3	13	4		17
Japanese	54	12	4	70	19	3		22	73	15	4	92
Newfoundland	439	265	54	758	134	114	24	272	573	379	78	1,030
New Zealand	31	23	2	56	5	2	1	8	36	25	3	4
Polish	2			2	1			1	3			63
Russian	8	3	3	14					8	3	3	14
Finnish		1		1						1		1
Spanish	6	2	5	13	2			2	8	2	5	15
Swiss	6	3	1	10	2			2	8	3	1	12
Danish	4	1		5	1	1		2	5	2		7
Swedish	10	2		12		1		1	10	3		13
Norwegian	4	1		5	2	1		3	6	2		8
Armenian	1	1	2	4					1	1	2	4
Egyptian	1			1	1			1	2			2
Syrian	11			11	1		1	2	12		1	13
U. S. A. Citizens	151	104	19	274	806	609	91	1,506	957	713	110	1,780
Negro	4	3		7					4	3		7
Hindoo	3			3					3			3
Canadian	2,196	1,704	320	4,220	3	2		5	2,199	1,706	320	4,225
Tourists	950	577	108	1,635	129	51	3	183	1,079	628	111	1,818
Totals	7,782	4,868	925	13,575	1,333	934	153	2,420	9,115	5,802	1,078	15,995

TABLE II.

NATIONALITY and Sex of Steerage Passengers arriving at Ocean Ports for the Fiscal Year ending March 31, 1908.

	CANADA.				UNITED STATES.				CANADA AND UNITED STATES.			
	Males.	Females.	Children.	Totals.	Males.	Females.	Children.	Totals.	Males.	Females.	Children.	Totals.
African, South	40	16	20	76	3	...	7	10	43	16	27	86
Australian	105	44	31	180	102	69	53	224	207	113	84	404
Austrian, N.E.S.	1,333	296	270	1,899	227	127	109	463	1,560	423	379	2,362
Bohemian	50	25	27	102	5	5	9	19	55	30	36	121
Bukowinian	1,931	119	95	2,145	...	...	...	...	1,931	119	95	2,145
Croatian	204	15	5	224	25	4	3	32	229	19	8	256
Dalmatian	10	...	...	10	...	...	...	...	10	...	...	10
Galician	9,646	2,312	2,310	14,268	96	53	36	185	9,742	2,365	2,346	14,453
Hungarian, N.E.S.	789	254	264	1,307	124	76	61	261	913	330	325	1,568
Magyar	201	58	62	321	...	...	...	...	201	58	62	321
Ruthenian	647	132	133	912	...	...	...	...	647	132	133	912
Slovak	135	30	23	188	...	...	...	...	135	30	23	188
Belgian	693	283	238	1,214	84	21	24	129	777	304	262	1,343
Bulgarian	2,516	7	6	2,529	1,224	11	3	1,238	3,740	18	9	3,767
Brazilian	1	...	...	1	...	...	...	...	1	...	...	1
Chinese	1,719	39	126	1,884	156	2	4	162	1,875	41	130	2,046
Dutch	671	228	313	1,212	77	52	68	197	748	280	381	1,409
French	1,578	689	404	2,671	57	36	25	118	1,635	725	429	2,789
German, N.E.S.	1,079	580	704	2,363	269	192	206	667	1,348	772	910	3,030
Alsatian	...	1	1	2	...	1	3	4	...	2	4	6
Bavarian	6	1	...	7	1	1	.	2	7	2	...	9
Prussian	4	1	...	5	3	1	...	4	7	2	...	9
Wurtemburg	...	...	...	...	1	...	...	1	1	...	...	1
English	45,987	22,973	21,420	90,380	1,256	929	663	2,848	47,243	23,902	22,083	93,228
Welsh	663	194	175	1,032	46	23	15	84	709	217	190	1,116
Scotch	12,090	5,938	4,195	22,223	325	261	198	784	12,415	6,199	4,393	23,007
Irish	3,799	1,838	910	6,547	229	165	58	452	4,028	2,003	968	6,999
West Indian	78	53	3	134	8	.	...	8	86	53	3	142
Bermudian	26	13	4	43	...	...	...	...	26	13	4	43
Jamaican	64	27	10	101	...	...	...	...	64	27	10	101
Greek	982	37	34	1,053	151	2	3	156	1,133	39	37	1,209
Hebrew, N.E.S.	648	476	555	1,679	43	43	56	142	691	519	611	1,821
" Russian	2,332	1,608	1,798	5,738	67	56	70	193	2,399	1,664	1,868	5,931
" Polish	21	11	14	46	2	1	...	3	23	12	14	49
" Austrian	99	52	44	195	2	...	...	2	101	52	44	197
" German	23	15	16	54	1	...	...	1	24	15	16	55
Italian	9,957	708	547	11,212	165	30	16	211	10,122	738	563	11,423
Japanese	6,945	566	90	7,601	590	121	5	716	7,535	687	95	8,317
Newfoundland	2,497	571	306	3,374	721	594	91	1,406	3,218	1,165	397	4,780
New Zealand	50	14	6	70	24	17	4	45	74	31	10	115
Portuguese	1	1	.	2	1	...	...	1	2	1	...	3
Polish, N.E.S.	167	47	41	255	53	21	10	84	220	68	51	339
" Austrian	422	93	71	586	1	...	...	1	423	93	71	587
" German	5	7	4	16	...	...	...	...	5	7	4	16
" Russian	513	126	97	736	55	17	26	98	568	143	123	834
Persian	6	1	...	7	5	3	...	8	11	4	...	15
Roumanian	481	203	265	949	60	48	37	145	541	251	302	1,094
Russian, N.E.S.	3,487	1,250	1,544	6,281	1,893	974	977	3,844	5,380	2,224	2,521	10,125
Finnish	844	271	97	1,212	1,252	630	268	2,150	2,096	901	365	3,362
Spanish	50	9	2	61	2	...	...	2	52	9	2	63
Swiss	136	40	19	195	17	6	2	25	153	46	21	220
Servian	33	6	9	48	1	1	3	5	34	7	12	53
Danish	195	61	34	290	246	106	67	419	441	167	101	709
Icelandic	43	30	24	97	1	...	...	1	44	30	24	98
Swedish	1,271	445	416	2,132	811	511	279	1,601	2,082	956	695	3,733
Norwegian	934	337	283	1,554	1,754	833	103	2,990	2,688	1,170	686	4,544
Turkish	466	14	9	489	150	2	...	152	616	16	9	641
Armenian	320	142	101	563	24	25	12	61	344	167	113	624
Egyptian	6	2	...	8	2	1	...	3	8	3	...	11

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TABLE II.

NATIONALITY and Sex of Steerage Passengers arriving at Ocean Ports for the Fiscal Year ending March 31, 1908.—*Concluded.*

	CANADA.				UNITED STATES.				CANADA AND UNITED STATES.			
	Males.	Females.	Children.	Totals.	Males.	Females.	Children.	Totals.	Males.	Females.	Children.	Totals.
Syrian	469	165	98	732	112	44	41	197	581	209	139	929
Arabian	37	6	7	50	5	.....	4	9	42	6	11	59
U. S. Citizens	77	27	29	133	949	959	411	2,319	1,026	986	440	2,452
Negro	91	34	11	136	4	3	.....	7	95	37	11	143
Hindoo	2,620	....	3	2,623	4	....	....	4	2,624	.....	3	2,627
Total Immig'n	122,293	43,541	38,323	204,157	13,486	7,077	4,330	24,893	135,779	50,618	42,653	229,050
Ret'd Canadians	12,391	3,799	1,462	17,652	.....	.....	.....	.....	12,391	3,799	1,462	17,652
Tourists	3,909	1,250	304	5,463	1,157	110	76	1,343	5,066	1,360	380	6,806
Totals	138,593	48,590	40,089	227,272	14,643	7,187	4,406	26,236	153,236	55,777	44,495	253,508

TABLE III.

MONTHLY arrivals of Immigrants for Canada, by Nationalities, at Ocean Ports for the Fiscal Year ending March 31, 1908.

	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Totals.
African, South.	9	9	3	8	9	3	12	6	9	3	4	1	76
Australian	15	13	26	39	14	10	10	15	6	1	7	24	180
Austrian, N.E.S.	214	435	215	120	142	77	79	200	211	29	35	142	1,899
Bohemian	16	5	19	4	8	6	15	8	1	6		14	102
Bukowinian	676	554	397	134	60	41	63	9	58	38	29	86	2,145
Croatian	49	37	38	11	11	12	28	14	1	3	1	19	224
Dalmatian	2	2	3	1				2					10
Galician	4,414	3,257	4,053	761	301	192	386	307	224	88	74	211	14,268
Hungarian, N.E.S.	268	433	102	56	45	64	96	123	71	8	2	39	1,307
Magyar	116	5	36	10	24	19	47	38	11	5	10		321
Ruthenian	201	49	176	174	71	77	45	34		45	40		912
Slovak	69	2	23	9	9	28	13	13	9	6	5	2	188
Belgian	266	224	116	126	99	67	52	87	37	34	29	77	1,214
Bulgarian	104	468	145	139	42	159	347	548	567	9		1	2,529
Brazilian								1					1
Chinese	92	112	143	175	195	179	244	207	144	110	101	182	1,884
Dutch	316	222	178	30	122	39	91	82	24	22	23	63	1,212
French	175	627	305	263	298	217	216	134	102	73	92	169	2,671
German, N.E.S.	290	355	246	259	221	228	246	185	81	84	86	82	2,363
Alsatian		2											2
Bavarian	1	2	1				1	2					7
Prussian			1	2		1	1						5
English	16,067	17,076	14,737	9,551	8,657	6,264	6,095	3,420	1,337	610	1,689	4,877	90,380
Welsh	153	195	129	95	103	68	105	52	17	27	32	56	1,032
Scotch	3,483	5,439	4,213	2,224	1,424	1,981	1,125	801	357	189	296	691	22,223
Irish	1,025	1,271	1,200	525	622	566	471	266	124	55	114	308	6,547
West Indian	14	20	11	29	3	13	16	12	6	2	2	6	134
Bermudian	10	13	6	9			2			1	2		43
Jamaican	5		2	12	41	15	16	9		1			101
Greek	79	67	184	118	126	121	148	103	69	17	1	20	1,053
Hebrew, N.E.S.	62	42	86	108	203	237	237	56	258	227	35	128	1,679
" Russian	298	603	658	737	961	594	357	511	344	298	197	180	5,738
" Polish	1	1	1	12	1	2	4		3	3	8	10	46
" Austrian	16	7	43	12	38	6	13	15	13	15	10	7	195
" German	9	2	13	5	8	2	5	9	1				54
Italian	3,036	3,083	1,538	638	513	450	482	376	197	85	232	582	11,212
Japanese	714	521	807	2,323	649	1,238	396	198	359	108	139	149	7,601
Newfoundland	439	537	267	231	218	230	328	445	144	110	101	333	3,374
New Zealand	1	12	12	20	5	3	8	3	2			4	70
Portuguese		1					1						2
Polish, N.E.S.	3	62	21	35	12	29	17	4	7	4		61	255
" Austrian	84	26	118	102	24	67	42	35	11	27	28	22	586
" German	3		6	3			1					3	16
" Russian	54	63	102	148	86	44	88	56	28	37	11	19	736
Persian				3						2	2		7
Roumanian	144	154	69	80	86	52	56	128	47	84	27	22	949
Russian, N.E.S.	407	1,225	855	581	531	311	456	797	575	183	124	236	6,281
Finnish	161	214	149	163	128	89	85	115	66	28	16	7	1,212
Spanish	8	10	8	3	1	10	5	7	1	1	5	2	61
Swiss	21	45	29	29	23	9	11	9	6	2	2	18	195
Servian		1	7	6	5	1	19	2	1		2	4	48
Danish	13	68	34	29	16	16	32	13	12	2	8	17	290
Icelandic	8	8	8	19	5	3	2	5	9				97
Swedish	305	491	255	276	178	134	172	161	60	16	34	50	2,132
Norwegian	273	372	248	101	139	122	109	76	28	16	26	44	1,554
Turkish	88	134	34	15	21	18	24	69	61	4	3	18	489
Armenian	10	14	32	123	42	97	49	153	1	12	3	27	563
Egyptian		2	1		4	1							8
Syrian	5	38	79	115	148	68	61	167	35	5	2	9	732
Arabian	4	2		21	8	8	1	3		1	2		50
U.S. Citizens	16	14	15	12	26	14	8	8	8	2	1	9	133
Negro	7	19	17	28	50	8	3	1				3	136
Hindoo	98	90	108	54	160	903	555	9	356	67	6	217	2,623
Totals	34,438	38,755	32,319	20,946	16,936	15,204	13,597	10,105	6,099	2,805	3,698	9,251	204,157

TABLE IV.

Monthly arrivals of Immigrants for Canada, by Occupation and Destination at Ocean Ports, for the Fiscal Year ending March 31, 1908.

—	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Totals.
Agriculturists	7,722	8,850	8,245	3,868	2,621	2,054	1,852	1,593	1,162	380	737	2,782	41,866
General labourers	14,078	12,269	9,251	6,060	3,893	4,320	3,901	3,114	2,221	852	994	2,219	63,172
Mechanics	8,221	10,591	8,828	6,433	6,261	4,384	3,979	2,809	1,280	798	868	1,883	56,335
Clerks	1,569	2,560	2,188	1,913	1,689	1,671	1,433	952	505	309	396	845	15,930
Miners	459	534	505	426	526	487	618	372	145	119	118	253	4,562
Female servants	1,173	1,701	1,910	978	906	974	925	732	309	132	236	433	10,499
Not classed	1,216	2,250	1,392	1,268	1,040	1,314	889	637	387	215	349	836	11,793
Totals	34,438	38,755	32,319	20,946	16,936	15,204	13,597	10,109	6,099	2,805	3,698	9,251	204,157
Maritime Provinces	2,041	1,186	1,060	692	866	605	707	1,009	665	270	314	894	10,309
Quebec	5,059	8,814	6,751	4,443	4,216	3,674	3,376	2,765	1,293	852	774	1,269	43,286
Ontario	13,369	14,320	12,067	7,771	6,318	5,081	4,788	3,514	2,000	716	1,104	2,980	74,328
Manitoba	8,509	8,322	6,615	2,732	1,994	1,443	1,220	894	591	341	479	1,296	34,436
Saskatchewan	1,787	2,413	1,849	813	618	529	616	507	187	71	150	669	10,209
Alberta	1,706	1,709	1,786	867	700	593	581	337	198	87	226	615	9,405
British Columbia	1,964	1,987	2,191	3,628	1,921	3,278	2,309	1,083	1,165	468	649	1,528	22,171
Yukon	3	4	. . . .	. . . .	3	1	. . . .	. . . . .	. . . .	. . . . .	2	. . .	13
Totals	34,438	38,755	32,319	20,946	16,936	15,204	13,597	10,109	6,099	2,805	3,698	9,251	204,157

TABLE

Nationality, Sex, Occupation and Destination of Immigrant Arrivals

	Sex.				Trade or								
					Farmers, or Farm Labourers Class.			General Labourers.			Mechanics.		
	Males.	Females.	Children.	Totals.	Males.	Females.	Children.	Males.	Females.	Children.	Males.	Females.	Children.
African, South	40	16	20	76	12	8	13	3	1	.....	8	2	7
Australian	105	44	31	180	18	3	4	18	2	1	34	4	6
Austrian, N.E.S	1,333	296	270	1,899	348	50	79	776	59	81	100	37	34
Bohemian	50	25	27	102	9	3	1	11	2	4	10	3	3
Bukowinian	1,931	119	95	2,145	460	34	49	1,398	36	37	51	1	3
Croatian	204	15	5	224	18	.....	.....	165	1	.....	7	.....	.....
Dalmatian	10	.....	.....	10	1	.....	.....	9	.....	.....	.....	.....	.....
Galician	9,646	2,312	2,310	14,268	3,348	749	1,353	5,924	533	783	273	64	68
Hungarian, N.E.S.	789	254	264	1,307	325	61	70	415	83	112	31	15	19
Magyar	201	58	62	321	2	3	3	188	29	38	7	2	.....
Ruthenian	647	132	133	912	13	.....	.....	622	61	116	11	1	.....
Slovak	135	30	23	188	3	.....	.....	128	9	10	1	1	1
Belgian	693	283	238	1,214	199	61	84	184	30	30	153	86	56
Bulgarian	2,516	7	6	2,529	478	.....	4	2,011	4	2	17	.....	.....
Brazilian	1	.....	.....	1	.....	.....	.....	.....	.....	.....	.....	.....	.....
Chinese	1,719	39	126	1,884	32	.....	.....	453	2	7	41	1	1
Dutch	671	228	313	1,212	236	69	98	119	27	67	257	60	97
French	1,578	689	404	2,671	673	158	191	266	43	38	320	139	103
German, N.E.S.	1,079	580	704	2,363	323	179	375	266	67	106	292	102	132
Alsatian	.....	1	1	2	.....	.....	.....	.....	.....	.....	.....	1	1
Bavarian	6	1	.....	7	1	.....	.....	2	.....	.....	2	.....	.....
Prussian	4	1	.....	5	1	.....	.....	2	.....	.....	1	1	.....
English	45,987	22,973	21,420	90,380	11,316	3,169	3,697	9,580	2,827	4,060	17,873	8,128	8,989
Welsh	663	194	175	1,032	163	22	35	88	17	24	221	55	61
Scotch	12,090	5,938	4,195	22,223	2,800	653	781	2,520	405	536	4,776	1,879	1,892
Irish	3,799	1,838	910	6,547	1,149	189	200	934	132	158	912	407	284
West Indian	78	53	3	134	5	.....	.....	26	1	1	25	4	.....
Bermudian	26	13	4	43	1	.....	.....	5	.....	.....	14	2	.....
Jamaican	64	27	10	101	1	.....	.....	44	.....	.....	4	3	.....
Greek	982	37	34	1,053	136	.....	4	788	11	25	23	3	.....
Hebrew, N.E.S.	648	476	555	1,679	125	65	131	139	48	93	304	267	246
" Russian	2,332	1,608	1,798	5,738	114	36	66	524	121	170	1,485	902	999
" Polish	21	11	14	46	.....	.....	.....	7	.....	.....	13	8	13
" Austrian	99	52	44	195	2	.....	.....	33	1	2	46	16	13
" German	23	15	16	54	5	.....	.....	2	1	.....	15	10	15
Italian	9,957	708	547	11,212	1,092	40	38	8,157	262	273	424	39	25
Japanese	6,945	566	90	7,601	1,656	95	11	3,773	147	34	96	20	3
Newfoundland	2,497	571	306	3,374	35	2	.....	2,115	99	114	186	45	66
New Zealand	50	14	6	70	14	2	.....	6	1	.....	18	4	4
Portuguese	1	1	.....	2	.....	.....	.....	1	.....	.....	.....	.....	.....
Polish, N.E.S.	167	47	41	255	47	6	12	69	12	17	26	7	4
" Austrian	422	93	71	586	7	1	3	394	41	50	17	2	3
" German	5	7	4	16	.....	.....	.....	2	1	.....	3	.....	.....
" Russian	513	126	97	736	73	13	23	320	29	39	88	24	15
Persian	6	1	.....	7	1	.....	.....	3	.....	.....	2	.....	.....
Roumanian	481	203	265	949	73	34	73	316	60	109	72	43	63
Russian, N.E.S.	3,487	1,250	1,544	6,281	725	265	511	1,880	240	422	658	295	310
Finnish	844	271	97	1,212	69	5	15	630	40	21	56	12	19
Spanish	50	9	2	61	5	.....	.....	26	3	.....	9	1	2
Swiss	136	40	19	195	41	7	11	32	4	1	43	7	6
Servian	33	6	9	48	1	.....	.....	22	2	4	4	2	3
Danish	195	61	34	290	92	16	26	51	4	3	40	6	3
Icelandic	43	30	24	97	13	2	10	14	.....	.....	8	5	5
Swedish	1,271	445	416	2,132	364	101	181	634	61	107	209	53	73
Norwegian	934	337	283	1,554	289	70	102	434	49	93	163	34	43

V.

for Canada at Ocean Ports, for the Fiscal Year ending March 31, 1908.

Occupation.										Destination.							
Clerks, Traders, &c.			Miners.			Female Servants.	Not Classified.			Maritime Provinces.	Quebec.	Ontario.	Manitoba.	Saskatchewan.	Alberta.	British Columbia.	Yukon.
Males.	Females.	Children.	Males.	Females.	Children.		Males.	Females.	Children.								
12	3	.....	.....	.....	.....	2	5	.....	.....	3	15	16	24	.....	4	14	..
15	6	....	13	2	6	10	7	17	14	3	9	24	10	2	5	127	..
21	7	12	76	9	15	98	12	36	49	130	720	315	432	134	108	59	1
1	.....	.....	19	4	9	6	.....	7	10	25	11	12	19	8	13	14	..
.....	1	1	22	2	1	41	.....	4	4	122	851	223	717	127	87	18	..
.....	1	....	14	...	1	4	.....	9	4	15	15	149	17	.....	1	27	..
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	4	5	.....	1	.....	.....	..
6	.....	.....	89	11	22	901	6	54	84	249	2,595	1,714	7,452	1,169	989	100	..
4	1	.....	12	2	2	50	2	42	61	60	108	355	262	459	32	31	..
2	.....	.....	.....	.....	.....	10	2	14	21	25	20	102	36	99	36	3	..
1	.....	.....	.....	.....	.....	59	.....	11	17	7	302	191	357	37	11	7	..
.....	.....	.....	2	.....	.....	11	1	9	12	.....	5	63	11	3	45	61	..
39	17	9	111	36	39	38	7	15	20	191	327	53	406	83	111	43	..
6	.....	.....	1	.....	.....	3	3	.....	.....	116	186	2,203	15	3	.....	6	..
1	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	.....	.....	.....	.....	.....	.....	..
1,105	16	37	1	.....	.....	1	87	19	81	14	156	143	8	.....	9	1,554	..
18	18	20	2	.....	.....	28	9	26	31	17	219	379	408	74	86	29	..
161	66	21	34	15	15	116	124	152	36	208	1,178	185	616	178	202	102	2
114	38	37	45	6	7	114	39	74	47	74	418	371	790	344	256	109	1
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	2	.....	.....	.....	.....	.....	..
1	.....	.....	.....	.....	.....	.....	.....	1	.....	1	4	1	.....	1	.....	.....	..
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	2	.....	1	1	1	.....	..
4,552	2,218	1,619	1,211	403	575	4,432	1,455	1,796	2,480	5,127	15,903	44,464	12,618	4,412	1,378	5,470	8
59	18	18	115	17	23	40	17	25	14	55	162	362	146	53	86	168	..
1,374	592	405	316	116	201	1,849	304	444	380	736	4,549	8,650	4,274	1,083	1,285	1,646	..
627	235	149	38	11	6	681	139	183	113	218	1,330	2,687	1,329	222	411	349	1
12	1	.....	.....	.....	.....	45	10	2	2	74	7	52	1	.....	.....	.....	..
2	.....	.....	.....	.....	.....	9	4	2	4	30	.....	.....	1	.....	12	.....	..
8	4	5	.....	.....	.....	10	7	10	5	53	12	36	.....	.....	.....	.....	..
30	2	.....	.....	.....	.....	15	5	6	5	97	318	583	10	.....	.....	45	..
66	23	59	.....	.....	.....	45	14	28	26	11	1,257	183	161	52	14	1	..
171	146	288	3	3	9	232	35	168	266	147	2,925	1,764	714	85	64	39	..
.....	.....	.....	.....	.....	.....	3	1	.....	1	4	16	25	1	.....	.....	.....	..
15	10	11	.....	.....	.....	15	3	10	18	7	98	80	10	.....	.....	.....	..
1	3	1	.....	.....	.....	.....	.....	1	.....	.....	34	12	3	.....	5	.....	..
48	9	4	201	5	2	189	35	164	205	439	5,213	4,365	215	11	200	769	..
596	61	6	77	2	.....	15	747	226	36	4	7	1	.....	.....	.....	7,589	..
44	8	5	95	30	41	293	22	94	80	3,014	141	105	23	2	11	78	..
8	2	.....	4	.....	.....	.....	.....	5	2	.....	9	5	7	.....	6	43	..
.....	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	2	.....	.....	.....	.....	..
2	1	2	8	2	3	13	15	6	3	10	101	33	53	31	9	18	..
.....	1	.....	3	.....	.....	35	1	13	15	26	149	131	188	15	65	12	..
.....	.....	.....	.....	.....	.....	4	.....	2	4	.....	2	2	6	6	.....	.....	..
5	2	4	27	2	3	44	....	12	13	32	345	177	124	17	9	32	..
.....	.....	.....	.....	.....	.....	.....	.....	1	.....	.....	1	6	.....	.....	.....	.....	..
16	5	6	.....	.....	.....	52	4	9	14	6	421	128	128	257	8	1	..
74	50	80	115	5	7	267	35	128	214	202	1,750	1,268	1,607	727	373	354	..
2	1	.....	86	11	25	190	1	12	17	13	103	922	44	5	37	88	..
8	1	.....	.....	.....	.....	1	2	3	.....	2	6	19	19	..	1	14	..
13	2	.....	.....	.....	.....	9	7	11	1	4	82	39	27	11	18	14	..
1	1	.....	4	.....	.....	.....	1	1	2	6	6	22	3	7	3	1	..
10	4	.....	.....	2	.....	24	2	5	2	7	63	73	71	29	36	11	..
3	1	.....	.....	.....	.....	21	5	1	9	.....	12	3	79	.....	3	.....	..
17	5	5	38	9	17	187	9	29	33	45	192	635	588	233	192	247	..
14	3	2	30	2	1	153	4	26	42	79	114	371	375	222	170	223	..

TABLE

NATIONALITY, Sex, Occupation and Destination of Immigrant Arrivals

	SEX.				TRADE OR								
					Farmers, or Farm Labourers Class.			General Labourers.			Mechanics.		
	Males.	Females.	Children.	Totals.	Males.	Females.	Children.	Males.	Females.	Children.	Males.	Females.	Children.
Turkish	466	14	9	489	138	2	3	280	2	2	33	3	2
Armenian	320	142	101	563	46	4	7	150	27	28	103	39	37
Egyptian	6	2		8							3		
Syrian	469	165	98	732	151	12	18	203	26	19	48	25	12
Arabian	37	6	7	50	2	1	1	26	1		2		
U.S. Citizens	77	27	29	133	14	2	3	8	6	9	31	7	4
Negro	91	34	11	136	7			31			35	1	6
Hindoo	2,620		3	2,623	116			2,429			2		
Totals	122,293	43,541	38,323	204,157	27,388	6,192	8,286	49,656	5,670	7,846	29,706	12,878	13,751

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V.

Canada at Ocean Ports, for the Fiscal Year ending March 31, 1908—*Continued.*

Occupation.										Destination.							
Clerks, Traders, &c.			Miners.			Female Servants.	Not Classified.			Maritime Provinces.	Quebec.	Ontario.	Manitoba.	Saskatchewan.	Alberta.	British Columbia.	Yukon.
Males.	Females.	Children.	Males.	Females.	Children.		Males.	Females.	Children.								
10	3	2	.....	.....	.....	1	5	3	.....	50	98	334	5	.....	2	.....	.....
11	8	11	2	.....	.....	46	8	18	18	45	375	139	1	.....	3	.....	.....
1	1	.....	.....	.....	.....	.....	2	1	.....	3	4	1	.....	.....	.....	.....	.....
60	14	6	.....	1	1	57	7	30	42	367	252	96	13	.....	.....	4	.....
5	.....	1	1	1	3	2	1	1	2	10	34	4	2	.....	.....	.....	.....
14	3	2	3	1	.....	2	7	6	11	30	29	24	5	6	7	32	.....
6	1	.....	.....	.....	.....	26	12	6	5	95	16	20	4	.....	1	.....	.....
63	.....	3	.....	.....	.....	.....	10	.....	.....	.....	3	1	.....	.....	.....	2,619	.....
9,485	3,614	2,831	2,818	710	1,034	10,499	3,240	3,978	4,575	10,309	43,286	74,328	34,436	10,209	9,405	22,171	13

PORT OF NORTH SYDNEY.

For the fiscal year 1907-8 there arrived at the port of North Sydney 9,790 passengers, of whom 2,953 travelled saloon and 6,837 steerage. Of the saloon passengers 2,116 were destined to Canada and 837 to the United States. Of the steerage passengers 5,159 were for Canada and 1,678 for the United States. Included in the steerage passengers for Canada were 1,204 returned Canadians and 233 tourists, leaving the immigration proper at 3,722 souls.

Table I. deals with the total arrivals of saloon passengers, Table II. with the total arrivals of steerage passengers, Table III. with the monthly arrivals of immigrants for Canada, and Tables IV. and V. give summaries of the information obtained from immigrants for Canada upon arrival.

TABLE I.

NATIONALITY and Sex of Saloon Passengers arriving at the Port of North Sydney for the Fiscal Year ending March 31, 1908.

	CANADA.				UNITED STATES.				CANADA AND UNITED STATES.			
	Males.	Females.	Children.	Totals.	Males.	Females.	Children.	Totals.	Males.	Females.	Children.	Totals.
Australian	1			1					1			1
Austrian					2			2	2			2
Hungarian	1			1					1			1
Chinese	3			3					3			3
French	83	70	33	186	12	20	8	40	95	90	41	226
German	2			2	6			6	8			8
English	136	21		157	16	4	2	22	152	25	2	179
Welsh	5	1		6					5	1		6
Scotch	38	6		44	6	3		9	44	9		53
Irish	14	2		16	7	3		10	21	5		26
West Indian	2			2					2			2
Italian	2			2					2			2
Japanese	1			1	1			1	2			2
Newfoundland	423	242	53	718	130	114	23	267	553	356	76	985
New Zealand	1			1					1			1
Russian	2			2					2			2
Spanish					1			1	1			1
Danish	1			1	1	1		2	2	1		3
Swedish						1		1		1		1
Norwegian	2			2	1	1		2	3	1		4
Syrian	4			4	1			1	5			5
U. S. Citizens	57	18	3	78	343	92	18	453	400	110	21	531
Hindoo	1			1					1			1
Canadian	583	175	57	815		1		1	583	176	57	816
Tourists	35	30	8	73	12	7		19	47	37	8	92
Totals	1,397	565	154	2,116	539	247	51	837	1,936	812	205	2,953

TABLE II.

NATIONALITY and Sex of Steerage Passengers arriving at the Port of North Sydney for the Fiscal Year ending March 31, 1908.

	CANADA.				UNITED STATES.				CANADA AND UNITED STATES.			
	Males.	Females.	Children.	Totals.	Males.	Females.	Children.	Totals.	Males.	Females.	Children.	Totals.
Austrian	2	1	2	5					2	1	2	5
Chinese	12			12					12			12
French	104	50	42	196	7			7	111	50	42	203
German	9	1		10	1			1	10	1		11
English	49	1	6	56	11	1		12	60	2	6	68
Welsh	6			6	4			4	10			10
Scotch	15	3		18	2	1		3	17	4		21
Irish	7	1		8	2	1	1	4	9	2	1	12
West Indian	3			3					3			3
Bermudian	1			1					1			1
Italian	6		2	8	1			1	7		2	9
Newfoundland	2,464	555	301	3,320	703	593	91	1,387	3,167	1,148	392	4,707
Polish					6			6	6			6
Russian, N.E.S	6	1		7	2	1	1	4	8	2	1	11
Finnish	1			1					1			1
Danish	3			3					3			3
Icelandic					1			1	1			1
Swedish	15	1	4	20	4			4	19	1	4	24
Norwegian	8	1	1	10	3			3	11	1	1	13
Armenian	1			1					1			1
Syrian	8			8	5	3		8	13	3		16
U.S.A. Citizens	6	3	20	29	21	14	174	209	27	17	194	238
Total immigration	2,726	618	378	3,722	773	614	267	1,654	3,499	1,232	645	5,376
Returned Canadians	787	216	201	1,204					787	216	201	1,204
Tourists	117	92	24	233	15	5	4	24	132	97	28	257
Totals	3,630	926	603	5,159	788	619	271	1,678	4,418	1,545	874	6,837

TABLE III.

MONTHLY arrivals of Immigrants for Canada, by Nationalities, at the Port of North Sydney, for the Fiscal Year ending March 31, 1908.

	April.	May.	June.	July.	August.	September.	October.	November.	December.	January.	February.	March.	Totals
Austrian					5								5
Chinese	2			2	3	1	4						12
French	1	57	18	17	12	15	22	19	28	5	2		196
German				2		6	1		1				10
English	3	15	1	5	4	4	4	10	2	3	2	3	56
Welsh		1		3					2				6
Scotch	2	4			7		2			1		2	18
Irish				1	2			1	2		1	1	8
West Indian	1					1						1	3
Bermudian			1										1
Italian		1					3		4				8
Newfoundland	428	507	266	231	208	228	326	439	143	110	101	333	3,320
Russian, N.E.S.				2	3			1		1			7
Finnish												1	1
Danish							2				1		3
Swedish					14		1	1			3	1	20
Norwegian	1		2		3		2	1				1	10
Armenian	1												1
Syrian		2	2		2	1			1				8
U. S. Citizens	1	5	5	1	5	8			2			2	29
Totals	440	592	295	264	268	264	367	472	185	120	110	345	3,722

TABLE IV.

MONTHLY arrivals of Immigrants for Canada, by Occupation and Destination, at the Port of North Sydney, for the Fiscal Year ending March 31, 1908.

	April.	May.	June.	July.	August.	September	October.	November	December	January.	February.	March.	Totals.
Agriculturists	....	1	2	2	11	12	3	5	....	3	3	1	43
General labourers	376	414	199	134	129	141	240	312	102	78	71	288	2,484
Mechanics	34	68	33	49	33	21	35	41	12	9	13	30	378
Clerks	6	23	9	8	8	3	10	8	12	6	2	1	96
Miners	3	11	11	10	12	21	21	51	15	17	5	9	186
Female servants	10	52	33	30	27	29	40	38	18	3	8	12	300
Not classed	11	23	8	31	48	37	18	17	26	4	8	4	235
Totals	440	592	295	264	268	264	367	472	185	120	110	345	3,722
Maritime Provinces	404	463	266	228	213	237	334	401	170	117	93	317	3,243
Quebec	9	87	4	24	15	22	27	24	4	1	5	7	229
Ontario	9	26	21	4	7	1	3	33	7	1	2	1	115
Manitoba	3	6	1	....	27	1	....	....	....	....	....	1	39
Saskatchewan	1	....	....	1	....	....	....	....	....	....	....	....	2
Alberta	2	5	....	1	....	....	....	3	....	....	....	1	12
British Columbia	12	5	3	6	6	3	3	11	4	1	10	18	82
Totals	440	592	295	264	268	264	367	472	185	120	110	345	3,722

TABLE

NATIONALITY, Sex, Occupation and Destination of Immigrant arrivals for

	Sex.				Trade or Farmers or Farm Labourers Class.			General Labourers.			Mechanics.		
	Males.	Females.	Children.	Totals.	Males.	Females.	Children.	Males.	Females.	Children.	Males.	Females.	Children.
Austrian	2	1	2	5				1	1	2			
Chinese	12			12				6					
French	104	50	42	196				87	9	5	12	11	21
German	9	1		10				1			1	1	
English	49	1	6	56				23			9	1	3
Welsh	6			6				1			3		
Scotch	15	3		18				7			5	3	
Irish	7	1		8				3					
West Indian	3			3				3					
Bermudian	1			1							1		
Italian	6		2	8									
Newfoundland	2,464	555	301	3,320	34	2		2,091	98	110	182	44	66
Russian, N.E.S.	6	1		7				5			1	1	
Finnish	1			1				1					
Danish	3			3				2			1		
Swedish	15	1	4	20		1	4	12			2		
Norwegian	8	1	1	10	1			6			1	1	1
Armenian	1			1									
Syrian	8			8	1			1					
U. S. Citizens	6	3	20	29				2	1	6	4		3
Totals	2,726	618	378	3,722	36	3	4	2,252	109	123	222	62	94

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V.

Canada at the Port of North Sydney for the Fiscal Year ending March 31, 1908.

Occupation.										Destination.						
Clerks, Traders, &c.			Miners.			Female Servants.	Not classified.			Maritime Provinces.	Quebec.	Ontario.	Manitoba.	Saskatchewan.	Alberta.	British Columbia.
Males.	Females.	Children.	Males.	Females.	Children.		Males.	Females.	Children.							
...	....	...	1	....	....	....	....	.....	...	5	.....	...	.....	.....	.....	.....
5	...	...	...	....	....	.....	1	...	...	3	8	1	...	.....	.....	.....
4	3	6	...	...	....	16	1	11	10	127	69	.....	.....	.....	.....	.....
1	...	....	6	....	....	.....	.....	...	.....	10	....	...	....	.....	.....	...
3	....	...	10	....	....	...	4	.....	3	47	3	2	2	.....	1	1
....	....	....	2	....	....	.....	.....	...	.....	6	....	...	.	.....	.....	...
3	....	....	...	....	....	.....	.....	....	.....	12	2	....	3	.....	.....	1
1	....	....	1	....	....	.....	2	1	.....	5	1	2	...	.....	.....	...
....	....	....	...	....	....	.....	....	....	.....	3	....	.....	..	...	.....	..
...	....	....	...	....	....	.....	.....	.....	.....	1	.....	.....	.....	.....	.....	.....
6	....	2	...	....	....	.....	.....	.....	.....	8	.....	.....	.....	.....	.....	.....
41	8	5	95	30	41	284	21	89	79	2,963	140	103	23	2	11	78
....	....	....	....	....	....	.....	.....	...	.....	6	1	....	.....	.....	.....	.....
....	....	....	....	....	....	....	.....	....	.....	1	.....	...	.....	.....	.....	.....
....	....	....	...	....	....	....	.....	.....	.....	1	2	.....	.....	.....	....	.....
1	....	....	...	....	....	... ..	... ..	.....	.....	9	1	....	10	.....	....	.....
...	....	....	....	....	....	.....	.....	.....	.....	6	1	1	1	.....	.....	1
1	....	....	...	....	....	...	.....	....	. ..	1	.....	.....	.....	.....	....	.....
6	...	....	....	....	....	.....	. ..	...	.....	6	1	1	.....	.....	.....	.....
....	....	....	....	....	....	.....	.....	2	11	23	....	5	.....	.....	.....	1
72	11	13	115	30	41	300	29	103	103	3,243	229	115	39	2	12	82

PORT OF HALIFAX.

For the fiscal year 1907-8 there arrived at the port of Halifax 36,091 passengers, of whom 2,002 travelled saloon and 34,089 steerage. Of the saloon passengers 1,909 were destined to Canada and 93 to the United States. Of the steerage passengers 31,279 were for Canada and 2,810 for the United States. Included in the steerage passengers for Canada were 2,624 returned Canadians and 336 tourists, leaving the immigration proper at 28,319 souls, a decrease, as compared with the twelve months ending March 31, 1907, of 293 persons.

Table I. deals with the total arrivals of saloon passengers, Table II. with the total arrivals of steerage passengers, Table III. with the monthly arrivals of immigrants for Canada, and Tables IV. and V. give summaries of the information obtained from immigrants for Canada upon arrival.

TABLE I.

NATIONALITY and Sex of Saloon Passengers arriving at the Port of Halifax for the Fiscal Year ending March 31, 1908.

	CANADA.				UNITED STATES.				CANADA AND UNITED STATES.			
	Males.	Females.	Children.	Totals.	Males.	Females.	Children.	Totals.	Males.	Females.	Children.	Totals.
Australian	1	1		2					1	1		2
French	17	4	3	24					17	4	3	24
German		1		1						1		1
English	294	133	28	455	1	1		2	295	134	28	457
Welsh	3	2		5					3	2		5
Scotch	37	22		59					37	22		59
Irish	10	7		17					10	7		17
West Indian	7	4	1	12					7	4	1	12
Bermudian	2	10	4	16					2	10	4	16
Jamaican	2	2		4					2	2		4
Italian	1			1					1			1
Newfoundland	13	21	1	35	4		1	5	17	21	2	40
Russian		1		1						1		1
Spanish	1			1					1			1
Norwegian	1	1		2					1	1		2
Armenian	1	1	2	4					1	1	2	4
U. S. A. Citizens	16	11	2	29	7	2		9	23	13	2	38
Canadian	218	123	34	375	1			1	219	123	34	376
Tourists	474	322	70	866	71	4	1	76	545	326	71	942
Totals	1,098	666	145	1,909	84	7	2	93	1,182	673	147	2,002

TABLE II.

NATIONALITY and Sex of Steerage Passengers arriving at the Port of Halifax for the Fiscal Year ending March 31, 1908.

	CANADA.				UNITED STATES.				CANADA AND UNITED STATES.			
	Males.	Females.	Children.	Totals.	Males.	Females.	Children.	Totals.	Males.	Females.	Children.	Totals.
African, South	7	1	7	15					7	1	7	15
Australian	9			9					9			9
Austrian, N.E.S	102	16	5	123	17	23	14	54	119	39	19	177
Bohemian	14	1	5	20	1			1	15	1	5	21
Bukowinian	59	12	2	73					59	12	2	73
Croatian	14		1	15	17	1	2	20	31	1	3	35
Galician	1,114	360	380	1,854	8	6	2	16	1,122	366	382	1,870
Hungarian	21	5	5	31	9	6	2	17	30	11	7	48
Belgian	138	54	44	236	19	3	2	24	157	57	46	260
Bulgarian	290		4	294	106			106	396		1	400
Brazilian	1			1					1			1
Chinese	15			15					15			15
Dutch	208	54	105	367	11	3	11	25	219	57	116	392
French	349	105	74	528	5	2	4	11	354	107	78	539
German, N.E.S	191	91	174	456	48	26	35	109	239	117	209	565
Alsatian		1	1	2						1	1	2
Bavarian	2			2					2			2
English	9,973	2,940	2,509	15,422	160	88	72	320	10,133	3,028	2,581	15,742
Welsh	99	13	17	129	4	3		7	103	16	17	136
Scotch	2,152	661	517	3,330	26	13	8	47	2,178	674	525	3,377
Irish	601	170	97	868	23	5	3	31	624	175	100	899
West Indian	38	14	1	53	7			7	45	14	1	60
Bermudian	6	3	1	10					6	3	1	10
Jamaican	50	8		58					50	8		58
Greek	135	6	4	145	16	1	1	18	151	7	5	163
Hebrew, N.E.S	200	177	194	571	8	2	1	11	208	179	195	582
" Russian	363	270	289	922	33	17	14	64	396	287	303	986
" Polish	8	6	7	21	1			1	9	6	7	22
" Austrian	21	4	3	28	2			2	23	4	3	30
" German	5	2	3	10					5	2	3	10
Italian	200	16	11	227	19	5	5	29	219	21	16	256
Japanese	3			3					3			3
Newfoundland	33	16	5	54	17	1		18	50	17	5	72
Polish, N.E.S	7	3	2	12	10	3	2	15	17	6	4	27
" Austrian	5	1		6	1			1	6	1		7
" Russian	41	10	10	61	42	14	25	81	83	24	35	142
Persian	4			4	3	3		6	7	3		10
Roumanian	43	37	64	144	5	2		7	48	39	64	151
Russian, N.E.S	373	152	224	749	359	136	163	658	732	288	387	1,407
Finnish	96	35	8	139	158	74	24	256	254	109	32	395
Spanish	1	2		3					1	2		3
Swiss	22	4	3	29	1			1	23	4	3	30
Servian	4			4					4			4
Danish	23	6		29	28	8	13	49	51	14	13	78
Icelandic	2	1	8	11					2	1	8	11
Swedish	73	20	11	104	82	39	25	146	155	59	36	250
Norwegian	116	25	12	153	236	71	35	342	352	96	47	495
Turkish	105	3	1	109	30	2		32	135	5	1	141
Armenian	196	115	82	393	22	24	12	58	218	139	94	451
Egyptian	2			2					2			2
Syrian	272	85	55	412	96	39	41	176	368	124	96	588
Arabian	10	2	2	14	3		3	6	13	2	5	20
U.S. Citizens	7	3	1	11	23	11	3	37	30	14	4	48
Negro	34	4		38	1			1	35	4		39
Total Immigration	17,857	5,514	4,948	28,319	1,657	631	522	2,810	19,514	6,145	5,470	31,129
Returned Canadians	2,108	347	169	2,624					2,108	347	169	2,624
Tourists	239	78	19	336					239	78	19	336
Totals	20,204	5,939	5,136	31,279	1,657	631	522	2,810	21,861	6,570	5,658	34,089

TABLE III.

Monthly arrivals of Immigrants for Canada, by Nationalities, at the Port of Halifax, for the Fiscal Year ending March 31, 1908.

	April.	May.	June.	July.	August.	September.	October.	November.	December.	January.	February.	March.	Totals.
African, South	6	3	1	2	2						1		15
Australian	5	1						1				2	9
Austrian, N.E.S.	8	5						3	32	3	19	53	123
Bohemian										6		14	20
Bukowinian	34	1	1						37				73
Croatian									1			14	15
Galician	1,040	4	616		5		2	12	158		2	15	1,854
Hungarian	11	2	2		2				8			6	31
Belgian	71	26			1	9		37	21	4	12	52	236
Bulgarian		14		13	1			7	258	1			294
Brazilian								1					1
Chinese						14					1		15
Dutch	281			1				3	16		13	53	367
French	129	126	7		7			5	36	48	55	115	528
German, N.E.S.	136	61	11	30	1	18	1	34	46	38	42	38	456
Alsatian		2											2
Bavarian	1		1										2
English	9,392	1,252	473	140	159	88	78	326	442	223	478	2,371	15,422
Welsh	64	17	3	2	2	3		7	1	10	5	15	129
Scotch	2,353	53	36	23	39	21	12	83	160	108	126	316	3,330
Irish	473	62	17	15	9	10	5	31	26	23	34	133	868
West Indian	1	17	6	16		4	2		4			3	53
Bermudian	2	3	2	2						1			10
Jamaican	3		2	1	39		5	8					58
Greek	7	3		6	32	25	8	29	24	11			145
Hebrew, N.E.S.	14	15	3	1		2	1	9	243	179	13	91	571
" Russian	76	47	34	52	17	41	9	121	249	121	67	88	922
" Polish			1	1					2	2	5	10	21
" Austrian				1				3	13	5	1	5	28
" German					4			5	1				10
Italian	80	52	1				2		46	8	18	20	227
Japanese				1						1		1	3
Newfoundland	2	30	1		10	2	2	6	1				54
Polish, N.E.S.						1		3	4	4			12
" Austrian			1			1			3			1	6
" Russian	1		3			4	5	20	21	7			61
Persian										2	2		4
Roumanian		15						1	30	80		18	144
Russian, N.E.S.	48	34	26	13	6	4		164	203	84	53	114	749
Finnish	50	4		1				36	20	16	8	4	139
Spanish	1								1		1		3
Swiss	6	9						1	3	2		8	29
Servian												4	4
Danish	12	1			1			4	2	1	3	5	29
Icelandic	2								9				11
Swedish	36			2				20	14	8	14	10	104
Norwegian	110				14		3	3	7	1	5	10	153
Turkish	24	3	7	8	6	13	3	40		4	1		109
Armenian	6	10	17	71	25	85	38	129	1	5	1	5	393
Egyptian			1			1							2
Syrian			45	39	119	41	22	127	12	3		4	412
Arabian	4	1		2	4			2			1		14
U. S. Citizens	2		1				1	1	1			5	11
Negro		12	6		18		1					1	38
Totals	14,491	1,885	1,355	443	523	387	200	1,282	2,159	1,009	981	3,604	28,319

TABLE IV.

MONTHLY arrivals of Immigrants for Canada by Occupation and Destination at the Port of Halifax for the Fiscal Year ending March 31, 1908.

	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Totals.
Agriculturists	5,494	482	655	125	62	43	45	285	529	203	336	1,854	10,113
General labourers	2,678	585	376	83	197	96	44	282	589	203	111	342	5,586
Mechanics	4,508	467	161	143	119	118	53	337	677	395	289	735	8,002
Clerks	743	79	22	27	37	43	13	138	109	54	104	213	1,582
Miners	216	46	48	20	28	17	14	70	58	50	51	165	783
Female servants	504	52	63	22	31	18	16	105	125	61	57	185	1,239
Not classed	348	174	30	23	49	52	15	65	72	43	33	110	1,014
Totals	14,491	1,885	1,355	443	523	387	200	1,282	2,159	1,009	981	3,604	28,319
Maritime Provinces	834	309	494	184	416	184	120	360	291	82	115	377	3,766
Quebec	1,602	288	115	103	56	132	49	331	572	475	254	429	4,406
Ontario	6,409	518	125	91	25	37	25	307	736	256	307	1,068	9,904
Manitoba	3,562	381	364	47	9	1	4	154	320	100	157	555	5,654
Saskatchewan	822	260	94	12	5	19	...	54	105	30	47	347	1,795
Alberta	930	92	161	2	6	1	..	47	70	32	38	266	1,645
British Columbia	332	37	2	4	6	13	2	29	65	34	63	562	1,149
Totals	14,491	1,885	1,355	443	523	387	200	1,282	2,159	1,009	981	3,604	28,319

TABLE

NATIONALITY, Sex, Occupation and Destination of Immigrant arrivals

	Sex.				Trade or Farmers or Farm Labourers Class.			General Labourers.			Mechanics.		
	Males.	Females.	Children.	Totals.	Males.	Females.	Children.	Males.	Females.	Children.	Males.	Females.	Children.
African, South	7	1	7	15	5	1	5						2
Australian	9			9	3			1			4		
Austrian, N.E.S.	102	16	5	123	12	3	2	21	1		7	3	
Bohemian	14	1	5	20									
Bukowinian	59	12	2	73	40	8	2	19					
Croatian	14		1	15				1					
Galician	1,114	360	380	1,854	968	212	343	116	16	16	28	7	13
Hungarian	21	5	5	31	6	2	4	11	1		1	1	1
Belgian	138	54	44	236	55	13	20	19	3		16	12	2
Bulgarian	290		4	294	95		3	188		1	4		
Brazilian	1			1									
Chinese	15			15				1					
Dutch	208	54	105	367	121	27	45	28	8	34	53	9	17
French	349	105	74	528	203	48	48	38	6	5	68	19	13
German, N.E.S.	191	91	174	456	90	54	144	17	4		47	11	22
Alsatian		1	1	2								1	1
Bavarian	2			2	1						1		
English	9,973	2,940	2,509	15,422	3,747	737	848	2,271	348	392	3,148	844	811
Welsh	99	13	17	129	27	1	7	14			37	4	
Scotch	2,152	661	517	3,330	550	111	121	447	49	74	841	163	173
Irish	601	170	97	868	208	26	29	183	11	10	109	33	23
West Indian	38	14	1	53	3			16	1	1	18		
Bermudian	6	3	1	10				3			2	1	
Jamaican	56	8		68				43			2		
Greek	135	6	4	145	12			107	2	4	6	2	
Hebrew, N.E.S.	200	177	194	571	82	46	90	25	9	9	74	105	78
" Russian	363	270	289	922	40	14	21	25	12	15	276	180	175
" Polish	8	6	7	21				1			7	5	6
" Austrian	21	4	3	28	1			2			13	3	2
" German	5	2	3	10	3						2	2	3
Italian	200	16	11	227	18	4	4	161	5	4	15	2	2
Japanese	3			3							1		
Newfoundland	33	16	5	54	1			24	1	4	4	1	
Polish, N.E.S.	7	3	2	12	1			2	1		4	1	2
" Austrian	5	1		6	3						1		
" Russian	41	10	10	61	6			18	3	4	9	5	4
Persian	4			4				2			2		
Roumanian	43	37	64	144	13	11	26	15	6	16	12	15	21
Russian, N.E.S.	373	152	224	749	148	63	129	146	15	26	48	36	38
Finnish	96	35	8	139	7	2	5	76	8	2	4	2	1
Spanish	1	2		3				1	1				
Swiss	22	4	3	29	12		2	1			8		
Servian	4			4									
Danish	23	6		29	14			5			2	2	
Icelandic	2	1	8	11		1	8	2					
Swedish	73	20	11	104	30	4	3	32	3	5	7	1	3
Norwegian	116	25	12	153	52	6	11	40	1	1	18	2	
Turkish	105	3	1	109	21			73	1		10	1	1
Armenian	196	115	82	393	41	4	7	61	22	23	81	31	25
Egyptian	2			2							1		
Syrian	272	85	55	412	118	10	13	102	15	11	26	17	4
Arabian	10	2	2	14	2			5	1		1		
U. S. Citizens	7	3	1	11	2				1	1	2		
Negro	34	4		38	4			10			15		
Totals	17,857	5,514	4,948	28,319	6,765	1,408	1,949	4,373	555	658	5,038	1,521	1,443

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V.

for Canada, at the Port of Halifax, for the Fiscal Year ending March 31, 1908.

Occupation.										Destination.						
Clerks, Traders, &c.			Miners.			Female servants.	Not Classified.			Maritime Provinces.	Quebec.	Ontario.	Manitoba.	Saskatchewan.	Alberta.	British Columbia.
Males.	Females.	Children.	Males.	Females.	Children.		Males.	Females.	Children.							
2										2	1	7	1		2	2
							1			1		6	1		1	
1	2	3	61	2		4		1		85	12	8	4	9	7	
			14	1	5					20						
						4				6	27	9	19	11		1
			13		1					14						1
			2	1	1	118		6	7	53	218	202	934	135	311	1
			3			1				9	2	1	11	6	2	
7			41	18	22	7		1		91	31	4	75	15	19	1
2							1			44	15	236	2			
1										1						
14											15					
3	1	7				6	3	3	2	6	20	130	144	17	47	3
16	4		9	7	8	15	15	6		51	162	47	190	35	38	5
12	7	5	19			14	6	1	3	34	38	37	187	114	28	18
											2					
										1	1					
518	200	124	178	60	87	568	111	183	247	1,857	1,711	6,605	2,663	1,005	742	839
9		4	12	2	6	4		2		29	13	37	20	17	6	7
182	49	39	74	27	32	232	55	30	78	413	340	1,419	610	161	232	155
82	20	17	4	2	2	60	15	18	16	129	86	322	156	57	76	42
1	1					12				39	1	13				
1						2			1	9			1			
5						8				50		8				
10	1					1				93	22	28	2			
14	4	7				6	5	7	10	10	372	34	101	47	7	
20	23	54				27	2	14	21	59	488	242	114		19	
						1			1	3	10	8				
3	1	1					2			5	10	9	4			
											7		1		2	
2	1	1	4			3		1		8	125	52	12		19	11
							2			2	1					
3						9	1	5	1	51	1	2				
						1				1	6	3	2			
			1			1				2	1	2	1			
	1	2	8			1				24	22	13	1			1
												4				
2	1	1				2	1	2		1	62	17	41	23		
2	7	14	26	3	3	19	3	9	14	65	113	128	244	113	46	40
			9			23				8	13	96	11		1	10
	1											1			1	1
							1	4	1	2	10	6	2	3	5	1
			4							4						
2	1			1		2				3	11	7	6	1	1	
													11			
2	1		1			10	1	1		10	9	20	37	10	15	3
1			5			14		2		24	11	37	45	16	15	5
1								1		27	48	34				
5	5	10	1			37	7	16	17	44	301	48				
1										1	1					
22	7	3			1	25	4	11	23	346	54	18				
2								1	2	7	7					
1			1	1			1	1		3	3	1			2	2
2	1					2	3	1		30	3	3	1		1	
951	339	292	490	125	168	1,239	240	327	447	3,766	4,406	9,904	5,654	1,795	1,645	1,149

PORT OF ST. JOHN.

For the fiscal year 1907-8 there arrived at the port of St. John 23,774 passengers, of whom 1,323 travelled saloon and 22,451 steerage. Of the saloon passengers 1,286 were destined to Canada and 37 to the United States. Of the steerage passengers 20,527 were for Canada and 1,924 for the United States. Included in the steerage passengers for Canada were 2,228 returned Canadians and 405 tourists, leaving the immigration proper at 17,894 souls, a decrease, as compared with the twelve months ending March 31, 1907, of 1,026 persons.

Table I. deals with the total arrivals of saloon passengers, Table II. with the total arrivals of steerage passengers, Table III. with the monthly arrivals of immigrants for Canada, and Tables IV. and V. give summaries of the information obtained from immigrants for Canada upon arrival.

TABLE I.

NATIONALITY and Sex of Saloon Passengers arriving at the Port of St. John for the Fiscal Year ending March 31, 1908.

	CANADA.				UNITED STATES.				CANADA AND UNITED STATES.			
	Males.	Females.	Children.	Totals.	Males.	Females.	Children.	Totals.	Males.	Females.	Children.	Totals.
African, South	1			1					1			1
Australian		2	1	3						2	1	3
Austrian	2	3		5					2	3		5
Belgian	3	1		4					3	1		4
Chinese	2			2					2			2
Dutch	1			1					1			1
French	7	5		12		1		1	7	6		13
German	4	1		5	1			1	5	1		6
English	337	141	43	521	11	3	2	16	348	144	45	537
Welsh	6	3	3	12		1		1	6	4	3	13
Scotch	55	14	3	72	1			1	56	14	3	73
Irish	21	4		25	1			1	22	4		26
West Indian	24	18	17	59					24	18	17	59
Bermudian	46	54	27	127					46	54	27	127
Japanese	4	2	1	7					4	2	1	7
Finnish		1		1						1		1
Spanish	1			1					1			1
Danish		1		1						1		1
Swedish	3			3					3			3
Egyptian	1			1	1			1	2			2
U. S. Citizens	9	4	1	14	6	6	1	13	15	10	2	27
Negro	4	3		7					4	3		7
Hindoo	2			2					2			2
Canadian	196	134	30	360		1		1	196	135	30	361
Tourists	26	11	3	40	1			1	27	11	3	41
Totals	755	402	129	1,286	22	12	3	37	777	414	132	1,323

TABLE II.

NATIONALITY and Sex of Steerage Passengers arriving at the Port of St. John for the Fiscal Year ending March 31, 1908.

	CANADA.				UNITED STATES.				CANADA AND UNITED STATES.			
	Males.	Females.	Children.	Totals.	Males.	Females.	Children.	Totals.	Males.	Females.	Children.	Totals.
African, South	10	5	2	17					10	5	2	17
Australian	2	2	1	5					2	2	1	5
Austrian, N.E.S.	93	13	16	122	24	17	19	60	117	30	35	182
Bohemian	4	4	6	14	1			1	5	4	6	15
Bukowinian	746	42	28	816					746	42	28	816
Croatian	9			9	1			1	10			10
Galician	2,994	472	326	3,792	18	12	10	40	3,012	484	336	3,832
Hungarian, N.E.S.	134	44	47	225	13	9	1	23	117	53	48	248
Magyar	1			1					1			1
Slovak	2			2					2			2
Belgian	121	39	33	193	14			14	135	39	33	207
Bulgarian	118			118	89			89	207			207
Chinese	10			10					10			10
Dutch	23	5	17	45		2		2	23	7	17	47
French	36	35	1	72					36	35	1	72
German	61	30	37	128	39	26	37	102	100	56	74	230
English	4,004	1,856	1,454	7,314	94	69	58	221	4,098	1,925	1,512	7,535
Welsh	92	24	13	129	3	1	1	5	95	25	14	134
Scotch	851	330	220	1,401	27	13	15	55	878	343	235	1,456
Irish	443	130	67	640	13	8	11	32	456	138	78	672
West Indian	26	36		62					26	36		62
Bermudian	19	10	3	32					19	10	3	32
Jamaican	2			2					2			2
Greek	6			6	5			5	11			11
Hebrew, N.E.S.	34	44	28	106		1		1	34	45	28	107
" Russian	153	101	63	317	10	21	17	48	163	122	80	365
" Polish	6			6					6			6
" Austrian	3	1		4					3	1		4
" German		1	2	3						1	2	3
Italian	1,017	17	14	1,048	13	1		14	1,030	18	14	1,062
Japanese	3			3					3			3
New Zealand	2			2					2			2
Polish, N.E.S.	2	1		3	1	2		3	3	3		6
" German	2	1		3					2	1		3
" Russian	51	17	6	74					51	17	6	74
Roumanian	11	4	10	25	13	10	10	33	24	14	20	58
Russian, N.E.S.	236	36	26	292	213	75	58	346	443	111	84	638
Finnish	74	23	4	101	75	32	14	121	149	55	18	222
Spanish	4			4					4			4
Swiss	11	4		15					11	4		15
Danish	23	8	9	40	45	20	5	70	68	28	14	110
Icelandic		2	4	6						2	4	6
Swedish	247	56	48	351	105	66	26	197	352	122	74	548
Norwegian	142	30	30	202	259	67	35	361	401	97	65	563
Turkish	30	1		31	15			15	45	1		46
Egyptian	2			2					2			2
Syrian	6	2	1	9					6	2	1	9
Arabian	1			1					1			1
U. S. Citizens	4	2		6	33	11	9	53	37	13	9	59
Negro	48	26	11	85	3	3		6	51	29	11	91
Total immigration	11,913	3,454	2,527	17,894	1,126	466	326	1,918	13,039	3,920	2,853	19,812
Returned Canadians	1,704	347	177	2,228					1,704	347	177	2,228
Tourists	293	59	53	405	6			6	299	59	53	411
Totals	13,910	3,860	2,757	20,527	1,132	466	326	1,924	15,042	4,326	3,083	22,451

TABLE III.

MONTHLY arrivals of Immigrants for Canada, by Nationalities, at the Port of St. John for the Fiscal Year ending March 31, 1908.

	April.	May.	June.	July.	August.	September.	October.	November.	December.	January.	February.	March.	Totals
African, South.	1								9	3	3	1	17
Australian									1		2	2	5
Austrian, N.E.S.	95							5	2	7	12	1	122
Bohemian	13								1				14
Bukowinian	642								21	38	29	86	816
Croatian								9					9
Galician	3,374								66	85	72	195	3,792
Hungarian, N.E.S.	206							5	4	7	2	1	225
Magyar	1												1
Slovak										2			2
Belgian	141								11	16	11	14	193
Bulgarian								88	22	7		1	118
Chinese							1		3	5		1	10
Dutch	19							1	4	19		2	45
French	2			1				14	22	7	14	12	72
German	52							2	2	32	20	20	128
English	3,379	8	22	3	11	3	10	290	646	269	912	1,761	7,314
Welsh	41	1						7	12	15	22	31	129
Scotch	763						5	58	124	62	99	290	1,401
Irish	357							14	73	23	51	122	640
West Indian	10	3	4	11	2	1	14	11	2	1	1	2	62
Bermudian	8	10	3	7			2				2		32
Jamaican	1							1					2
Greek	6												6
Hebrew, N.E.S.	19								9	42	8	28	106
" Russian	81							3	27	111	55	40	317
" Polish	1								1	1	3		6
" Austrian	1									1	1	1	4
" German	3												3
Italian	1,001							4	8	13	1	21	1,048
Japanese								3					3
New Zealand	1								1				2
Polish, N.E.S.	2								1				3
" German												3	3
" Russian	18							7	4	25	4	16	74
Roumanian	14							5	3	2	1		25
Russian, N.E.S.	93							39	26	44	38	52	292
Finnish	25							15	43	12	4	2	101
Spanish	3										1		4
Swiss	8							1	1		1	4	15
Danish	21							1	8	1	4	5	40
Icelandic	6												6
Swedish	227							63	33	2	10	16	351
Norwegian	127				1			9	13	10	18	24	202
Turkish	27							1	1		2		31
Egyptian					2								2
Syrian	1						2	2				4	9
Arabian										1			1
U.S. Citizens	3								2			1	6
Negro		7	11	28	32	6						1	85
Totals	10,793	29	40	50	48	10	34	658	1,206	863	1,403	2,760	17,894

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TABLE IV.

Monthly arrivals of Immigrants for Canada, by Occupation and Destination, at the Port of St. John, for the Fiscal Year ending March 31, 1908.

	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Totals.
Agriculturists	1,306	1	2	...	6	...	...	119	158	85	312	534	2,523
General labourers	6,406	...	1	17	2	...	8	198	320	261	289	664	8,166
Mechanics	1,937	5	9	10	13	4	7	141	357	286	368	873	4,010
Clerks	273	7	4	2	3	3	10	58	116	85	163	301	1,025
Miners	169	...	...	...	...	...	...	49	62	43	50	58	431
Female servants	393	1	19	16	10	...	7	49	94	48	105	138	880
Not classed	309	15	5	5	14	3	2	44	99	55	116	192	859
Totals	10,793	29	40	50	48	10	34	658	1,206	863	1,403	2,760	17,894
Maritime Provinces	720	1	24	41	33	7	16	73	161	68	85	173	1,400
Quebec	1,854	7	2	...	7	3	...	175	229	198	238	362	3,075
Ontario	2,920	5	9	9	3	...	18	149	441	232	394	864	5,044
Manitoba	3,785	4	2	...	4	...	...	56	120	180	251	555	4,957
Saskatchewan	675	...	...	...	1	...	...	70	30	36	67	254	1,133
Alberta	529	11	3	...	...	...	...	24	46	39	129	263	1,044
British Columbia	310	1	...	...	...	...	...	111	179	110	240	289	1,240
Yukon	...	...	...	...	...	...	...	...	...	...	1	...	1
Totals	10,793	29	40	50	48	10	34	658	1,206	863	1,403	2,760	17,894

TABLE

NATIONALITY, Sex, Occupation and Destination of Immigrant Arrivals for

	Sex.				Trade or								
					Farmers or Farm Labourers Class.			General Labourers.			Mechanics.		
	Males.	Females.	Children.	Totals.	Males.	Females.	Children.	Males.	Females.	Children.	Males.	Females.	Children.
African, South	10	5	2	17	....	3	2	2	....	....	2	....	....
Australian	2	2	1	5	....	....	....	....	....	....	1	1	....
Austrian, N.E.S.	93	13	16	122	1	1	3	89	4	7	2	2	2
Bohemian	4	4	6	14	....	....	....	1	....	....	3	2	3
Bukowinian	746	42	28	816	2	5	4	706	23	19	29	....	....
Croatian	9	....	....	9	....	....	....	9	....	....	....	....	....
Galician	2,994	472	326	3,792	7	10	12	2,893	222	291	79	8	9
Hungarian, N.E.S.	134	44	47	225	1	4	4	130	30	37	3	1	3
Magyar	1	....	....	1	....	....	....	1	....	....	....	....	....
Slovak	2	....	....	2	....	....	....	2	....	....	....	....	....
Belgian	121	39	33	193	6	6	9	48	8	14	22	7	4
Bulgarian	118	....	....	118	19	....	....	97	....	....	1	....	....
Chinese	10	....	....	10	....	....	....	8	....	....	....	....	....
Dutch	23	5	17	45	9	1	4	4	....	....	9	3	12
French	36	35	1	72	9	4	....	5	....	....	6	4	....
German	61	30	37	128	12	7	11	30	4	9	12	8	15
English	4,004	1,856	1,454	7,314	1,038	300	263	873	247	259	1,413	577	576
Welsh	92	24	13	129	22	2	2	9	3	3	40	5	7
Scotch	851	330	220	1,401	239	46	63	108	26	19	372	75	77
Irish	443	130	67	640	119	23	25	107	11	8	128	26	18
West Indian	26	36	....	62	1	....	....	6	....	....	6	4	....
Bermudian	19	10	3	32	1	....	...	2	...	...	11	1	....
Jamaican	2	....	....	2	....	....	....	1	....	....	1	..	....
Greek	6	....	....	6	2	....	....	3	....	....	1	....	....
Hebrew, N.E.S.	34	44	28	106	....	....	...	7	4	3	21	26	19
" Russian	153	101	63	317	1	....	....	50	12	7	96	65	37
" Polish	6	....	....	6	....	....	....	4	....	....	1	....	....
" Austrian	3	1	....	4	....	....	....	1	....	....	2	....	....
" German	....	1	2	3	....	....	....	....	....	....	....	1	2
Italian	1,017	17	14	1,048	3	....	....	998	11	13	11	1	....
Japanese	3	....	....	3	....	....	....	....	....	....	3	....	....
New Zealand	2	....	....	2	1	....	....	....	....	....	....	....	....
Polish, N.E.S.	2	1	....	3	1	....	....	1	....	....	....	1	....
" German	2	1	....	3	....	....	....	1	1	....	1	....	....
" Russian	51	17	6	74	6	1	1	38	3	3	6	4	1
Roumanian	11	4	10	25	1	....	4	6	....	....	3	1	....
Russian, N.E.S.	230	36	26	292	24	1	3	183	12	16	21	6	1
Finnish	74	23	4	101	4	....	....	67	1	...	1	....	....
Spanish	4	....	....	4	....	....	....	2	....	....	2	....	....
Swiss	11	4	....	15	2	1	....	7	1	....	2	....	....
Danish	23	8	9	40	8	2	9	9	....	....	4	1	....
Icelandic	....	2	4	6	....	....	....	....	....	....	....	1	4
Swedish	247	56	48	351	49	11	26	174	5	8	21	3	1
Norwegian	142	30	30	202	30	7	10	94	5	11	15	....	....
Turkish	30	1	....	31	11	....	....	10	....	....	8	....	....
Egyptian	2	....	....	2	....	....	....	....	....	....	....	....	....
Syrian	6	2	1	9	....	....	....	2	....	....	....	....	....
Arabian	1	....	....	1	....	....	....	1	....	....	....	....	....
U.S.A. Citizens	4	2	...	6	2	....	....	....	1	....	1	....	....
Negro	48	26	11	85	2	....	....	16	....	....	18	1	6
Totals	11,913	3,454	2,527	17,894	1,633	435	455	6,805	634	727	2,378	835	797

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V.

Canada at the Port of St. John, for the Fiscal Year ending March 31, 1908.

Occupation.										Destination.							
Clerks, Traders, &c.			Miners.			Female servants.	Not Classified.			Maritime Provinces.	Quebec.	Ontario.	Manitoba.	Saskatchewan.	Alberta.	British Columbia.	Yukon.
Males.	Females.	Children.	Males.	Females.	Children.		Males.	Females.	Children.								
5	2						1				6	2	1			8	
			1					1	1	1		1	1			2	
1				1	3	4		1	1	5	73	2	21	10	5	6	
				2	3							6	2		1	5	
			9	1	1	9		4	4	103	237	66	338	39	24	9	
											8		1				
1			13	2	1	217	1	13	13	131	571	494	2,328	137	107	24	
						7		2	3	14	10	38	49	114			
														1			
															2		
2			42	5	6	10	1	3		51	23	2	73	20	17	7	
			1							24	77	11	6				
2										1	7	1	1				
1	1	1											33			12	
3			3			3	10	24	1	6	49	2	8	3	3	1	
3			3			6	1	5	2	7	9	18	57	8	20	9	
422	164	124	151	42	55	326	107	200	177	533	699	2,890	1,290	550	561	790	1
3	4		17			5	1	5	1	12	7	43	21	5	5	36	
86	38	20	31	6	12	94	15	45	29	77	172	480	279	116	129	148	
63	16	6	4			33	22	21	10	28	83	238	130	30	75	56	
9						31	4	1		30	3	28	1				
1						7	4	2	3	20					12		
										1		1					
											1	5					
6	2	4				6		6	2	1	84	2	15	4			
2	5	7	1			11	3	8	12	31	187	57	40	2			
							1			1	3	1	1				
								1			4						
											3						
2			3			5			1	143	609	261	22		4	9	
										2	1						
			1								1	1					
												1		1		1	
												1	2				
1						8		1	1	4	33	6	21	1		9	
	1						1	2	6	2	15		7	1			
			1			12	1	5	6	53	47	44	103	6	13	26	
			2			18		4	4	2	6	71	3		7	12	
										2		2					
						2					1	6	2		2	4	
2						4		1		2	3	8	16	5	4	2	
						1					5				1		
1			2	2	2	30		5	11	11	7	175	37	57	19	45	
	1		2			10	1	7	9	31	10	41	48	23	31	18	
1	1										4	27					
							2			2							
4	2	1								3	6						
										1							
1								1		2		1			2	1	
3						21	9	4	5	63	11	11					
625	237	163	287	61	83	880	185	372	302	1,400	3,075	5,044	4,957	1,133	1,044	1,240	1

PORT OF QUEBEC.

For the fiscal year 1907-8 there arrived at the port of Quebec 146,142 passengers, of whom 7,210 travelled saloon and 138,932 steerage. Of the saloon passengers 6,412 were destined to Canada and 798 to the United States. Of the steerage passengers 122,028 were for Canada and 16,904 for the United States. Included in the steerage passengers for Canada were 7,989 returned Canadians and 1,715 tourists, leaving the immigration proper at 112,324 souls, an increase over the twelve months ending March 31, 1907, of 28,420 persons.

Table I. deals with the total arrivals of saloon passengers, Table II. with the total arrivals of steerage passengers, Table III. with the monthly arrivals of immigrants for Canada, and Tables IV. and V. give summaries of the information obtained from immigrants for Canada upon arrival.

TABLE I.

NATIONALITY and Sex of Saloon Passengers arriving at the Port of Quebec, for the Fiscal Year ending March 31, 1908.

	CANADA.				UNITED STATES.				CANADA AND UNITED STATES.			
	Males.	Females.	Children.	Totals.	Males.	Females.	Children.	Totals.	Males.	Females.	Children.	Totals.
African, South.	3	1		4					3	1		4
Australian	9	11	4	24	1			1	10	11	4	25
Hungarian	1			1					1			1
Belgian	13	3	2	18	1	1		2	14	4	2	20
Chinese	1			1					1			1
Dutch	4			4					4			4
French	55	39	6	100	2	1		3	57	40	6	103
German	17	6		23	3			3	20	6		26
English	1,541	991	120	2,652	57	40	4	101	1,598	1,031	124	2,753
Welsh	13	3		16					13	3		16
Scotch	298	182	18	498	14	10	1	25	312	192	19	523
Irish	70	53	5	128	3	2		5	73	55	5	133
Hebrew	1	1		2					1	1		2
Italian	7	2		9	2	1		3	9	3		12
Japanese	12	1		13					12	1		13
Newfoundland	1	2		3					1	2		3
New Zealand	4	5		9					4	5		9
Polish					1			1	1			1
Russian		1		1						1		1
Spanish	2	2	5	9					2	2	5	9
Swiss	4	2	1	7	1			1	5	2	1	8
Danish	2			2					2			2
Swedish	3			3					3			3
Syrian	7			7			1	1	7		1	8
U.S. Citizens	35	42	3	80	248	365	28	641	283	407	31	721
Canadian	1,062	1,154	161	2,377	2			2	1,064	1,154	161	2,379
Tourists	260	148	13	421	2	7		9	262	155	13	430
Totals	3,425	2,649	338	6,412	337	427	34	798	3,762	3,076	372	7,210

TABLE II.

NATIONALITY and Sex of Steerage Passengers arriving at the Port of Quebec, for the Fiscal Year ending March 31, 1908.

	CANADA.				UNITED STATES.				CANADA AND UNITED STATES.			
	Males.	Females.	Children.	Totals.	Males.	Females.	Children.	Totals.	Males.	Females.	Children.	Totals.
African, South.	19	8	10	37	1		2	3	20	8	12	40
Australian	24	5	2	31		2		2	24	7	2	33
Austrian, N.E.S.	492	144	163	799	177	87	76	340	669	231	239	1,139
Bohemian	18	10	6	34	3	5	9	17	21	15	15	51
Bukowinian	1,126	65	65	1,256					1,126	65	65	1,256
Croatian	3			3	7	3	1	11	10	3	1	14
Dalmatian	3			3					3			3
Galician	5,535	1,479	1,604	8,618	70	35	24	129	5,605	1,514	1,628	8,747
Hungarian, N.E.S.	246	87	108	441	102	61	58	221	348	148	166	662
Ruthenian	1			1					1			1
Belgian	314	160	134	608	51	18	22	91	365	178	156	699
Bulgarian	877	4	1	882	1,029	11	3	1,043	1,906	15	4	1,925
Chinese	18			18					18			18
Dutch	370	132	145	647	66	47	57	170	436	179	202	817
French	865	380	248	1,493	42	33	21	96	907	413	269	1,589
German, N.E.S.	499	290	369	1,158	168	128	132	428	667	418	501	1,586
Alsatian						1	3	4		1	3	4
Bavarian	4	1		5					4	1		5
Prussian	4	1		5	3	1		4	7	2		9
English	27,213	16,810	16,258	60,281	926	741	524	2,191	28,139	17,551	16,782	62,472
Welsh	334	140	132	606	35	19	14	68	369	159	146	674
Scotch	8,334	4,679	3,368	16,381	261	226	173	660	8,595	4,905	3,541	17,041
Irish	2,299	1,352	667	4,318	163	139	43	345	2,462	1,491	710	4,663
Greek	342	2	15	359	121	1	2	124	463	3	17	483
Hebrew, N.E.S.	341	218	317	876	35	40	55	130	376	258	372	1,006
" Russian	1,397	912	1,103	3,412	24	18	39	81	1,421	930	1,142	3,493
" Polish	7	5	7	19	1	1		2	8	6	7	21
" Austrian	41	23	16	80					41	23	16	80
" German	16	11	7	34	1			1	17	11	7	35
Italian	2,070	60	56	2,186	124	24	11	159	2,194	84	67	2,345
Japanese	5			5					5			5
Newfoundland					1			1	1			1
New Zealand	19	4		23	1			1	20	4		24
Portuguese		1		1						1		1
Polish, N.E.S.	98	35	34	167	36	16	8	60	134	51	42	227
" Austrian	7	2	3	12					7	2	3	12
" Russian	237	67	66	370	13	3	1	17	250	70	67	387
Persian	2	1		3	2			2	4	1		5
Roumanian	188	99	103	390	39	35	27	101	227	134	130	491
Russian, N.E.S.	1,527	613	706	2,846	1,307	758	750	2,815	2,834	1,371	1,456	5,661
Finnish	525	183	76	784	1,017	524	230	1,771	1,542	707	306	2,555
Spanish	24	6	2	32					24	6	2	32
Swiss	84	25	15	124	15	6	2	23	99	31	17	147
Servian	8	1	2	11	1	3	5	9	9	2	5	16
Danish	109	33	19	161	165	75	48	288	274	108	67	449
Icelandic	41	27	12	80					41	27	12	80
Swedish	736	313	315	1,364	617	405	228	1,250	1,353	718	543	2,614
Norwegian	537	237	200	974	1,254	695	333	2,282	1,791	932	533	3,256
Turkish	50	1	2	53	105			105	155	1	2	158
Armenian	55	24	15	94	2	1		3	57	25	15	97
Egyptian	1	2		3	2	1		3	3	3		6
Syrian	92	39	16	147	11	2		13	103	41	16	160
Arabian	18	4	5	27	2		1	3	20	4	6	30
U. S. Citizens	40	13	6	59	738	857	199	1,794	778	870	205	1,853
Hindoo	3			3					3			3
Total immigration	57,218	28,708	26,398	112,324	8,738	5,020	3,099	16,857	65,956	33,728	29,497	129,181
Returned Canadians	4,457	2,729	803	7,989					4,457	2,729	803	7,989
Tourists	807	835	73	1,715	23	20	4	47	830	855	77	1,762
Totals	62,482	32,272	27,274	122,028	8,761	5,040	3,103	16,904	71,243	37,312	30,377	138,932

TABLE III.

MONTHLY arrivals of Immigrants for Canada, by Nationalists, at the Port of Quebec, for the Fiscal Year ending March 31, 1908.

	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Totals.
African, South	5	2	5	5	3	12	5	37
Australian	3	5	12	5	2	2	2	31
Austrian, N.E.S	184	185	91	129	57	61	92	799
Bohemian	5	14	2	2	2	8	1	34
Bukowinian	553	396	134	60	41	63	9	1,256
Croatian				2			1	3
Dalmatian			1				2	3
Galician	3,253	3,437	761	296	192	384	295	8,618
Hungarian, N.E.S	188	73	41	28	33	52	26	441
Ruthenian		1						1
Belgian	161	109	102	85	55	46	50	608
Bulgarian	477	22	77	13	119	297	177	882
Chinese		5	6	1	1	2	3	18
Dutch	176	174	23	108	32	67	67	647
French	367	242	205	249	178	168	84	1,493
German, N.E.S	170	167	189	169	155	205	103	1,158
Bavarian	2					1	2	5
Prussian		1	2		1	1		5
English	14,276	13,759	9,200	8,353	6,044	5,921	2,728	60,281
Welsh	106	109	90	99	62	105	35	606
Scotch	5,219	4,013	2,144	1,350	1,932	1,085	638	16,381
Irish	1,020	1,096	475	568	532	440	187	4,318
Greek	9	105	61	74	23	72	15	359
Hebrew, N.E.S	18	72	93	192	228	234	39	876
" Russian	504	518	557	818	411	300	304	3,412
" Polish	1		11	1	2	4		19
" Austrian	2	31	6	23	4	7	7	80
" German	2	12	5	4	2	5	4	34
Italian	1,293	345	138	131	81	147	51	2,186
Japanese			2		3			5
New Zealand	2	6	10	2	1	1	1	23
Portuguese						1		1
Polish, N.E.S	59	19	35	12	28	14		167
" Austrian	1	8		2		1		12
" Russian	43	49	106	63	19	65	25	370
Persian			3					3
Roumanian	83	60	80	55	29	43	40	390
Russian, N.E.S	491	460	460	455	236	359	385	2,846
Finnish	144	135	156	125	77	84	63	784
Spanish	8	5	2		8	2	7	32
Swiss	29	19	28	22	9	10	7	124
Servian			6	1		4		11
Danish	49	26	23	15	15	25	8	161
Icelandic	8	8	49	5	3	2	5	80
Swedish	384	237	254	149	111	162	67	1,364
Norwegian	305	225	84	107	116	85	52	974
Turkish	1	3	6	8	1	15	19	53
Armenian	3	9	45	16	9	7	5	94
Egyptian	2			1				3
Syrian	31	20	25	16	16	23	16	147
Arabian			19	4	2	1	1	27
U. S. Citizens	7	8	5	21	6	6	6	59
Hindoo					2	1		3
Totals	29,344	26,190	15,829	13,844	10,883	10,600	5,634	112,324

TABLE IV.

MONTHLY arrivals of Immigrants for Canada, by Occupation and Destination, at the Port of Quebec, for the Fiscal Year ending March 31, 1908.

	May.	June.	July.	August.	Sept.	Oct.	Nov.	Totals.
Agriculturists	6,750	6,979	3,323	2,388	1,468	1,596	795	23,299
General labourers	8,541	6,383	3,066	2,261	1,927	2,244	1,228	25,650
Mechanics	8,879	8,186	5,950	5,897	4,085	3,753	2,120	38,870
Clerks	1,920	1,822	1,546	1,432	1,322	1,128	577	9,747
Miners	421	411	355	442	399	562	185	2,775
Female servants	1,463	1,655	830	777	854	802	446	6,827
Not classed	1,370	754	759	647	828	515	283	5,156
Totals	29,344	26,190	15,829	13,844	10,883	10,600	5,634	112,324
Maritime Provinces	327	236	223	186	143	189	83	1,387
Quebec	7,080	5,692	3,901	3,829	3,189	3,002	1,916	28,609
Ontario	10,591	10,361	6,942	6,008	4,438	4,228	2,246	44,814
Manitoba	7,174	5,813	2,377	1,831	1,328	1,124	585	20,232
Saskatchewan	1,832	1,613	730	547	444	509	219	5,894
Alberta	1,387	1,504	829	635	530	530	199	5,614
British Columbia	953	971	827	805	810	1,018	386	5,770
Yukon	.....	.....	.....	3	1	.....	.....	4
Totals	29,344	26,190	15,829	13,844	10,883	10,600	5,634	112,324

TABLE

NATIONALITY, Sex, Occupation and Destination of Immigrant arrivals for

	Sex.				Trade or Farmers or Farm Labourers Class.			General Labourers.			Mechanics.		
	Males.	Females.	Children.	Totals.	Males.	Females.	Children.	Males.	Females.	Children.	Males.	Females.	Children.
African, South.	19	8	10	37	7	4	6	1	1		5	2	4
Australian	24	5	2	31	6	1		6		1	8		
Austrian, N.E.S.	492	144	163	799	146	32	54	257	31	51	64	20	22
Bohemian	18	10	6	34	9	3	1	3	1	4	2	1	
Bukowinian	1,126	65	65	1,256	418	21	43	673	13	18	22	1	3
Croatian	3			3				3					
Dalmatian	3			3	1			2					
Galician	5,535	1,479	1,604	8,618	2,372	527	998	2,914	295	476	166	49	46
Hungarian, N.E.S.	246	87	108	441	95	34	51	124	23	38	17	10	15
Ruthenian	1			1							1		
Belgian	314	160	134	608	124	41	55	54	17	15	84	54	40
Bulgarian	877	4	1	882	24		1	846	2		6		
Chinese	18			18	1			7			5		
Dutch	370	132	145	647	89	40	44	63	12	24	174	43	65
French	865	380	248	1,493	412	97	137	81	19	20	194	92	65
German, N.E.S.	499	290	369	1,158	172	97	194	118	34	57	143	64	80
Bavarian	4	1		5				2			1		
Prussian	4	1		5	1			3			1	1	
English	27,213	16,810	16,258	60,281	5,899	2,039	2,498	5,341	2,044	3,064	11,460	6,386	7,267
Welsh	334	140	132	606	85	17	23	36	12	20	98	42	53
Scotch	8,334	4,679	3,368	16,381	1,917	489	596	1,845	321	435	3,257	1,598	1,617
Irish	2,299	1,352	667	4,318	748	129	136	501	101	130	581	334	236
Greek	342	2	15	359	99		3	223		11	9		
Hebrew, N.E.S.	341	218	317	876	40	19	41	86	32	78	177	121	144
" Russian	1,397	912	1,103	3,412	67	21	42	356	87	140	861	512	663
" Polish	7	5	7	19				2			5	3	7
" Austrian	41	23	16	80	1			12			24	10	10
" German	16	11	7	34	2			2	1		11	6	6
Italian	2,070	60	56	2,186	104	4	6	1,721	26	38	82	13	7
Japanese	5			5				5					
New Zealand	19	4		23	6			1			9	2	
Portuguese		1		1									
Polish, N.E.S.	98	35	31	167	19	4	10	51	10	15	20	5	2
" Austrian	7	2	3	12	2	1	3	5					
" Russian	237	67	66	370	49	11	21	110	17	29	56	13	10
Persian	2	1		3	1			1					
Roumanian	188	99	103	390	36	13	25	90	18	27	49	25	41
Russian, N.E.S.	1,527	613	706	2,846	302	119	230	727	89	146	365	190	220
Finnish	525	183	76	784	57	3	10	347	26	19	45	9	18
Spanish	24	6	2	32	4			12	2		6	1	2
Swiss	84	25	15	124	25	5	9	15	2	1	30	6	5
Servian	8	1	2	11				5		1	2		1
Danish	109	33	19	161	62	10	14	17	2	2	24	3	3
Icelandic	41	27	12	80	13	1	2	12			8	4	1
Swedish	736	313	315	1,364	266	81	145	270	47	83	155	44	66
Norwegian	537	237	200	974	190	53	80	200	36	63	105	30	41
Turkish	50	1	2	53	2		1	41			4	1	1
Armenian	55	24	15	94	4			30	3	3	16	8	11
Egyptian	1	2		3							1		
Syrian	92	39	16	147	7	1	4	51	8	3	14	4	4
Arabian	18	4	5	27		1	1	15					
U. S. Citizens	40	13	6	59	8	2	3	4	2	2	14	5	1
Hindoo	3			3				3					
Totals	57,218	28,708	26,398	112,324	13,892	3,920	5,487	17,302	3,334	5,014	18,381	9,712	10,777

SESSIONAL PAPER No. 25

V.

Canada at the Port of Quebec, for the Fiscal Year ending March 31, 1908.

Occupation.										Destination.							
Clerks, Traders, &c.			Miners.			Female Servants.	Not Classified.			Maritime Provinces.	Quebec.	Ontario.	Manitoba.	Saskatchewan.	Alberta.	British Columbia.	Yukon.
Males.	Females.	Children.	Males.	Females.	Children.		Males.	Females.	Children.								
4	1						2				6	6	22		2	1	
2	3		1			1	1		1	1	9	14	4	2	1		
9	5	9	11	6	12	41	5	9	15	12	321	97	191	85	63	30	
1			3	1	1	3		1		1	7		13	1	4	8	
	1	1	13	1		28				13	587	148	360	77	63	8	
											1	2					
											2	1					
5			74	8	20	565	4	35	64	65	1,805	1,016	4,189	897	571	75	
2			8	1	2	17		2	2	11	77	89	74	183	5	2	
											1						
23	16	9	26	13	11	18	3	1	4	49	220	33	175	43	70	18	
						2	1			1	55	816	5	3		2	
							5				14	3				1	
41	13	10	2			17	1	7	2	8	185	187	190	35	35	7	
99	47	12	15	3	2	59	64	63	12	20	727	77	365	117	141	46	
46	21	23	11	5	5	56	9	13	10	12	298	136	380	162	136	34	
1								1			3	1		1			
											2		1	1	1		
2,975	1,739	1,300	773	293	425	3,244	765	1,074	1,704	626	12,563	30,426	7,771	2,646	2,823	3,422	1
37	14	14	72	15	17	28	6	12	5	8	108	205	78	22	70	115	
958	488	341	182	81	155	1,405	175	297	224	220	3,829	6,213	3,253	778	868	1,220	
390	185	110	18	7	3	488	61	108	52	41	1,012	1,760	937	128	232	208	
10	1					1	1		1	1	47	310	1				
36	14	41				24	2	8	10		744	91	36	1	4		
97	101	206	2	3	9	155	14	33	43	51	1,906	880	421	80	43	31	
						2					3	16					
4	5	6				8				2	52	23	3				
1	3	1						1			24	5	2		3		
12	2		139	3	1	11	12	1	4	148	1,700	226	43	2	20	47	
											5						
3	1							1			8	4	6		3	2	
	1											1	7				
	1	2	8	2	3	11		2	2	4	74	20	36	23	5	4	
						1					2	3				1	
3	1	2	19	2	3	22		1	1	4	197	84	58	12	4	11	
								1			1	2					
12	3	5				37	1	3	5	1	261	37	44	41	6		
40	33	55	81	2	4	151	12	29	51	42	1,084	480	730	239	156	115	
1			75	11	25	133		1	4	2	76	593	30	5	27	51	
2						1		2			3	7	19			3	
8	2					5	6	5		1	64	19	22	6	9	3	
1	1									2	6	3					
4	2			1		13	2	2			42	46	36	10	21	6	
3	1					20	5	1	9		7	3	68		2		
8	3	1	33	7	15	122	4	9	5	12	146	383	404	143	118	158	
10	2	2	22	1	1	108	1	7	13	18	82	239	247	146	105	137	
2							1				14	39					
5	3	1				9		1			71	22	1				
	1							1			3						
18	4	2				17	2	5	3	9	101	34	3				
1		1	1	1	3	2	1				25		2				
6	1		2			2	6	1		2	26	14	5	5	3	4	
											3						
4,880	2,719	2,157	1,591	467	717	6,827	1,172	1,738	2,246	1,387	28,609	44,814	20,232	5,894	5,614	5,770	4

PORT OF VANCOUVER.

For the fiscal year 1907-8 there arrived at the port of Vancouver 14,786 passengers, of whom 1,978 travelled saloon and 12,808 steerage. Of the saloon passengers 1,408 were destined to Canada and 570 to the United States. Of the steerage passengers 11,179 were for Canada and 1,629 for the United States. Included in the steerage passengers for Canada were 1,977 returned Canadians and 2,636 tourists, leaving the immigration proper at 6,566 souls, an increase over the twelve months ending March 31, 1907, of 3,265 persons.

Table I. deals with the total arrivals of saloon passengers, Table II. with the total arrivals of steerage passengers, Table III. with the monthly arrivals of immigrants for Canada, and Tables IV. and V. give summaries of the information obtained from immigrants for Canada upon arrival.

TABLE I.

NATIONALITY and Sex of Saloon Passengers arriving at the Port of Vancouver, for the Fiscal Year ending March 31, 1908.

	CANADA.				UNITED STATES.				CANADA AND UNITED STATES.			
	Males.	Females.	Children.	Totals.	Males.	Females.	Children.	Totals.	Males.	Females.	Children.	Totals.
African, South	1			1					1			1
Australian	49	49	13	111	19	25	7	51	68	74	20	162
Austrian	4	2		6					4	2		6
Hungarian	3			3					3			3
Belgian	4			4	2			2	6			6
Chinese	4	6	1	11	9	3	1	13	13	9	2	24
Dutch	2			2					2			2
French	17	6	4	27	5	2	2	9	22	8	6	36
German	25	5		30	8	1		9	33	6		39
English	356	175	52	583	24	19	6	49	380	194	58	632
Scotch	49	18	4	71	4	2		6	53	20	4	77
Irish	16	6	2	24		1		1	16	7	2	25
West Indian		1		1	1	1		2	1	2		3
Italian	1	1		2					1	1		2
Japanese	21	6	1	28	17	3		20	38	9	1	48
Newfoundland	1			1					1			1
New Zealand	26	17	2	45	5	2	1	8	31	19	3	53
Polish	1			1					1			1
Russian	6	1	3	10					6	1	3	10
Spanish	2			2	1			1	3			3
Swiss	2	1		3	1			1	3	1		4
Danish	1			1					1			1
Swedish	4	2		6					4	2		6
Norwegian	1			1	1			1	2			2
U. S. Citizens	30	28	10	68	168	120	35	323	198	148	45	391
Canadian	63	44	34	141					63	44	34	141
Tourists	148	64	13	225	41	31	2	74	189	95	15	299
Totals	837	432	139	1,408	306	210	54	570	1,143	642	193	1,978

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TABLE II.

NATIONALITY and Sex of Steerage Passengers arriving at the Port of Vancouver, for the Fiscal Year ending March 31, 1908.

	CANADA.				UNITED STATES.				CANADA AND UNITED STATES.			
	Males.	Females.	Children.	Totals.	Males.	Females.	Children.	Totals.	Males.	Females.	Children.	Totals.
African, South	2		1	3					2		1	3
Australian	57	32	27	116	28	15	11	54	85	47	38	170
Austrian	1			1	1			1	2			2
Chinese	1,017	23	71	1,111	139	1	4	144	1,156	24	75	1,255
French	8	1		9	2	1		3	10	2		12
German	3	1		4		3		3	3	4		7
English	71	19	9	99	15	11		26	86	30	9	125
Welsh	1	1	5	7					1	1	5	7
Scotch	30	5	1	36	1	4		5	31	9	1	41
Irish	11	1		12	5	4		9	16	5		21
Greek	4			4	1			1	5			5
Italian	5			5					5			5
Japanese	2,568	113	23	2,704	98	20		118	2,666	133	23	2,822
New Zealand	28	8	2	38	8	4	1	13	36	12	3	51
Russian, N.E.S.					5	4	5	14	5	4	5	14
Finnish	1			1	1			1	2			2
Spanish	1			1	2			2	3			3
Swiss	1			1					1			1
Servian	1			1					1			1
Danish	1			1	2	2		4	3	2		5
Swedish	3	1		4	2			2	5	1		6
Norwegian	2			2	2			2	4			4
Syrian	3			3					3			3
U. S. Citizens	10	3	1	14	51	23	6	80	61	26	7	94
Hindoo	2,389			2,389	1			1	2,390			2,390
Total immigration	6,218	208	140	6,566	364	92	27	483	6,582	300	167	7,049
Returned Canadians	1,893	37	47	1,977					1,893	37	47	1,977
Tourists	2,354	156	126	2,636	1,048	46	52	1,146	3,402	202	178	3,782
Totals	10,465	401	313	11,179	1,412	138	79	1,629	11,877	539	392	12,808

TABLE III.

MONTHLY arrivals of Immigrants for Canada, by Nationalities, at the Port of Vancouver, for the Fiscal Year ending March 31, 1908.

	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Totals.
African, South	1			1				1					3
Australian	7	7	21	21	6	7	8	11	4	1	4	19	116
Austrian				1									1
Chinese	52	61	94	102	119	104	109	128	97	57	65	123	1,111
French												9	9
German			1	2				1					4
English	4	13	7	37	6	12	4	3	4		8	1	99
Welsh		6						1					7
Scotch	4	5	6	7	1	1		5	4	1	2		36
Irish			2	5			2	1			1	1	12
Greek			2	1				1					4
Italian			2	3									5
Japanese	430	86	43	1,480	307	309	1		29	4	4	11	2,704
New Zealand		9	6	5	3	2	6	2	1			4	38
Finnish						1							1
Spanish						1							1
Swiss									1				1
Servian					1								1
Danish				1									1
Swedish	2	1		1									4
Norwegian				1		1							2
Syrian			2					1					3
U.S. Citizens	4		1	4				1	2	2			14
Hindoo	47	84	102	37	145	901	517	8	284	42	6	216	2,389
Totals	551	272	289	1,709	588	1,339	647	161	425	107	90	384	6,566

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TABLE IV.

MONTHLY arrivals of Immigrants for Canada, by Occupation and Destination, at the Port of Vancouver, for the Fiscal Year ending March 31, 1908.

	April.	May.	June.	July.	August.	September.	October.	November.	December.	January.	February.	March.	Totals.
Agriculturists	36	17	78	25	8	44	2	1	20	....	2	17	250
General labourers	349	120	46	1,496	515	1,163	526	99	286	44	58	215	4,917
Mechanics	13	14	15	40	7	7	6	14	9	....	6	3	134
Clerks	94	53	111	103	31	116	93	9	92	62	10	116	890
Miners	5	7	6	17	....	....	12	2	3	....	2	6	50
Female servants	1	3	1	1	2	1	2	2	....	....	1	3	17
Not classed	53	58	32	27	25	8	16	37	16	1	11	24	308
Totals	551	272	289	1,709	588	1,339	647	164	426	107	90	384	6,566
Maritime Provinces	3	....	....	1	1	4	1	....	....	....	....	1	11
Quebec	....	2	....	12	21	12	16	4	12	11	3	19	112
Ontario	4	10	3	9	14	22	20	11	11	10	13	24	151
Manitoba	....	....	2	4	2	2	....	3	....	....	....	1	14
Saskatchewan	....	....	....	....	....	2	1	....	....	....	....	....	3
Alberta	2	4	....	....	2	....	3	3	3	....	....	1	18
British Columbia	542	256	284	1,683	548	1,297	606	143	400	86	74	338	6,257
Totals	551	272	289	1,709	588	1,339	647	164	426	107	90	384	6,566

TABLE

NATIONALITY, Sex, Occupation and Destination of Immigrant Arrivals for

	Sex.				Trade or								
					Farmers or Farm Labourers Class.			General Labourers.			Mechanics.		
	Males.	Females.	Children.	Totals.	Males.	Females.	Children.	Males.	Females.	Children.	Males.	Females.	Children.
African, South	2		1	3									1
Australian	57	32	27	116	6	2	4	7	2		19	2	5
Austrian	1			1									
Chinese	1,017	23	71	1,111	3			255		1	9		
French	8	1		9	7	1		1					
German	3	1		4	1						1		
English	71	19	9	99	9			6			32	2	1
Welsh	1	1	5	7									
Scotch	30	5	1	36	4	1		3			14		1
Irish	11	1		12				2			4		
Greek	4			4				2			1		
Italian	5			5				1					
Japanese	2,568	113	23	2,704	113	4		2,279	69	17	19	2	
New Zealand	28	8	2	38	7	2		4	1		9	1	
Finnish	1			1									
Spanish	1			1							1		
Swiss	1			1									
Servian	1			1									
Danish	1			1							1		
Swedish	3	1		4							2	1	
Norwegian	2			2				1					
Syrian	3			3				3					
U. S. Citizens	10	3	1	14				2	1		4	1	
Hindoo	2,389			2,389	86			2,260			1		
Totals	6,218	208	140	6,566	236	10	4	4,826	73	18	117	9	8

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V.

Canada, at the Port of Vancouver, for the Fiscal Year ending March 31, 1908.

Occupation.										Destination.						
Clerks, Traders, &c.			Miners.			Female Servants.	Not Classified			Maritime Provinces.	Quebec.	Ontario.	Manitoba.	Saskatchewan.	Alberta.	British Columbia.
Males.	Females.	Children.	Males.	Females.	Children.		Males.	Females.	Children.							
							2									3
10	2		10	1	6	8	5	15	12			3	4		2	107
			1													1
698	11	18				1	52	11	52	10	112	138	7		9	835
																9
			1					1								4
14	2	3	7	3	3		3	12	2			2	1	3		93
			1					1	5			6				1
4	1		4			1	1	2					1		3	32
2			3					1		1					1	10
1																4
			4													5
71	5	1	3			7	83	26	5			1				2,703
5	1		3					3	2				1		3	34
							1									1
																1
1																1
							1									1
																1
							1									4
							1									2
																3
4	1	1														14
34							8					1				2,388
844	23	23	37	4	9	17	158	72	78	11	112	151	14	3	18	6,257

PORT OF VICTORIA.

For the fiscal year 1907-8 there arrived at the port of Victoria 9,108 passengers, of whom 312 travelled saloon and 8,796 steerage. Of the saloon passengers 227 were destined to Canada and 85 to the United States. Of the steerage passengers 7,505 were for Canada and 1,291 for the United States. Included in the steerage passengers for Canada were 1,365 returned Canadians and 116 tourists, leaving the immigration proper at 6,024 souls, an increase over the twelve months ending March 31, 1907, of 3,182 persons.

Table I. deals with the total arrivals of saloon passengers, Table II. with the total arrivals of steerage passengers, Table III. with the monthly arrivals of immigrants for Canada, and Tables IV. and V. give summaries of the information obtained from immigrants for Canada upon arrival.

TABLE I.

NATIONALITY and Sex of Saloon Passengers arriving at the Port of Victoria, for the Fiscal Year ending March 31, 1908.

	CANADA.				UNITED STATES.				CANADA AND UNITED STATES.			
	Males.	Females.	Children.	Totals.	Males.	Females.	Children.	Totals.	Males.	Females.	Children.	Totals.
Australian	2	2	....	4	5	2	....	7	7	4	....	11
Austrian	1	....	....	1	....	....	....	....	1	....	....	1
Chinese	5	3	3	11	....	....	....	....	5	3	3	11
Dutch	....	1	....	1	....	1	....	1	....	2	....	2
French	....	....	....	....	....	1	....	1	....	1	....	1
German	3	1	....	4	1	1	....	2	4	2	....	6
English	90	32	3	125	1	....	....	1	91	32	3	126
Scotch	6	2	....	8	1	....	....	1	7	2	....	9
Irish	....	1	....	1	....	....	....	....	....	1	....	1
West Indian	....	1	....	1	....	....	....	....	....	1	....	1
Japanese	16	3	2	21	1	....	....	1	17	3	2	22
Newfoundland	1	....	....	1	....	....	....	....	1	....	....	1
New Zealand	....	1	....	1	....	....	....	....	....	1	....	1
Polish	1	....	....	1	....	....	....	....	1	....	....	1
U. S. Citizens	4	1	....	5	34	24	9	67	38	25	9	72
Canadian	24	9	....	33	....	....	....	....	24	9	....	33
Tourists	6	2	1	9	2	2	....	4	8	4	1	13
Totals	159	59	9	227	45	31	9	85	204	90	18	312

TABLE II.

NATIONALITY and Sex of Steerage Passengers arriving at the Port of Victoria, for the Fiscal Year ending March 31, 1908.

	CANADA.				UNITED STATES.				CANADA AND UNITED STATES.			
	Males.	Females.	Children.	Totals.	Males.	Females.	Children.	Totals.	Males.	Females.	Children.	Totals.
African, South					2		5	7	2		5	7
Australian	10	4	1	15	74	52	42	168	84	56	43	183
Austrian	1			1	8			8	9			9
Chinese	617	16	55	718	17	1		18	664	17	55	736
Dutch	1			1					1			1
French					1			1	1			1
German, N.E.S.	2			2	13	9	2	24	15	9	2	26
Bavarian					1	1		2	1	1		2
Wurtemburg					1			1	1			1
English	34	7	2	43	50	19	9	78	84	26	11	121
Scotch	5			5	8	4	2	14	13	4	2	19
Irish	1	1	3	5	23	8		31	24	9	3	36
West Indian					1			1	1			1
Greek	3			3	8			8	11			11
Italian	3			3	8			8	11			11
Japanese	4,365	453	67	4,885	492	101	5	598	4,857	554	72	5,483
New Zealand	1	2	4	7	15	13	3	31	16	15	7	38
Portuguese					1			1	1			1
Roumanian					3	1		4	3	1		4
Russian, N.E.S.	93	1		94	7			7	100	1		101
Finnish					1			1	1			1
Swiss		1		1	1			1	1	1		2
Danish					6	1	1	8	6	1	1	8
Swedish					1	1		2	1	1		2
U. S. Citizens	7	2	1	10	83	43	20	146	90	45	21	156
Hindoo	228		3	231	3			3	231		3	234
Total immigration	5,401	487	136	6,024	828	254	89	1,171	6,229	741	225	7,195
Returned Canadians	1,272	51	42	1,365					1,272	51	42	1,365
Tourists	84	21	8	116	65	39	16	120	149	63	24	236
Totals	6,757	562	186	7,505	893	293	105	1,291	7,650	855	291	8,796

TABLE III.

MONTHLY arrivals of Immigrants for Canada, by Nationalities, at the Port of Victoria, for the Fiscal Year ending March 31, 1908.

	April.	May.	June.	July.	August.	September.	October.	November.	December.	January.	February.	March.	Totals.
Australian	3	2	....	6	....	1	...	1	1	....	....	1	15
Austrian	1	....	....	....	....	....	....	....	....	....	....	....	1
Chinese	38	51	44	65	72	59	128	76	44	48	35	58	718
Dutch	....	....	....	....	....	....	....	....	....	1	....	....	1
German	....	....	....	....	....	1	....	....	1	....	....	....	2
English	8	4	1	12	2	....	4	....	2	2	7	1	43
Scotch	....	....	....	1	....	....	2	1	....	....	1	...	5
Irish	....	....	....	5	....	....	....	....	....	....	....	....	5
Greek	1	...	....	2	....	....	....	....	....	....	....	...	3
Italian	2	....	....	1	....	....	....	....	....	....	....	....	3
Japanese	284	434	764	840	342	926	395	195	330	103	135	137	4,885
New Zealand	....	1	....	5	...	....	1	...	....	....	....	....	7
Russian	5	15	....	11	....	23	17	15	....	8	....	....	94
Swiss	....	....	....	....	....	....	....	....	1	....	....	....	1
U. S. Citizens	5	....	....	2	....	....	1	....	1	....	1	....	10
Hindoo	51	6	6	17	15	....	37	1	72	25	....	1	231
Totals	398	513	815	967	431	1,010	585	289	452	187	179	198	6,024

TABLE IV.

Monthly arrivals of Immigrants for Canada, by Occupation and Destination, at the Port of Victoria, for the Fiscal Year ending March 31, 1908.

——	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Totals.
Agriculturists	70	81	287	350	116	434	145	77	75	50	12	14	1,711
General labourers	104	171	242	228	114	276	183	149	257	70	107	89	1,990
Mechanics	17	18	23	38	19	13	25	17	10	8	10	4	202
Clerks	110	94	102	159	75	119	141	19	83	48	28	71	1,049
Miners	3	.....	.....	1	38	31	3	2	1	2	1	6	88
Female servants	.....	.....	2	.....	2	.....	3	.....	1	.....	.....	1	9
Not classed	91	149	159	191	67	137	85	25	25	9	21	13	975
Totals	398	513	815	967	431	1,010	585	289	452	187	179	198	6,024
Maritime Provinces	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Quebec	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Ontario	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Manitoba	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Saskatchewan	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Alberta	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
British Columbia	398	513	815	967	431	1,010	585	289	452	187	179	198	6,024
Totals	398	513	815	967	431	1,010	585	289	452	187	179	198	6,024

TABLE

Nationality, Sex, Occupation and Destination of Immigrant arrivals for

	Sex.				Trade or								
					Farmers or Farm Labourers Class.			General Labourers.			Mechanics.		
	Males.	Females.	Children.	Totals.	Males.	Females.	Children.	Males.	Females.	Children.	Males.	Females.	Children.
Australian	10	4	1	15	3			4			1	1	1
Austrian	1			1							1		
Chinese	647	16	55	718	28			176	2	6	27	1	1
Dutch	1			1				1					
German	2			2									
English	34	7	2	43	3	1		5	1	1	13	1	1
Scotch	5			5				1					
Irish	1	1	3	5							1		
Greek	3			3							3		
Italian	3			3				1					
Japanese	4,365	453	67	4,885	1,543	91	11	1,488	78	17	73	18	3
New Zealand	1	2	4	7				1				1	4
Russian	93	1		94				41	1		46		
Swiss		1		1									
U. S. Citizens	7	2	1	10	1						4		
Hindoo	228		3	231	30			166			1		
Totals	5,401	487	136	6,024	1,608	92	11	1,884	82	24	170	22	10

V.

Canada at the Port of Victoria, for the Fiscal Year ending March 31, 1908.

Occupation.										Destination.						
Clerks, Traders, &c.			Miners.			Female Servants.	Not Classified.									
Males.	Females.	Children.	Males.	Females.	Children.		Males.	Females.	Children.	Maritime Provinces.	Quebec.	Ontario.	Manitoba.	Saskatchewan.	Alberta.	British Columbia.
2	1	....	....	1	.....	.....	....	1	....	.....	....	....	....	.....	....	15
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	....	....	....	....	.....	....	1
386	5	19	1	....	....	.....	29	8	29	.....	.....	.....	.....	.....	....	718
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	....	1
1	.....	.....	.....	.....	.....	.....	1	.....	.....	.....	.....	.....	.....	.....	....	2
5	3	.....	6	.....	.....	.....	2	1	.....	.....	.....	.....	.....	.....	....	43
1	.....	.....	3	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	....	5
.....	.....	.....	.....	.....	.....	.....	.....	1	3	.....	.....	.....	.....	.....	...	5
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	...	3
1	.....	.....	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	....	3
525	56	5	74	2	.....	8	662	200	31	.....	.....	.....	.....	.....	....	4,885
.....	.....	.....	.....	.....	.....	.....	.....	1	.....	.....	.....	.....	.....	.....	....	7
3	.....	.....	.....	.....	.....	.....	3	.....	.....	.....	.....	.....	.....	.....	....	94
.....	.....	.....	.....	.....	.....	1	.....	.....	.....	.....	.....	.....	.....	.....	....	1
2	1	1	.....	.....	.....	.....	.....	1	.....	.....	.....	.....	.....	.....	....	10
29	.....	3	.....	.....	.....	.....	2	.....	.....	.....	.....	.....	.....	.....	....	231
955	66	28	85	3	.....	9	699	213	63	.....	.....	.....	.....	.....	....	6,024

UNITED STATES PORTS.

For the fiscal year 1907-8 there arrived in Canada, via ports in the United States, 29,812 passengers, of whom 217 travelled saloon and 29,595 steerage. Included in the steerage passengers were 265 returned Canadians and 22 tourists, leaving the immigration proper at 29,308 souls, an increase over the twelve months ending March 31, 1907, of 4,460 persons.

Table I. deals with the total arrivals of saloon passengers, Table II. with the total arrivals of steerage passengers, Table III. with the monthly arrivals of immigrants for Canada, and Tables IV. and V. give summaries of the information obtained from immigrants for Canada upon arrival.

TABLE I.

NATIONALITY and Sex of Saloon Passengers for Canada, via Ports in the United States, for the Fiscal Year ending March 31, 1908.

	CANADA.			
	Males.	Females.	Children.	Totals.
Belgian	1			1
English	45	22	5	72
Welsh	1			1
Scotch	5	1		6
Irish	1	2		3
West Indian	2	1	1	4
Jamaican	5	4	1	10
Canadian	50	65	4	119
Tourists	1			1
Totals	111	95	11	217

TABLE II.

NATIONALITY and Sex of Steerage Passengers for Canada, via Ports in the United States, for the Fiscal Year ending March 31, 1908.

	CANADA.			
	Males.	Females.	Children.	Totals.
African, South	2	2	.....	4
Australian	3	1	.....	4
Austrian, N.E.S	642	122	84	848
Bohemian	14	10	10	34
Croatian	178	15	4	197
Dalmatian	7	.....	.....	7
Galician	3	1	.....	4
Hungarian, N.E.S	388	118	104	610
Magyar	200	58	62	320
Ruthenian	646	132	133	911
Slovak	133	30	23	186
Belgian	120	30	27	177
Bulgarian	1,231	3	1	1,235
Dutch	69	37	46	152
French	216	118	39	373
German	314	167	124	605
English	4,643	1,340	1,182	7,165
Welsh	131	16	8	155
Scotch	703	260	89	1,052
Irish	437	183	76	696
West Indian	11	3	2	16
Jamaican	12	19	10	41
Greek	492	29	15	536
Hebrew, N.E.S	73	37	16	126
" Russian	419	325	343	1,087
" Austrian	34	24	25	83
" German	2	1	4	7
Italian	6,656	615	464	7,735
Japanese	1	.....	.....	1
Portuguese	1	.....	.....	1
Polish, N.E.S	60	8	5	73
" Austrian	410	90	68	568
" German	3	6	4	13
" Russian	184	32	15	231
Roumanian	239	63	88	390
Russian, N.E.S	1,258	447	588	2,293
Finnish	147	30	9	186
Spanish	20	1	.....	21
Swiss	18	6	1	25
Servian	20	5	7	32
Danish	36	14	6	56
Swedish	197	54	38	289
Norwegian	129	44	40	213
Turkish	281	9	6	296
Armenian	68	3	4	75
Egyptian	1	.....	.....	1
Syrian	88	39	26	153
Arabian	8	.....	.....	8
U. S. Citizens	3	1	.....	4
Negro	9	4	.....	13
Total immigration	20,960	4,552	3,796	29,308
Returned Canadians	170	72	23	265
Tourists	15	6	1	22
Totals	21,145	4,630	3,820	29,595

TABLE III.

MONTHLY arrivals of Immigrants for Canada, by Nationalities, via Ports in the United States, for the Fiscal Year ending March 31, 1908.

	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Totals
African, South..	1	1			2								4
Australian					3						1		4
Austrian, N.E.S	110	246	30	28	8	20	18	100	177	19	4	88	848
Bohemian	3		5	2	6	4	7	7					34
Croatian	49	37	38	11	9	12	28	4		3	1	5	197
Dalmatian	2	2	3										7
Galician										3		1	4
Hungarian, N.E.S	51	243	27	15	15	31	44	92	59	1		32	610
Magyar	115	5	36	10	24	19	47	38	11	5	10		320
Ruthenian	201	49	175	174	71	77	45	34		45	40		911
Slovak	69	2	23	9	9	28	13	13	9	4	5	2	186
Belgian	54	37	7	24	13	3	6		2	14	6	11	177
Bulgarian	104	277	123	49	28	40	50	276	287	1			1,235
Dutch	16	46	4	6	14	7	24	11	4	2	10	8	152
French	43	77	38	40	30	24	26	12	16	13	21	33	373
German	102	124	67	36	51	48	39	45	31	14	24	24	605
English	3,281	1,508	474	154	122	113	74	63	241	113	282	740	7,165
Welsh	48	64	17		2	3		2	2	2	5	10	155
Scotch	361	158	158	49	27	27	19	16	69	17	68	83	1,052
Irish	195	189	55	24	43	24	24	32	23	9	27	51	696
West Indian	2		1	2	1	7		1		1	1		16
Jamaican	1			11	2	15	11			1			41
Greek	65	55	77	48	20	73	68	58	45	6	1	20	536
Hebrew, N.E.S.	29	9	11	14	11	7	2	8	6	6	14	9	126
" Russian	141	52	106	128	126	142	48	83	68	66	75	52	1,087
" Austrian	15	5	12	5	15	2	6	5		9	8	1	83
" German	6		1										7
Italian	1,953	1,737	1,190	496	382	369	330	321	139	64	213	541	7,735
Japanese		1											1
Portuguese		1											1
Polish, N.E.S.	1	3	2					3	1	2		61	73
" Austrian	84	25	109	102	22	66	41	35	8	27	28	21	568
" German	3		6	3			1						13
" Russian	35	20	50	42	23	21	18	4	3	5	7	3	231
Roumanian	130	56	9		31	23	13	82	14	2	26	4	390
Russian, N.E.S.	261	685	369	95	67	48	80	193	346	46	33	70	2,293
Finnish	86	66	14	6	3	2	1	1	3		4		186
Spanish	4	2	3	1	1	1	3			1	3	2	21
Swiss	7	7	1	1	1		1				1	6	25
Servian		1	7		3	1	15	2	1		2		32
Danish	10	18	8	5		1	5		2			7	56
Swedish	40	106	18	19	15	23	9	10	13	6	7	23	289
Norwegian	35	67	21	16	14	5	19	11	8	5	3	9	213
Turkish	37	130	24	1	7	4	6	9	60			18	296
Armenian	3	1	6	7	1	3	4	19		7	2	22	75
Egyptian					1								1
Syrian	4	5	10	51	11	10	14	21	22	2	2	1	153
Arabian		1				6					1		8
U.S. Citizens	1	2										1	4
Negro	7					2	2	1				1	13
Totals	7,765	6,120	3,335	1,684	1,234	1,311	1,164	1,610	1,671	519	935	1,960	29,308

TABLE IV.

Monthly arrivals of Immigrants for Canada, by Occupation and Destination, via Ports in the United States, for the Fiscal Year ending March 31, 1908.

	April.	May.	June.	July.	August.	September.	October.	November.	December.	January.	February.	March.	Totals.
Agriculturists	816	1,518	242	43	30	53	61	311	380	39	72	362	3,927
General labourers	4,165	2,438	2,004	1,036	675	717	656	846	667	196	358	621	14,379
Mechanics	1,712	1,140	401	203	173	136	100	139	215	100	182	238	4,739
Clerks	343	384	118	68	103	65	38	43	93	54	89	143	1,541
Miners	63	49	29	23	6	19	16	13	6	7	9	9	249
Female servants	265	130	137	79	57	72	55	92	161	20	65	94	1,227
Not classed	401	461	404	232	190	249	238	166	149	103	160	493	3,246
Totals	7,765	6,120	3,335	1,684	1,234	1,311	1,164	1,610	1,671	519	935	1,960	29,308
Maritime Provinces	80	86	40	15	17	30	47	92	43	3	23	26	502
Quebec	1,594	1,350	938	403	288	316	282	315	476	167	274	452	6,855
Ontario	4,027	3,170	1,548	716	561	583	494	768	805	217	388	1,023	14,300
Manitoba	1,159	757	433	304	121	111	92	96	151	61	71	184	3,540
Saskatchewan	289	321	142	70	65	64	106	164	52	5	36	68	1,382
Alberta	243	210	118	35	57	62	48	61	79	16	59	84	1,072
British Columbia	370	222	116	141	125	145	95	114	65	50	83	123	1,649
Yukon	3	4	....	....	....	....	....	....	....	....	1	....	8
Totals	7,765	6,120	3,335	1,684	1,234	1,311	1,164	1,610	1,671	519	935	1,960	29,308

TABLE

NATIONALITY, Sex, Occupation and Destination of Immigrant arrivals for

	Sex.				Trade or								
					Farmers or Farm Labourers Class.			General Labourers.			Mechanics.		
	Males.	Females.	Children.	Totals.	Males.	Females.	Children.	Males.	Females.	Children.	Males.	Females.	Children.
African, South	2	2	....	4	....	....	....	....	....	....	1	....	....
Australian	3	1	....	4	....	....	....	....	....	....	1	....	....
Austrian, N.E.S	642	122	84	848	189	14	20	408	22	21	26	12	10
Bohemian	14	10	10	34	....	....	....	7	1	....	5	....	....
Croatian	178	15	4	197	18	....	....	152	1	....	7	....	....
Dalmatian	7	....	....	7	....	....	....	7	....	....	....	....	....
Galician	3	1	....	4	1	....	....	1	....	....	....	....	....
Hungarian, N.E.S	388	118	104	610	223	21	11	150	29	37	10	3	....
Magyar	200	58	62	320	2	3	3	187	29	38	7	2	....
Ruthenian	646	132	133	911	13	....	....	622	61	116	10	1	....
Slovak	133	30	23	186	3	....	....	126	9	10	1	1	1
Belgian	120	30	27	177	14	1	....	63	2	1	31	13	10
Bulgarian	1,231	3	1	1,235	340	....	....	880	2	1	6	....	....
Dutch	69	37	46	152	17	1	5	23	7	9	21	5	3
French	216	118	39	373	42	8	6	54	9	8	40	13	4
German	314	167	124	605	48	21	26	100	25	40	88	18	15
English	4,643	1,340	1,182	7,165	620	92	88	1,061	187	344	1,798	317	330
Welsh	131	16	8	155	29	2	3	28	2	1	43	4	1
Scotch	703	260	89	1,052	90	6	1	109	9	8	284	40	24
Irish	437	183	76	696	74	11	10	138	9	10	89	14	7
West Indian	11	3	2	16	1	....	....	1	....	....	1	....	....
Jamaican	12	19	10	41	1	....	....	....	....	....	1	3	....
Greek	492	29	15	536	23	....	1	453	9	10	3	1	....
Hebrew, N.E.S	73	37	16	126	3	....	....	21	3	3	32	15	5
" Russian	419	325	343	1,087	6	1	3	93	10	8	252	145	124
" Austrian	34	24	25	83	....	....	....	18	1	2	7	3	1
" German	2	1	4	7	....	....	....	....	....	....	2	1	4
Italian	6,656	615	464	7,735	967	32	28	5,275	220	218	316	23	16
Japanese	1	....	....	1	....	....	....	1	....	....	....	....	....
Portuguese	1	....	....	1	....	....	....	1	....	....	....	....	....
Polish, N.E.S	60	8	5	73	26	2	2	15	1	2	2	....	....
" Austrian	410	90	68	568	2	....	....	389	41	50	16	2	3
" German	3	6	4	13	....	....	....	1	....	....	2	....	....
" Russian	184	32	15	231	12	1	1	154	6	3	17	2	....
Roumanian	239	63	88	390	23	10	18	205	36	66	8	2	1
Russian, N.E.S	1,258	447	588	2,293	251	82	149	778	123	234	177	62	51
Finnish	147	30	9	186	1	....	....	139	5	....	6	1	....
Spanish	20	1	....	21	1	....	....	11	....	....	....	....	....
Swiss	18	6	1	25	2	1	....	9	1	....	3	1	1
Servian	20	5	7	32	1	....	....	17	2	3	2	2	2
Danish	36	14	6	56	8	4	3	18	2	1	8	....	....
Swedish	197	54	38	289	19	4	3	146	6	11	22	4	3
Norwegian	129	44	40	213	16	4	1	84	7	18	24	1	1
Turkish	281	9	6	296	104	2	2	156	1	2	11	1	....
Armenian	68	3	4	75	1	....	....	59	2	2	6	....	1
Egyptian	1	....	....	1	....	....	....	....	....	....	1	....	....
Syrian	88	39	26	153	25	1	1	44	3	5	8	4	4
Arabian	8	....	....	8	....	....	....	5	....	....	1	....	....
U.S. Citizens	3	1	....	4	1	....	....	....	....	....	2	1	....
Negro	9	4	....	13	1	....	....	5	....	....	2	....	....
Totals	20,960	4,552	3,796	29,308	3,218	324	385	12,214	883	1,282	3,400	717	622

V.

Canada, via Ports in the United States, for the Fiscal Year ending March 31, 1908.

Occupation.										Destination.							
Clerks, Traders, &c.			Miners.			Female Servants.	Not Classified.			Maritime Provinces.	Quebec.	Ontario.	Manitoba.	Saskatchewan.	Alberta.	British Columbia.	Yukon.
Males.	Females.	Children.	Males.	Females.	Children.		Males.	Females.	Children.								
1						2				1	2	1					
1			1			1									1	3	
10			2			49	7	25	33	25	314	208	216	30	33	21	1
			2			3		6	10	4	4	6	4	7	8	1	
	1		1			4		9	4	1	6	147	16		1	26	
											2	4		1			
						1	1				1	2	1				
2	1		1	1		25	2	38	56	26	19	227	128	156	25	29	
2						10	2	14	21	25	20	102	36	98	36	3	
1						59		11	17	7	301	191	357	37	11	7	
			2			11	1	9	12		5	63	11	3	43	61	
7	1		2			3	3	10	16		53	14	83	5	5	17	
4						1	1			50	39	1,140	2			4	
3	3	2				5	5	16	27	3	14	62	41	22	4	6	
39	12	3	7	5	5	23	34	48	13	4	171	59	53	23	20	41	2
51	10	9	5	1	2	38	22	54	32	11	73	180	166	60	72	42	1
615	119	68	86	5	5	294	463	326	347	64	927	4,539	891	208	251	282	3
10			11			3	10	5	3		34	71	27	9	5	9	
140	16	5	22	2	2	117	58	70	49	14	206	538	128	28	53	85	
89	14	16	8	2	1	100	39	33	32	14	148	365	106	7	27	28	1
2						2	6	1	2	2	3	11					
3	4	5				2	7	10	5	2	12	27					
9						13	4	6	4	3	248	240	7			38	
10	3	4				9	7	7	4		57	56	9		3	1	
52	17	21				39	16	113	187	6	344	585	139	3	2	8	
8	4	4				7	1	9	18		32	48	3				
												7					
25	6	1	50	2	1	170	23	162	200	132	2,779	3,826	138	9	157	694	
																1	
												1					
2						1	15	4	1	5	21	9	14	7	4	13	
	1		2			33	1	13	15	24	146	126	181	15	65	11	
						4		2	4		2	1	4	6			
1						13		10	11		93	74	44	4	5	11	
2						13	1	2	3	2	83	74	36	192	2	1	
29	10	11	7			85	16	85	143	36	505	616	530	369	158	79	
1	1					16		7	9		8	162			2	14	
6							2	1			3	9				9	
4						1		2		1	7	8	1	2	2	4	
								1	2			19	3	7	3		
2	1					5		2	2	1	5	12	13	13	10	2	
5	1	4	2			25	3	14	17	3	29	57	100	23	40	37	
3			1	1		21	1	10	20		10	53	34	37	19	60	
6	2	2				1	4	2		23	32	234	5		2		
			1				1	1	1		3	69			3		
												1					
10	1			1		15	1	14	16	9	90	43	10			1	
2										2	2	4					
												3		1			
1						3		1		2	2	6	3				
1,158	228	155	213	20	16	1,227	757	1,153	1,336	502	6,855	14,300	3,540	1,382	1,072	1,649	8

In my report for the fractional fiscal year 1906-7 I remarked that the volume of work at headquarters had not shown any diminution, and I may now say that it has gone on steadily increasing. There were 163,115 attachments made to our correspondence files in 1907-8, as compared with 140,635 during the next preceding twelve months, and during the year now reported upon 430,336 requests for information, direct and indirect, were attended to, the total number of pamphlets sent out of my office during the year being 2,397,747.

The following is a statement showing immigration literature ordered during the year:—

	Copies.
Suggestions to Medical Officers	1,500
Immigration Act (English)	5,000
" (French)	3,000
Last Best West (English)	173,000
" " (Swedish)	10,000
" " (French)	60,000
" " (German)	50,000
" " (Norwegian)	45,000
" " (Dutch)	20,000
" " (Flemish)	25,000
" " (Finnish)	25,000
Canada the Land of Opportunity	250,000
Canada West Magazine	10,000
Winter Wheat Pamphlet	175,000
Icelandic Pamphlet	10,000
Peace River Trail Pamphlet	800
Book on Nova Scotia	100
Canada in a Nutshell	150,000
Work, Wages and Land	200,000
" " " (German)	50,000
Atlas of the Dominion of Canada (English Edition)	25,000
" " " (Canadian Edition)	25,000
" " " (French)	25,000
" " " (Finnish)	10,000
" " " (Flemish)	10,000
" " " (German)	10,000
" " " (Dutch)	10,000
" " " (Danish)	10,000
" " " (Norwegian)	10,000
" " " (Swedish)	10,000
Philanthropic and Charitable Societies	2,000
Souvenirs et Impressions de Voyage au Nord-Ouest Canadien	100
Small Dodger (French)	50,000
Ontario Wants Farm Labourers	100,000
Nova Scotia pamphlets	31,500
Hungarian pamphlets	5,000
New Brunswick pamphlets	31,500
Ruthenian pamphlets	12,000
New Ontario pamphlets	5,000
The Lake St. John Region (Settlers' Guide)	25,000
The Unemployed in Canada	20,000
Canada wants Domestic Servants	50,000
Canada Life and Resources	6,000

Maps.

Small Dominion Maps of Canada	31,000

Newspapers.

Alberta German Herald	26,000
" " " Special Edition	6,667
Canada Swedish Weekly	18,000
" " " Special Edition	1,000
Der Nordwesten (German)	26,000
Danebrog	12,000
" Two Special Editions, 500 each	1,000
Logberg (Icelandic)	52,000
Le Nouveliste	3,000
'Canada,' published in London, England	26,000
Saskatoon Phœnix	5,000
'The Red Deer Advocate'	1,000
Le Courrier de l'Ouest	5,000
Saskatchewan Courier-German	8,360
The Canadian Hungarian	30,000

I have received a report from the Women's National Immigration Society, 87 Osborne street, Montreal, showing that this organization has continued its good work during the year.

The Ottawa Valley Immigration Aid Society, which receives some financial assistance from the department, has also made a report showing that the society has had 2,946 visitors, has directed the settlement of 683 individuals, distributed 8,470 pamphlets and given 8 lectures. The settlers have been placed as follows:—

In New Ontario	417
New Quebec	229
Western Provinces	37
Total	683

We have now three officers regularly employed in the deportation of undesirable immigrants, and two others who are called upon to act from time to time when required.

We may, I think, confidently expect a falling off in the number of deportations as a result of the more stringent measures we are now taking to shut out undesirables.

Dr. George W. Elliott, who is stationed at New York, reports that during the last fiscal year 22,472 aliens were landed at that port destined to different parts of Canada. Out of this number Dr. Elliott rejected 102 as disqualified for various reasons.

In my last annual report I made reference to the demand in recent years for farm help in Ontario, and stated that in order to assist as far as possible in meeting this demand the plan would be tried of employing agents on commission. This plan, I may say, has worked well, and the commission agents appointed in Ontario (and a smaller number in Quebec) have altogether placed in employment about 7,000 farm hands during the fiscal year.

Your obedient servant,

W. D. SCOTT,
Superintendent of Immigration.

OPERATIONS IN EUROPE

No. 1.

REPORT OF THE HIGH COMMISSIONER.

OFFICE OF THE HIGH COMMISSIONER FOR CANADA,
17 VICTORIA STREET, LONDON, S.W., June 13, 1908.

The Honourable
The Minister of the Interior,
Ottawa.

SIR,—I have the honour to transmit herewith the annual reports of the immigration agents of your department in Europe for the year ended March 31, 1908. These representatives at the present time are:—

THE IMMIGRATION STAFF.

Mr. J. Obed Smith, Assistant Superintendent of Emigration, 11-12 Charing Cross, London, S.W.
Mr. A. F. Jury, Old Castle Buildings, Preeson's Row, Liverpool.
Mr. G. H. Mitchell, 139 Corporation Street, Birmingham.
Mr. L. Burnett, 16 Parliament Street, York.
Mr. M. McIntyre, 35 and 37 St. Enoch Square, Glasgow.
Mr. John McLennan, 26 Guild Street, Aberdeen.
Mr. J. Webster, 17-19 Victoria Street, Belfast.
Mr. H. M. Murray, 81 Queen Street, Exeter.
Mr. E. O'Kelly, 44 Dawson Street, Dublin.
Mr. Paul Wiallard, 10 Rue de Rome, Paris.
Mr. Arthur Geoffrion, 10 Rue de Rome, Paris.
Mr. Treau de Cœli, 23 Place de la Gare, Antwerp.

During the year Mr. Murray was removed from Cardiff to Exeter, Mr. Webster from Glasgow to Belfast, and Mr. O'Kelly from Belfast to Dublin; while during the same period Mr. H. McIntyre was appointed to take charge of the Glasgow office, Mr. John McLennan of the Aberdeen agency, and Mr. Geoffrion to assist Mr. Wiallard in Paris.

The following is a list of the Canadian delegates appointed during the year to visit the United Kingdom for the purpose of promoting emigration:—

Mr. C. A. Aylesworth, Mr. E. E. Brewster, Mr. J. Robert Brown, Mr. A. R. Bredin, Mr. Allen Cruikshanks, Mr. Andrew Dalgarno, Mr. W. Moulding Baker, Mr. Donald Grant, Rev. Andrew Galley, Rev. A. Garritama, Mr. Geo. Gibbard, Mr. John L. Gray, Mr. John Hay, Rev. James Lawson, M. Edouard Montpetit, Mr. Alex. McOwan, Mr. J. T. Mayor, Mr. H. F. Morel, Mr. Henry Goodridge, Rev. Geo. McArthur, Mr. Hugh McKerracher, M. Edouard Parent, Mr. Wm. Patterson, Mr. Thomas Parsons, Rev. Father Royer, Mr. W. J. Smith, Mr. Geo. L. Stewart, Mr. W. West.

Mr. James Robinson of Larne was also appointed to take charge of an exhibition wagon to travel through Ireland.

During the year Mr. Bruce Walker, the recently appointed Assistant Superintendent of Emigration in London, has exchanged posts with Mr. J. Obed Smith, who held the office of Commissioner of Immigration at Winnipeg.

The condition of financial and industrial affairs in Canada towards the end of 1907 exercised a decisive effect in diminishing the volume of emigration from Europe to the Dominion, but while this is the case, there still remains much scope for official activity, as there is occasion for increased effort in supervising and inspecting the class of emigrants proposing to proceed to Canada, with a view to eliminating the unfit and the undesirable.

There is always a large number of persons, both in this country and on the continent, who desire better opportunities of improving their positions, and who possess all the qualities that go to the making of good settlers. Such persons ordinarily emigrate of their own volition, and one of the problems in dealing with emigration, along lines necessarily of a general description, is to place before this class the attractions of Canada, without at the same time, and by the same means, influencing others of a much less desirable sort, for the natural effect of an over-zealous propaganda must be to tend to draw unsuitable persons to the Dominion.

During the past year or two the various emigration bodies and societies in this country, founded for more or less charitable purposes, have exhibited great energy in their operations, and have doubtless been mainly responsible for directing to Canada that class whose presence—chiefly in the industrial centres of eastern Canada—has given rise to a congested condition of affairs.

In addition, the abnormal scarcity of labour in Canada during 1906 and 1907 no doubt somewhat embarrassed employers of labour, and men were engaged at high wages who, under ordinary circumstances, would not have been considered employable. This, it is suggested, led to misapprehension, and it was too readily assumed that any and all sorts and conditions of men could find employment in Canada, and was in part responsible for the congestion which ensued in some of the towns of the Dominion towards the end of 1907.

Official action has, as usual, been carefully confined to the encouragement of 'agricultural emigrants,' that is to say, those persons possessing a knowledge of farm life, and those intending to embark in the same on arrival in Canada; railway construction men, and female domestic servants.

The exercise of the restrictive powers provided for during the present session of the Dominion Parliament will no doubt prevent the emigration of as many 'undesirables' as was the case last year, and will doubtless ensure a better type of immigrant.

So far as I am able to judge, official and public sentiment in this country realises that the action of the Dominion government, in taking measures to prevent indiscriminate immigration, was justified by the conditions which have developed. Nevertheless, it may be expected that a large number of persons who may not be able to comply to the letter with the regulations that have been devised, will, in consequence of the industrial position here and on the continent, desire to emigrate to Canada. A great number of these persons, although engaged in towns and cities, have had some experience of farm life, and in cases where the probability is that they may become good farmers or efficient farm labourers, the regulations will no doubt, with advantage, be administered in a generous manner.

Cases have repeatedly transpired in which recorders, chairmen of sessions, and others, have postponed passing judgment on transgressors against the law, on the condition of their being sent to Canada. I have drawn the attention of those concerned to these cases, stating the strong objection which was felt by the people and the government of Canada in respect of them, and at my request wide publicity was given to the matter in the press, and it was hoped that as a consequence such practices would cease. This hope was not, however, fully borne out, and I ultimately brought the matter officially to the notice of the Imperial authorities, with the result shown in the appended correspondence:—

'OFFICE OF THE HIGH COMMISSIONER FOR CANADA,
'June 28, 1907.

'SIR,—I beg to state, for the information of the Earl of Elgin, that from time to time the Canadian government has had brought to its notice that, on occasions magistrates and others in this country have agreed, on the representation of interested persons, to defer passing judgment on transgressors against the law on the condition of their being sent to Canada.

'In November, 1905, I had a correspondence with the recorder of London in regard to a young man who was convicted of obtaining money by false pretences, but was not sent to prison but allowed to go to Canada. I then communicated to the recorder the strong opposition which was felt by the government and people of Canada to the sending to the Dominion of any person convicted of a crime, having exhibited criminal tendencies; and at the same time directed attention to the provisions of the Canadian Act respecting immigration and immigrants (6 Edward VII., chap 19), under which powers are given to prohibit the landing of, and to deport, any undesirables or criminals, such powers being rigidly enforced by the Canadian authorities.

'Attention was widely drawn to the correspondence at the time, both in the press of this country and of Canada, and it was hoped that, as a consequence, the practice complained of would cease.

'It would appear, however, from the enclosed copy of a letter from the Criminal Investigation Department to the Assistant Superintendent of Emigration in connection with my office, dated the 15th ultimo, that such is not the case; and it is feared that the course to which objection is taken may have been adopted to even a larger extent than has been apparent.

'In these circumstances, the Canadian government greatly desires that, if possible, some notification of its views on the subject may be conveyed to magistrates and others concerned, in order definitely to put a stop to the sending to Canada of persons convicted of crime. I therefore venture to bring the matter to the attention of Lord Elgin, with a view to such action being taken as His Lordship may deem advisable.

'I am, sir,

'Your obedient servant,

(Signed) 'STRATHCONA.

'The Under Secretary of State,
'Colonial Office, S.W.'

(Enclosure.)

'CRIMINAL INVESTIGATION DEPARTMENT, NEW SCOTLAND YARD,
'LONDON, S.W., May 15, 1907.

'To the Assistant Superintendent of Emigration,
'Interior Department of the Government of Canada,
'11 and 12 Charing Cross, S.W.

'SIR,—With further reference to your letter of the 2nd instant, regarding the encouragement given to criminals to emigrate to Canada, I have to acquaint you, for the information of the Superintendent of Immigration, Ottawa, that the circumstances relating to the two cases to which you refer are as follows:—

'Arthur Lloyd, who had been twice previously convicted for burglary, once for embezzlement and once as a rogue and a vagabond, was arrested on March 10 last and charged with committing a burglary at Lancaster Lodge, Bayswater Road, W. For this offence he was tried at the North London Sessions on March 26 and was put back for sentence till April 10 for inquiries to be made with a view to his being sent to Canada. On the latter date he appeared before the court and was bound over in the sum of £5 to come up for judgment, if called upon, being handed over to his friends on the condition that he went to Canada.

'With regard to Charles Stevenson, alias Charles John Parr, this man was arrested on March 3 last and charged with stealing a kit bag and contents, value £25, from a guard's van at Euston station. After appearing at Clerkenwell Police Court he was, on March 26, arraigned before Mr. Robert Wallace, K.C., chairman of the North London Sessions, who postponed sentence till April 10 with a view to Parr's parents sending him to Canada, and in the meantime for Mr. Wheatley, of St. Giles' Christian Mission, to make the necessary arrangements.

'The prisoner, who had been previously convicted of stealing luggage from Euston station, appeared before the chairman of the sessions on the 10th ultimo. He (prisoner) declined to avail himself of the assistance of Mr. Wheatley to send him to Canada, and was sentenced to four months' imprisonment with hard labour.

'I am, sir,

'Your obedient servant,

(Signed) 'M. T. MACNAGHTON.'

'Colonial Office, S.W., July 11, 1907.

'My Lord,—I am directed by the Earl of Elgin to acknowledge the receipt of your letter of the 26th June, relative to two cases in which judgment on convicted criminals has been postponed on condition of their being emigrated to Canada, and to inform you that His Lordship is in communication with the Home Office on the subject.

'I am, my Lord, your Lordship's most obedient servant,

(Signed) 'C. P. LUCAS.

'The High Commissioner for Canada.'

'Colonial Office, S.W., August 19, 1907.

'The Under Secretary of State for the Colonies presents his compliments to the High Commissioner for the Dominion of Canada, and, with reference to his letter of the 28th June, is directed by the Secretary of State to transmit to him, for his information, a copy of a correspondence with the Home Office on the subject of the emigration of convicted criminals to Canada.'

'Colonial Office, S.W., July 11, 1907.

'Sir,—With reference to the letter from your department of the 17th February, 1897, and previous correspondence on the subject of the emigration to Canada of convicted criminals, I am directed by the Earl of Elgin to transmit to you for the consideration of Mr. Secretary Gladstone, copy of a letter from the High Commissioner for Canada asking that the attention of magistrates might be called to the views of the Dominion government with regard to emigration of this class to Canada.

'I am, &c.,

(Signed) 'C. P. LUCAS.

'The Under Secretary of State,
'Home Office.'

'Home Office, Whitehall, S.W., August 9, 1907.

'Sir,—In reply to your letter of 11th July, forwarding a communication from the High Commissioner for Canada on the subject of the emigration to Canada of convicted criminals, I am directed by Mr. Secretary Gladstone to say, for the information of the Earl of Elgin, that he has communicated with the Chairman of the London Sessions regarding the cases of Arthur Lloyd and Charles Stevenson, which were brought to Lord Strathcona's notice.

Mr. Wallace states that he acted in the belief that the Canadian government would not be averse to receiving men who, like the two prisoners above-mentioned, had committed an offence, but were shown by the evidence before the court to have every prospect of doing well if given the opportunity in fresh surroundings.

On learning, however, that the Canadian government objected to the emigration of such persons, no further steps were taken to enable the men to proceed to Canada, and the Emigration Commissioner was informed some weeks ago that the matter was at an end.

'The Secretary of State has no knowledge of any similar cases having occurred elsewhere, but if any such cases should come to the High Commissioner's notice, he will be ready at once to take any steps necessary to stop the practice.

'I am, &c.,

(Signed) 'C. E. TROUP.

'The Under Secretary of State,
'Colonial Office.'

I have no doubt that in time, by entering a protest whenever such cases occur, they will be reduced to a vanishing point. In pursuance of this policy I recently addressed the following letters to the Lord Mayor of London:—

'Office of the High Commissioner for Canada,
'17 Victoria Street, S.W., April 2, 1908.

'My dear Lord Mayor,—My attention has been drawn to the inclosed extract from the Montreal *Herald* of the 8th March, relative to a youth who appears to have been charged at the Mansion House with theft, and to have been discharged on the understanding that he would go to Canada, and I have been asked to take official action with regard thereto.

'I feel, however, that it will be sufficient if I point out informally that the people and government of Canada strongly resent the sending to the Dominion of any person who has shown criminal tendencies. Indeed, powers exist under the Canadian law for deporting such persons, and these are rigidly put into force.

'I am confident that it is only necessary to mention this matter informally, as I now do, to secure your hearty co-operation in a matter with which the Canadian government is greatly concerned.

'Believe me, yours very truly,

(Signed) 'STRATHCONA.

'The Rt. Hon. the Lord Mayor,
'Mansion House, E.C.'

To which I received the following satisfactory reply from His Lordship:—

'The Mansion House, E.C., April 4, 1908.

'Dear Lord Strathcona,—I am much obliged to you for your letter of the 2nd instant.

'The statement of the Montreal *Herald* is virtually correct, but the lad was not discharged on the understanding that he should be sent to Canada. The boy was discharged under the Probation of Offenders Act, and that—so far as this court was concerned—closed the matter. The boy need never have left London, and, perhaps, has not, but it was mentioned in court that, in order to give him a fresh start, his parents were going to send him to Canada. Whether they have done so or not, we do not know. The boy was of good parentage and education, but had been tempted to bet with bookmakers and, having lost, was induced to steal. This was his first offence, and very likely this warning will make him a good citizen, either in London or elsewhere.

'No prisoners have ever been sent to Canada from this court, and I quite appreciate and applaud the strong objection which the Dominion rightly entertains to any attempt to unload our criminals on its shores.

'Yours very truly,

(Signed) 'J. C. BELL,
'*Lord Mayor.*

'The Rt. Hon. Lord STRATHCONA, G.C.M.G.,
'17 Victoria Street, London, S.W.'

This correspondence was given to the press, and its publication will serve to extend the knowledge of the strong feeling that exists in Canada on the subject.

My attention was recently drawn to the fact that apparently a misapprehension existed on the part of the Hungarian government as to the restrictive regulations issued in December last. Communication with His Majesty's Consul General at Buda-Pesth elicited the fact that the authorities there had issued the following notice to the chiefs of the different municipalities in Hungary:—

'The Imperial and Royal Consul General at Montreal reports by cable that the Canadian government has prohibited immigration till further notice. I hereby inform you (the chiefs of the different municipalities in Hungary) that in consequence of the above decision, I forbid, by virtue of the power conferred on me by clause 5 of the Law IV. of 1903, emigration to Canada until further notice. I call upon you to give this, my order, the fullest publicity.'

I have caused the exact position to be notified to the Hungarian government, through the Foreign Office, and have drawn attention to the fact that this order would appear to have been issued under a misapprehension, as the Canadian government has not prohibited immigration into Canada. This will no doubt result in clearing away any misconception which may have arisen.

The relief of Canadians who, from one reason or another, become destitute in Europe is a matter to which this department devotes much consideration during the course of the year. The fund appropriated by parliament for this purpose is a very small one, and needs careful distribution in order to meet the demands made upon it. During the past year 93 persons applied for assistance. For 17 of these return passages were procured, and of the balance 57 were provided with subsistence, lodging or clothing. With regard to the remaining 19 persons, the conclusion was arrived at, after careful consideration of the claims they presented, that their condition did not warrant the extension to them of any government aid.

Assistance to distressed Canadians has also been extended by the British consuls at various foreign points. In such cases it is the practice to act as far as practicable upon the recommendations of these gentlemen, whose intervention on behalf of the Canadian subjects of His Majesty is much appreciated.

The press cable service which was established as the result of arrangements made between us when you were last in this country has worked well and achieved valuable results.

The information which you have communicated to me I have transmitted to the press of this country, and through this medium there has been placed very fully from time to time, before the public of the United Kingdom information as to the crops, public revenue and expenditure, customs receipts, bank clearings, movement of grain, mineral production, urban development, and generally as to the industrial progress of the Dominion.

The information sent, as above, is also directly conveyed to a number of special newspaper correspondents, various banking institutions which are identified or interested in Canada, the English offices of the Canadian railways and shipping con-

cerns, the Canadian emigration agencies, and also to a large number of influential financiers and others identified with Canadian interests in this country. Many of the concerns to whom this information is conveyed have excellent facilities for displaying the cable messages in conspicuous public places, and by so doing still further extend the usefulness of the cable service.

Satisfactory as this service has been, experience will doubtless point to the advisability of still further extensions in the future.

I have the honour to be, sir, your obedient servant,

STRATHCONA.

High Commissioner.

No. 2.

REPORT OF MR. J. OBED SMITH.

ASSISTANT SUPERINTENDENT'S OFFICE,
11-12 CHARING CROSS, LONDON, April 2, 1908

The Rt. Hon. Lord STRATHCONA AND MOUNT ROYAL, G.C.M.G.,
High Commissioner for Canada,
17 Victoria Street, London, S.W.

MY LORD,—I have the honour to submit herewith the report of the Emigration Branch of the Department of the Interior, covering the agencies in the United Kingdom and the continent of Europe for the fiscal year ending March 31, 1908, together with the individual reports of the various emigration agents under this branch for the same period.

Up to the end of the calendar year 1907 the number of persons emigrating to Canada from this side of the Atlantic shows a material increase over the same period of the year 1906, but the first three months of the present calendar year—and being the last three months of the fiscal year covered by this report—show, for various reasons hereinafter mentioned, some decrease.

The wisdom of the policy inaugurated by the honourable the minister during his last visit here, by which all offices of the agents were brought into better prominence by the removal from some obscure situations to positions on the ground floor on important business thoroughfares, has been abundantly proved from the increased number of callers making personal inquiry, and the attractive displays from time to time furnished by the department, which, being shown to advantage, have undoubtedly laid the foundation for still further increase of inquiries concerning Canada, not only in the field of emigration but, I doubt not, along the line of commercial enterprises among those who may be seeking opportunities for investment. I am pleased to report that our agents in districts where there is no Canadian trade commissioner have not hesitated to secure for themselves information on commercial matters, the better to enable them to impart such knowledge to all inquirers.

In amplification of the propaganda, an extensive, but carefully revised list, of newspapers has been from time to time prepared and used for the insertion of advertisements which would draw attention to the resources of Canada. The general policy in this regard to avoid the large metropolitan and large provincial city newspapers has been continued, but at all times special regard is had to the peculiar experience of the local emigration agents, who satisfy themselves of the value of one paper over another. It is hoped that this system has been the means of sowing seed which will ultimately reap a large emigration harvest of desirable people from the country districts.

Mention may also be made of the work performed by the motor car, which has toured the Midland counties and attended at the Royal Agricultural Show held at Lincoln. In addition, three wagons, supplied by the department, were placed on the road the early part of the year—one in North Wales, one in the north of Ireland and one in the Highlands—reaching districts not possible to cover by motor car.

Owing to the financial depression which existed in other parts of the world, and reflected injuriously upon Canadian commerce and enterprise during the latter part of 1907, the department wisely directed the issue of the following circular:—

'Sir,—I am advised by the Superintendent of Immigration for Canada that the demand for labour of all kinds in the Dominion is over for the present season, and I am directed to ask you to strongly advise all persons looking for employment in Canada not to sail earlier than April next, and then only if they have employment assured or have sufficient cash to keep them until they secure employment.

'I shall be greatly obliged if you will take immediate steps to convey this announcement to prospective emigrants.

'Your obedient servant,

'J. BRUCE WALKER.

'December 4, 1907.'

So well has the circular done its work that the returns show a marked decrease in the number of arrivals in Canada for this side of the Atlantic ocean for the first three months of the present calendar year, and if that regulation has in other respects detracted somewhat from the flow of emigrants Canadawards, there has appeared no criticism whatever regarding the wisdom of this action of the department, which doubtless prevented some going to the Dominion who would have suffered through lack of employment or sufficient means to live upon.

The regulations lately adopted with respect to emigrants receiving financial assistance through philanthropic societies or public funds have been received with somewhat mixed feelings on the part of those interested, but I am pleased to note that the more the regulations become understood even those who were inclined at first to consider them unnecessary and harsh are rapidly coming to one point of agreement, viz., that it is better from the intending emigrant's standpoint alone that he should be subject to such inspection and approval before going.

It is hoped that still greater care will be exercised by booking agents, and the result of the restrictions intended only to prevent undesirables from going to Canada, will have the effect of still further reducing the percentage of deported persons. Not only is it inadvisable to have any one returned from Canada as being inefficient or incapable, but the placing of such deports in the hands of their friends or local authorities in the United Kingdom has entailed a very large amount of labour upon the officers of this branch, as obviously many of the cases returned are not willingly received by their relations, friends or local authorities.

I am pleased that the records and inspections will show that the minister's instructions to secure quality rather than quantity have been successfully carried out, and while taking some credit for this condition of affairs to this branch of the public service, I cannot lose sight of the fact that the great attraction is the wonderful resources and development of Canada, and it is not necessary to do aught than state the exact truth concerning the possibilities of the Dominion.

It is gratifying to all our agents to have visits from a largely increased number of persons who emigrated to Canada years ago, and having attained a fair amount of success are visiting the old land and their friends therein. All such, whether willing or not (because of the active demands for information at some time during their stay here), become volunteer lecturers and emigration agents for Canada. Added to this has been the active desire of this branch to co-operate with the officials in Canada so that those going there may be able to send back favourable reports, thus widening the policy that an emigration induced by those already in Canada is even better than the emigration which may be stimulated on this side.

The stringent regulations under which the bonus is paid to booking agents on certain classes of emigrants have, in my opinion, worked successfully thus far, being an intimation, in the first place, that none but the best will be accepted, and, secondly, an encouragement to the booking agent to select from those leaving the old country those most desirable for Canada, and who might by some persuasion on his part be induced to go to Canada.

Considering there are several thousand booking agents on the bonus-earning list it is believed the bonus granted is a factor in good selection. Reports on nearly all booking agents throughout the United Kingdom have already been placed on file with the department at Ottawa.

During the year the minister decided to extend the bonus arrangements to certain selected continental booking agents, but owing to the existence of anti-emigration laws in some of those countries the department have not been called upon to pay out much of the public funds for bonuses on the continent.

It was felt by some that the Small Holdings Act, passed by the Imperial parliament, would be a grave factor against the emigration of farmers and other agriculturists to Canada, but on going into the provisions of the Act, which in the main provide that certain small holdings may be secured by local authorities, and thereafter rented, I am of opinion that a persistent advertisement of the fact that Canada offers 160 acres of free land must eventually prove a greater attraction than the possibility of renting land under the Small Holdings Act, and I would respectfully recommend that consideration be given to this suggestion.

While it is true that somewhat undue prominence has been given to letters derogatory to Canada, which in some cases have been published without regard to the bona fides of the writer, I am pleased to say that the press of the United Kingdom has shown a willingness to publish our side of the story, and we have not been slow to take advantage of this favour. Canada is not the unknown quantity and the far-off land which some years ago was known to so few on this side, and the desire of the British public to know more about the Dominion has enabled us to secure the insertion of a large number of readable news items and paragraphs, which are prepared under the authority of this branch. I consider the insertion of news items of this kind amply repays the expense of their preparation.

Recently the department at Ottawa has arranged to furnish from time to time letters from successful settlers in Canada, and these are exhibited in suitable frames in all our agency windows.

Necessarily the cultivation of the demand for information regarding Canada brings with it an increased number of requests for literature, and I beg strongly to recommend that this office be furnished with a very much larger supply than has ever been provided before. The people like readable facts and maps, and nothing could exceed the value of the atlas and geography which the department has published during the last year. In this connection I would strongly recommend the issue of some literature in the Welsh language. There is, I believe, a field to be worked in Wales which should produce a number of extremely desirable agriculturists, but many of them prefer to disregard any literature as being of doubtful origin unless it appears in their native tongue.

In the Liverpool district and Aberdeen district some 25,000 copies of the geography, prepared by the minister, have been distributed to school children, the method being to require the individual scholar to ask for it, and not to send a supply in bulk to the schools. In addition, the distribution of the wall map of Canada to schools has continued, and I can conceive of no better value for the expenditure of public funds than would be received by getting these geographies in the homes of the school children in the United Kingdom and on the continent.

A very large quantity of such geographies will be required for the Franco-British exhibition, opening in the city of London in the month of May this year, and for the

Edinburgh exhibition a few weeks later. It is, therefore, extremely desirable that an immediate and very large supply of literature of all kinds be furnished to this office.

It is quite plain that the Dublin exhibition of 1907, together with the re-arrangement of our offices in Belfast and Dublin have resulted in a large increase in emigration from Ireland, but the movement is even now easily intercepted by the many friends living in the United States and elsewhere, who seek to draw their relations to them instead of to Canada, and the restriction requiring $25 to be in possession of each emigrant is actually being used by some of the bankers in Ireland as a reason for their statement that Canada is short of money.

I am pleased to record the great efficiency and labour expended by the various emigration agents, and the transaction of their duties during the past fiscal year. Great activity, considerable tact, business ability, and human kindness are daily required of them. The correspondence received and sent out by each agent has largely increased, and the distribution of literature would be greater still if their supply had been equal to their demands. They are obliged to be constantly on the watch for undesirables, and unofficial and unworthy agents who may by faulty information send emigrants to Canada who are not up to the required standard.

Our agents attend the weekly markets and country fairs for the purpose of distributing literature and giving information, and at agricultural shows where we are not able to put up a regular exhibit they provide a large exhibition stand, containing samples of the products of Canada, and by personal attendance seek in every way to aid the business of this department. Not a small portion of their work is the careful and periodical inspection of all the booking agents, numbering about 400 in each such district, and seeking such joint action with the booking agents as would be creditable to all concerned.

At London, Liverpool and Glasgow, the inspection of all out-going emigrant steamers by our respective agents at those ports has continued, and a report on each such steamer has been forwarded to the department at Ottawa.

Some idea can be secured from the above regarding the extent of the ramifications of the business-seeking propaganda of this office, but it will be our ambition to still further extend it during the coming years, and reach out to the smaller country villages by means of correspondents, advertisements, lecturers and the visits from our motor cars and exhibition wagons.

The policy of sending farmer delegates (who have been more or less successful in their operations in Canada) to give lectures and verbal information to persons contemplating emigrating has been continued with marked success, and all the provinces of the Dominion have been personally represented by the twenty-one delegates sent to the United Kingdom, and some parts of the continent.

Nothing can exceed the value of the experiences related by these men to people of their own class in person, and obviously they are able to answer many practical questions which only those engaged for years in up-to-date agricultural methods can possibly give a reply to. Therefore, I have no hesitation in respectfully recommending the continuance and enlargement of that portion of our propaganda.

This branch of the department has kept in close touch with the Imperial government emigrants' information office and the board of trade, the latter department controlling the issuing of licenses to booking agents, and one license was cancelled because the agent concerned did not properly carry out the instructions received from the department.

The whole of the United Kingdom has been divided into districts covering a number of counties, and each district is in charge of a regular agent and office staff.

The London district consists of fifteen counties, forming a compact area lying around the metropolis, which itself occupies a most central position in that area. It includes Norfolk, Suffolk, Essex, Cambridge, Middlesex, Kent, Surrey, Bedford, Hertford, Buckinghamshire, Oxford-hire, Berkshire, Hampshire, Sussex and the Channel

Islands, and is attended to by this office in addition to the general work of supervising all the other districts.

In this connection some of the London staff make periodical visits to steamship agents, and we have numerous calls from booking agents at the London office.

The good-will of the local press has been cultivated as far as possible, and will continue to receive attention. It must be admitted that the sum of these influences is a factor of great value when adopting means to an end, and I gladly acknowledge the service these features have been in securing the best results from the work of Canadian lectures and farmer delegates.

During the past year thirty-five lectures, with lantern slides, were delivered in the London district, outside the metropolitan area. The meetings were excellently well attended, were all reported in the local press, and served to allay any fears as to the agricultural outlook for those who intend to settle on the land, or otherwise, in Canada.

Four farm delegates made a tour of the fifteen counties in the district, and where the number of callers upon them was less than in former years, notices of the delegates' views appeared in the local press.

Between 35,000 and 40,000 persons visited the London office, making personal inquiry, and nearly three-quarters of a million stopped to inspect the window display here.

Participation in agricultural shows, cattle fairs, horticultural meetings, &c., was resumed on an extended scale, and an increased interest in Canada's resources was evident. Exhibits of Canadian produce have been placed with a large number of selected country booking agents in the district.

I wish to bear testimony to the excellent results which have been manifested through the employment agent system in Canada, which was put in force by the department last year. This has been of great assistance to booking agents throughout the country, and has enabled them in many cases to direct their passengers to actual employment beyond the port of landing. The system has worked well from this end, and has been highly appreciated by all the agencies concerned.

The British Columbia government has maintained fruit experts in England during the past winter for lecturing purposes, with marked benefit to that province.

Consideration should be given to the fact that Australia is now definitely in the field here for securing desirable British emigrants, and already their advertisements are appearing in the public press, offering, in certain cases, assisted passages.

Appreciation and cordial thanks are tendered to the officers of the steamship and railway transportation companies for their unfailing efforts to comply with every regulation from time to time issued, and their evident desire to consider that all such regulations are intended for the permanent good of Canada. I have assured them that they can depend upon the hearty sympathy of this department in their work of transporting passengers to the Dominion.

J. OBED SMITH,
Assistant Superintendent of Emigration.

No. 3.

REPORT OF MR. A. F. JURY.

OLD CASTLE BUILDINGS, PREESON'S ROW,
LIVERPOOL, April 9, 1908.

J. OBED SMITH, Esq.,
Assistant Superintendent of Emigration,
11 and 12 Charing Cross, London, S.W.

SIR,—The past year has been one of great activity in the movement of population from this country to Canada. Persons connected with emigration work unofficially have vied with each other in securing the greatest number of people to go to Canada. This has not always been done with a due regard to quality, but rather from the superficial business idea of quantity, which in a short time was bound to bring about its own downfall by unduly augmenting the city and town population out of all proportion to the rural. This state of things is accountable for the unprecedented number of letters that have appeared in the British press during the past winter, describing the hardships of the unemployed in the industrial centres of Canada. I have never lent countenance to this kind of propaganda, because I felt it was both bad business and unnecessary; bad business because it was sure to be the cause of numbers going to Canada who were totally unfit for pioneer life, and to one whose connection with Canada extends over a period of thirty-five years, it was quite apparent what the result must be; and unnecessary because my experience has taught me that just as many of the right sort can be got by right methods as wrong ones by wrong methods, and I can point with some degree of pride to the comparatively small number of undesirables that have been deported from Canada who have gone out from this district, and if the other agents that are working in emigration in this country can be made to confine their efforts along the same line as the government agents, a recurrence of the present congested state of the labour market in the centres of population and its consequent burden upon the authorities and charitably disposed people of Canada will be prevented in future.

The lantern slides contained in the sets that are in use at this office, for loaning out to people lecturing on Canada, are in most cases very old and in some cases not of the best quality, and complaint is often made by those using them that they are the same scenes year after year. If some new and more artistic slides could be made and sent over for the ensuing lecture season, it would meet a long felt want among those who are continually using them.

Last summer and fall the wagon work under the charge of Mr. Morris, in North Wales, created a large amount of interest and, I believe, will produce good results, but the benefit derived from such work can never be fully achieved until we have some emigration literature printed in the Welsh language. The most desirable people we are able to secure in Wales for Canada are the struggling tenant farmer, the agricultural laborer, and the domestic servant. Among these classes there are large numbers who can speak and read Welsh much better than they can English, and would be more likely to understand anything written in their own than in foreign language. I regard the rural Welshman as a most desirable emigrant; as a class they are industrious, sober, thrifty, ambitious and law abiding. They are accustomed to rural life, have been used to hard work, and are among the best type of settlers that could be obtained for Canada, but I do not think a propaganda in Wales will ever have a fair chance of obtaining the best results until we have a pamphlet printed in the Welsh language.

We have had the annual visit of the farmer delegates from Canada, but their success has not been as great as in former years. Steamship agents do not seem as anxious to obtain their services as formerly, on account of the bad reports that have reached this country about Canada, and the more stringent regulations imposed upon emigrants by the department, which they felt would prevent them getting the number of passengers that would warrant them in spending money advertising the attendance of the delegates at their respective offices. Some of the delegates arrived here too late in the season to be of much use, and I would suggest that any future delegates coming here should arrive about the end of the old or the beginning of the new year.

All indications point to an ebb in the tide of commercial prosperity enjoyed by this country during the past few years; this will naturally be followed by a larger amount of unemployment in most industrial centres, which will cause those out of employment to be looking for opportunities to sell their labour outside the British Isles, and many will look Canadawards. A large number of those employed in the various industries or contingent employments, such as carters, &c., have had some experience of farming, and if properly selected and advised, would make most estimable settlers for Canada. Some way could and should be found of admitting into Canada such men, even though they may not possess five pounds, in addition to their inland railway fare, as they would help to supply the real want that exists of assistance on the farms.

The work of this office in connection with deports has increased enormously during the past year, and now forms one of the heaviest branches of the business here.

Letters received during the year	8,945
Letters sent during the year	9,150
No. of callers in person at this office	4,512

Your obedient servant,

A. F. JURY,
Canadian Government Agent.

No. 4.

REPORT OF MR. G. H. MITCHELL.

139 CORPORATION STREET,
BIRMINGHAM, March 31, 1908.

J. OBED SMITH, Esq.,
Assistant Superintendent of Emigration,
London.

SIR,—I beg to submit my report for the year 1907-8.

Having been at the present address just over twelve months it is possible to compare the advantages obtained by the removal from a second floor office in a side street to ground floor premises with a shop front on the principal thoroughfare, with a window made attractive by a display of grains, grasses, fruit, pictures and transparencies of Canadian views; the result has been quite five times the number of callers for literature and personal interviews. My correspondence has also been considerably larger than during the previous twelve months, owing no doubt to the greater general emigration movement.

The shipping agents in my district had their full share in the record season experienced last year, and any suggestions that had to be made to them were cordially adopted. It was of course made very clear to them that outside the capitalist classes

the only emigration encouraged by the department was that of men able and willing to take up agricultural or railway construction work and female domestic servants, and in regard to the latter it is worthy of mention that a decided increase has taken place in the number of inquiries from young women.

The season which has just opened of course does not promise as well, the combination of circumstances existing in Canada, the warning notices published by the department, and the restrictions imposed, having had a deterrent effect as regards numbers, although the average quality will be still further improved, and in this connection it may be noted how large is the demand for second-class accommodation on the steamers.

Another temporary adverse influence will be the Small Holdings Act, which enables county councils to acquire land to be rented to men desiring to cultivate 50 acres or less. The Board of Agriculture has taken exceptional steps to make the provisions of this Act known among farm laborers, meetings having been addressed all over the country by officers of the department; the consequence has been that in the aggregate many thousands of acres have been applied for by the very men wanted in the Dominion, and many of whom doubtless would have attempted by emigration to satisfy their land-hunger and improve their position. But in my opinion the quantity of land they can rent (the Act does not contemplate ownership), will stimulate their ambition to assume larger responsibilities, and the future will see them or their families emigrating, and better fitted both pecuniarily and in character, for the change.

My time has been fully employed on much the same lines as in former years; in addition to office duties, attending and exhibiting at agricultural shows, visiting shipping agents, supplying them with printed matter, making suggestions as to their work, and furnishing them with information on current Canadian topics which should assist them to satisfy inquirers, arranging for lectures, for itineraries for delegates from Canada, for the motor exhibition car, and maintaining an oversight in regard to many other things to which attention is necessary.

During the year the office has been visited by the Deputy Minister, Mr. W. W. Cory; the Superintendent of Immigration, Mr. W. D. Scott; and the Assistant Superintendent of Emigration, Mr. J. Obed Smith, besides many Canadians who were visiting relatives and friends in the district. A total of 3,965 persons visited this office. We sent 4,207 and received 3,803 communications.

Your obedient servant,

G. H. MITCHELL.

No. 5.

REPORT OF MR. L. BURNETT.

16 Parliament Street,
York, March 31, 1908.

J. Obed Smith, Esq.,
Assistant Superintendent of Emigration,
London.

Sir,—I have the honour to submit to you my annual report for the year ending March 31, 1908.

As you are already aware this office has only been open a little over one year, and during that period my time has been actively employed in the interest of Canada, and I have no hesitation in saying with satisfactory results.

I attend the weekly markets and monthly fairs in York and the surrounding towns, which are always well attended by farmers and men of the agricultural class. There is plenty of scope for me at such assemblies as those to instil into the minds of these people the advantages of emigration, and to point out to them what chances there are in Canada for a successful career.

The two sets of slides which I have I find very useful to me in my lecture work, and when not in use by myself I always have plenty of applications for them from people who have visited Canada, and who were so favourably impressed that they desired to give a course of lectures in the neighbourhood in which they live.

I have a great many applications from children and school teachers for literature for school use, and whenever possible I comply with their requests, thereby getting the parents and brothers and sisters interested in Canada.

During the winter I have had some very interesting conversations with young men who went out to Canada two years ago, and came over here for a holiday. They speak in the highest terms of Canada, and have induced others to return with them.

The unfavourable reports from Canada during the last few months have had the effect of checking emigration to a certain extent, but I am under the impression that it will be a good thing for Canada, as there were some emigrating who were no good to this country, and never will be to any country, and I am satisfied that it will be to the interest of Canada for me to continue to send 'quality' instead of 'quantity.' The longer I am engaged in emigration work the more I am impressed with the fact that it behooves those of us who are soliciting men and women for that country that the best are none too good, and undesirables are not needed at all.

Your obedient servant,

L. BURNETT.

No. 6.

REPORT OF MR. M. McINTYRE.

35 AND 37 ST. ENOCH SQUARE,
GLASGOW, March 31, 1908.

J. OBED SMITH, Esq.,
Assistant Superintendent of Emigration,
11 and 12 Charing Cross,
London, S.W.

SIR,—In submitting my report for the year ending March 31, 1908, it is possible for me to make reference only to the months from, and including, September, 1907, to March 31, 1908, that being the period during which I have been in charge of the district in Scotland operated from the Glasgow office.

During that period of time, the number of emigrants leaving this district for Canada has been smaller than for the same period the previous year. This is due to a combination of circumstances. The general financial depression throughout the United States having to a certain degree affected Canada—and in fact, the British Isles as well—Scotch 'canniness' took possession of the people, and they became very backward in the matter of emigration. Following this came newspaper reports grossly exaggerating the condition of the unemployed in Canada. The government's warning to emigrants not to proceed to Canada until spring has had the desired effect of keeping out numbers of undesirables, and of course, which was unavoidable, some desirables have also held back. While the numbers have been reduced, it is gratifying to note that those going have been of a most superior class, the latest sailings showing a fair increase in numbers.

One policy of the government to be highly commended, is that of sending farmer delegates to this country, to meet the agricultural classes and give information regarding Canada, giving their own experience as examples of how one can succeed, if a willing worker.

Another source of bringing Canada before the people, which is very much appreciated, is the use of lantern views of the country. I find that a number of persons having the welfare of Canada at heart, enjoy exhibiting these views and lecturing to different organizations throughout the district. I myself have used them on a number of occasions when talking to an audience in an endeavour to place Canada in its proper light.

While the numbers for the year may not be all one would wish, still, as a whole, I believe the quality will be most satisfactory.

Your obedient servant,

M. McINTYRE.

Canadian Government Agent.

No. 7.

REPORT OF MR. JOHN McLENNAN.

CANADIAN GOVERNMENT OFFICE,
26 GUILD STREET,
ABERDEEN, March, 31, 1908.

The Assistant Superintendent of Emigration,
11 and 12 Charing Cross,
London.

SIR,—I have the honour to submit the report of the Aberdeen office for the year ending March 31, 1908.

Although I have not personally the advantage of comparing the work of the past year with those preceding it, the office having been opened only two months last year, yet I have the assurance from every source, that it has been the most successful in the history of Canadian emigration from the north of Scotland. In addition to the office duties, I have visited during the year nearly every booking agent in my territory, and conferred with them and others interested in our work. I have also delivered a large number of lectures, part of them illustrated by lantern slides. To avoid disappointment hereafter, I think it is only fair to say that in my judgment we have reached high water mark as far as it relates to farm labourers, especially that of skilled and experienced labour. The area of cultivated land in the district is very limited, hence the number of people required for the ordinary farm work is limited. The last three or four years have made a heavy drain upon this class, and in sections where there was a surplus of men a few years ago, there is now a scarcity and wages steadily increasing. To such an extent is this true that the farmer has become an active agent against our work in the best localities, and they have used the many conflicting reports of the past four months very effectively to pursuade men not to leave.

While a certain surplus will always be available, yet I think the maximum has been reached. Besides, we are now confronted on every hand with the active assisted emigration policy of the Australian States and Dominion of New Zealand. The almost uniform success of those who have gone to Canada, has endeared the country to the friends at home, and we have a warm greeting everywhere and in every place, except from those who for selfish purposes would have labour a drug on the market.

Although the field for skilled agriculturists is limited there is still a large number to be reached among the crofters in the highlands. These people, inured to hardships and living in poverty, although entirely ignorant of farming as it is conducted in Canada, make excellent settlers, and the want of means to take them out is the only thing that prevents thousands of them from going. We may look for a liberal supply from this section to continue yearly as they acquire the means to leave.

Your obedient servant,

JOHN McLENNAN,
Canadian Government Agent.

No. 8.

REPORT OF MR. JOHN WEBSTER.

17 AND 19 VICTORIA STREET,
BELFAST, March 31, 1908.

J. OBED SMITH, Esq.,
Assistant Superintendent of Emigration,
London.

SIR,—I beg to submit report of my work for the year ending March 31, 1908.

The spring of 1907 was a record one as regards emigration from Scotland to the Dominion, and the ships which left the Clyde were usually filled up at least a month previous to date of sailing. Some of the steamship agents expressed themselves to me that 'the difficulty lay not so much in finding emigrants as in securing accommodation for them.' Indeed, large numbers had to postpone their departure for weeks on this account.

As often as I could spare the time I travelled on the ship from Glasgow to Greenock, and thus had a good opportunity of going round and advising emigrants.

The steamship companies tell me that the second cabin accommodation was far more in demand than the third, which is an evidence regarding the respectable class from whom the emigrants were recruited.

The statistical board of trade return shows that 20,699 persons left Scotland for Canada during five months, April to August, as against 13,413 for similar period in 1907.

With the commencement of the fine weather the large exhibition wagon was put on the road, and was for a considerable time in charge of Mr. Edgar, and later, for several weeks, in care of Mr. McLaughlin from Prince Edward Island.

During the summer I visited many of the steamship agents in my district for the purpose of posting them in their work, seeing that they were supplied with literature, and that I might, in accordance with instructions, be able to report on them to the Superintendent of Immigration at Ottawa. An occasional visit from the government agent has a useful effect on the steamship agents, and stimulates them to keep Canada well to the front. Where an agent has a good window in a prominent position I was glad to furnish him with grasses and grains for exhibition. Some of the agents made very good use of them.

Towards the end of August the Superintendent of Immigration instructed me to take charge of the work in the North of Ireland, in the room of Mr. O'Kelly, who had been appointed to the new office about being opened in Dublin. On the 5th September I transferred to Belfast and spent a couple of days with Mr. O'Kelly, who spared no pains to explain everything connected with the working of the office. On the 7th September I took charge, and Mr. O'Kelly proceeded to Dublin.

I was glad to find the office established in a good central position and in close proximity to the offices of the prominent steamship agents. Belfast is a fine city, and a splendid centre from which to look after the Canadian interests in Ireland. I am pleased to discover in the north of Ireland an amount of sympathy with Canada which is helpful to my work. The attitude of some of the papers in Belfast has been very satisfactory. I would specially mention the 'Belfast Evening Telegraph,' which has been publishing most favourable illustrated articles depicting farm life in Canada. The editor is one of the journalists who last year visited the Dominion at the invitation of the government of Canada.

In September, 1906, the Canadian Pacific Railway Company arranged for a fortnightly service of their ships to call at Belfast. I am glad to say this experiment has proved a distinct success, and Belfast and Londonderry are now the principal ports of departure for north of Ireland people. On Thursday, March 26, 1908, one hundred and thirty emigrants sailed for Canada from Belfast by SS. 'Lake Manitoba.'

One of the democrat wagons, with grain exhibit, has been travelling through Ireland since July 20, in charge of Mr. Robinson. I kept him continuously going during the open season until December 21. The work of the wagon was of a most useful nature. It visited almost every district, village and town in the counties of Antrim, Derry, Tyrone, Armagh, Monaghan, Fermanagh, Down and a small portion of Donegal. As far as possible I arranged that visits to towns should fit in with markets and fairs. Mr. Robinson had thus a fine opportunity for meeting country people and distributing literature. I would recommend that this work should be continued when the season opens and when the fine weather comes.

During last winter I visited a large number of the steamship agents in my district, and reported on some who had not already been reported upon by Mr. O'Kelly. There is no question but that the liberal bonus paid by the department acts as a great stimulant to the steamship agents to do work for Canada.

During the winter there has been a fair demand for the use of our lantern slides for lecturing purposes.

Three Canadian farmer delegates, Messrs. Delgarno, Bredin and Patterson, were, this spring, placed under my direction. I had the services of these gentlemen for about two weeks, and arranged engagements for them with the principal steamship agents in my district. Their presence at these places was well advertised, so I trust their work may show good results.

There were 3,637 letters received, 4,405 were sent and 5,855 persons made personal inquiry at this office.

Your obedient servant,

JOHN WEBSTER,
Canadian Government Agent.

No. 9.

REPORT OF MR. H. M. MURRAY.

81 Queen Street, Exeter,
March 31, 1908.

J. Obed Smith, Esq.,
Assistant Superintendent of Emigration,
11-12 Charing Cross, London.

Sir,—I have the honour to report on the work of this office for the year ending March 31, 1908.

The removal last year of my headquarters from Cardiff, South Wales, to this city, has been a most satisfactory change—a change which enables me to work efficiently in the agricultural centres of the west of England, and at the same time to reach South Wales, Hereford and Monmouth within a few hours.

In Devon, Somerset and Hereford we have the right sort of agriculturists—strong, strapping and healthy fellows, men who are not afraid of hard work, and will do, and have done, well in Canada. I have not the figures before me, but I am certain that last year's emigration from my district exceeded to a large extent that of any previous year, and what was of more importance, we had the quality. During the season I was frequently present at Exeter railway station when batches of emigrants were passing through from all parts of the west, and could not but admire the generally healthy appearance and capital physique of the emigrants. I am glad to say that not one case of non-success has been reported to me. This is, I think, highly satisfactory.

In the district covered by this office there are placed by the steamship companies 440 agents. Some of these men are capable and energetic workers. Others, and many of them, are absolutely useless, both from their social standing and ability for the work. Again, in some small county villages, there are very often placed two or three agents representing the same lines of steamships, the result being that one will not go to the expense of advertising in case it might benefit his opponent. The same thing applies to several large towns and cities. Cardiff, for instance, has eleven agents; Swansea and neighbourhood twelve. Fewer agents but a better class of workers would in many cases be more profitable and acceptable if the steamship companies could be brought to see it.

Devon, Somerset and Gloucester continue to show the best results. Wiltshire has done better than before. Dorset comes along slowly, whilst South Wales has maintained its average. Cornwall produces the typical navvy, splendidly suited for railway construction work, but during the past year the tin mines and stone quarries situated in this county have been fully employed—in fact, many mines which had been closed for years were re-opened, thus lessening the possibilities of getting any large number of these men for Canada.

On the whole, when we take into consideration the many adverse reports regarding the conditions of employment in Canada, I think the results obtained have been satisfactory.

Apart from the usual routine of office work I, as usual, set apart several days of each week to visiting booking agents, so as to observe how they are advertising Canada, seeing intending settlers at their offices and keeping them well posted as to Canadian affairs, especially in regard to emigration, pointing out the prospects for agricultural settlers, construction men and female domestics.

The bonus of one pound paid by the department to booking agents on the special adult classes who enter Canada for farming work, railway construction, and also on female domestics, is acting in a satisfactory manner. As a rule, agents realize that a certain sense of responsibility rests upon them to select, where possible, the very best material to earn the bonus.

The windows of this office now present a very attractive appearance. Transparencies and pictures of Canadian life and work with exhibits of grains and grasses draw large crowds to our doors, many coming in for pamphlets and information.

The number of callers during the fiscal year now closed was 6,291. Correspondence received was 5,312 letters, and 6,406 were sent, as well as over 2,000 circulars to agents; 1,908 bonus forms were received and passed on to Ottawa.

As usual, our lantern slides were loaned out to voluntary lecturers, close upon a hundred of these lectures having been delivered by school teachers, clergymen and others interested in Canada.

I was glad to have the services of Mr. George A. Aylesworth, who lectured at Taunton, Cardiff and Bridgewater to crowded meetings, and was listened to with the closest attention. Lectures were also delivered at Salisbury and Hereford by Mr. R. Brown, of British Columbia. Here also we had good audiences. The limelight and cinematograph pictures shown of Canadian life and work were much appreciated and created great interest. The work of Delegates Goodridge, Gibbard and West has been most satisfactory. The numbers who called upon them at booking agents' offices for information have been much behind last year, still I am sure their efforts will produce good results.

I attended a number of agricultural shows in the various counties, exhibiting our produce, distributing pamphlets and giving interviews. This work, in my opinion, well repays the cost and time given to it. We meet at these shows the agricultural labourer in his thousands as also the well-to-do farmer. The latter, however, is hard to be persuaded to move, and as they, as a rule, hold their farms on long leases they are loath to quit, even at the end of the lease, and give up the land and farm buildings with all the improvements carried out at their own expense.

Your obedient servant,

H. M. MURRAY,
Agent for South Wales and West of England.

No. 10.

REPORT OF MR. EDWARD O'KELLY.

CANADIAN GOVERNMENT OFFICES,
44 DAWSON STREET, DUBLIN, March 31, 1908.

The Assistant Superintendent of Emigration,
11-12 Charing Cross, London, S.W.

SIR,—I beg to submit my annual report for the year ending March 31, 1908.

The number of emigrants who have left Ireland for Canada during the past twelve months has not only been very considerably the largest on record, the class has been better and the amount of capital taken more substantial. The judicious

advertising of Canada, the wonderful display made by the Dominion at the international exhibition held in Dublin this year, the travelling through the province of Ulster of the wagon of Canadian specimens of farm products and the presence of farmer delegates from different provinces of the Dominion, have all aided me in securing a favourable result for this year's work. I also had my usual stand of Canadian exhibits at the show fairs held in the important towns of Dungannon, Portadown, Ballymena and Londonderry, before I was moved to Dublin.

A considerable portion of my time has been occupied in visiting the steamship agents in my new district, supplying them with information and urging them to take advantage of the generous action of the Canadian government towards them in the granting of the increased bonus by inducing as large a proportion of those leaving Ireland as possible to settle in Canada. In addition to visiting the agents I keep them supplied with maps and literature, and frequently send them newspapers, &c., from Canada, illustrating the wonderful progress of the Dominion. By these means I am endeavouring, with some success, to divert the stream of emigration at present flowing to the United States to Canada.

Early in June Mr. J. Bruce Walker, by desire of the minister, instructed me to proceed to Dublin and look over premises suitable for an office for the department. I found the rents in Dublin higher than in Belfast and the choice of locality more restricted, but eventually secured suitable offices at 44 Dawson street, one of the leading thoroughfares, at a very reasonable rent. On September 8, by direction of Mr. Walker, I transferred the Belfast office to Mr. Webster, and on the 10th opened the Dublin office, where I have been kept busy attending to correspondence and callers when not travelling through my new district, the provinces of Leinster and Munster.

Owing to the normal conditions existing in these provinces, where over ninety per cent of the emigrants have been going to the United States for years, it may take some time to show them that they will do better in Canada, but that time is coming and sooner than I expected a year ago, by reason of the number that have returned from the United States during the past five months with woeful accounts of the condition of things in that country.

Under date December 4, Mr. Walker, by circular letter, issued under direction of the Superintendent of Immigration, advised the booking agents that the demand for labour of all kinds in Canada was over for the season, and to make known to all persons looking for employment in Canada not to sail earlier than April, and then only if employment was assured them, or if they had sufficient cash to keep them until they secured employment. I quote this circular to some extent, because I found that though it curtailed emigration for the early part of the season, it was well received and favourably commented on by the clergy and general public, showing, as it did, the care taken by the Dominion government for those seeking homes in Canada, and I am of opinion that the publicity given to this circular will lessen the opposition to emigration to the Dominion in the future.

I have received some trade inquiries and have attended to them. I am sorry to have to state that I have also received strong complaints from Irish importers of Canadian apples of the methods used by the shippers. I have inspected at hap-hazard a dozen barrels of one shipment complained of and found the complaint justified by every barrel I inspected. I brought the complaints before Mr. A. W. Grindley, chief inspector in Great Britain for the Department of Agriculture. Mr. Grindley forwarded my letter and complaint to Mr. W. W. Moore, Department of Agriculture, Ottawa. I have sent copies of the *Canadian Gazette*, containing reports of the steps taken by the Minister of Agriculture to put a stop to the fraudulent packing of fruit, and also extracts from the letters of Messrs. Grindley and Moore to the merchants making complaints, and have received replies thanking me for bringing their grievance before the proper officials and expressing their satisfaction with the steps taken to protect their interests.

In the six months this office has been open 1,771 letters have been received, and 2,415 sent out. The number of callers for same period who registered their names was 1,781, a large proportion of same from counties outside Dublin.

Your obedient servant,

EDWARD O'KELLY,
Canadian Government Agent.

No. 11.

REPORT OF MR. PAUL WIALLARD.

10 Rue de Rome, Paris, April 1, 1908.

J. Obed Smith, Esq.,
Assistant Superintendent of Emigration,
11 and 12 Charing Cross, London.

Sir,—I have the honour to submit my report for the year ending March 31, 1908.

The season 1907-8 seems to have been particularly bright. The opening was marked by an abundance of departures, which we expected from the considerable number of demands for information received during the preceding winter. On each steamer we have booked many emigrants, and it was only towards the end of the summer that one could readily find a place on board an outward-bound vessel.

Then came the American crisis which drove back to Europe a crowd of immigrants of all nationalities and determined at the same time a very serious exodus of labourers from the United States, thus disturbing the equilibrium between the supply and demand for employment. From the standpoint of emigration, the effects of this crisis were not much felt during the winter itself, because generally few think of moving before the spring, the time when agriculture is resumed, but the echo which these events found in the French press and the importance several organs appeared to give to this temporary state of affairs may perhaps be of a nature to offset the results of the season of 1908-9 to a certain extent. Although this setback may have been more apparent than real, there is little doubt but that Canada will this year suffer from the view-point of immigration by the financial crisis from which the neighbouring republic has suffered.

During the year we received upwards of 10,000 letters, exactly 10,250 being replied to.

The visits to the Commissioner General for Canada of persons seeking information about the country totalled 6,750. Independent of this demand for information at least the same number of persons asked for and were given pamphlets.

Every time a party of colonists, ready to leave, required to consult us in person and invited us, we did not hesitate to go to them and to give them all the information possible. Being very busy during the week, I generally devoted my Sundays to these trips, leaving on Saturday and returning on Monday.

M. Foursin has continued, as in previous years, to give, with his knowledge of Canadian affairs, verbal information as to the advantages afforded by Canada in return for the industries of farming or railway construction.

M. Geoffrion, who was added to my staff several months ago, has assisted M. Foursin in his work, and in addition has been delegated to reply to a part of the mail. My intention is to send him out into the provinces as soon as the work of the office

will permit, to give a series of lectures, which will assist in making the country better known, to which the general attention has elsewhere been recently directed by the conclusion of the Anglo-French treaty.

The department sent to France this year two delegates—M. Brutinel, of Edmonton, and M. Parent, farmer, Manitoba. These gentlemen have co-operated in spreading among the French people the idea that we are diligent workers, and that if we do not force people to emigrate it is not that our country does not offer such chances of success as would not be readily met with elsewhere.

We do not persuade persons who expect in Canada business, administrative or professional employment to emigrate, and as the countryman who has never left his native land or the village which gave him birth is, of all, the one who will last think of emigrating, it follows that we receive a considerably less number of requests for information from people not belonging to the class likely to succeed in the country than of those who are practically certain to find immediate work, and that the emigration from France to Canada is not as extensive as we would desire.

During the course of the year I have translated and corrected five new pamphlets, of which three were pretty voluminous. Of these five three have been printed in France under my supervision. I trust that my work in this and other respects has been satisfactory to the department, and I shall continue my efforts to increase still further the good-will which Canada enjoys in France.

One hundred and fifty thousand pamphlets have been distributed this year.

Your obedient servant,

PAUL WIALLARD.

No. 12.

REPORT OF MR. D. TREAU DE CŒLI.

23 Place de la Gare,
Antwerp, Belgium, March 31, 1908.

J. Obed Smith, Esq.,
Assistant Superintendent of Emigration,
London.

Sir,—I have the honour to submit my report for the year ending March 31, 1908.

The policy of propaganda inaugurated since my arrival in Belgium has been steadily followed, namely, lectures in winter, attendance at fairs in summer, with distribution of literature and meetings with intending emigrants in order to give them all important or necessary information.

I have followed up the introduction in our common and superior schools of the teaching of the geography of Canada. I had the honour to make mention of my endeavours to that effect in my report of 1905, when I stated that twenty-two schools were giving lessons on Canada; in 1906 this number increased to 505, and during this year I am pleased to state that in 1,875 more schools, forming the grand total of 2,380, the geography of Canada is taught. Every one of these schools has the large wall map of Canada in its classes, and a certain number of atlases and other pamphlets have been forwarded to them for free distribution. Special attention has been paid to provide also the schools of adults with the above.

I think it my duty to remark that I was greatly encouraged in this distribution by the school inspectors of the different districts and by other educational authorities, and also that neither map nor pamphlets were forwarded except on demand and on

special promise that the map should be used in the school and the pamphlets distributed gratuitously. Besides this, I loaned a good many Canadian views to be used for lectures.

I am quite sure that a more effective propaganda could not be made, and I expect the best results in the near future.

During the winter season I have given 20 lectures, generally in the localities where a certain movement of emigration was noticeable.

The orders issued by the department to restrict immigration have caused a certain hesitation, not only with those who were directly prevented from executing their project, but also with others who feared to risk their capital, the more so as these restrictions were closely allied with the crisis in the United States, but if it has made people more cautious, it has also brought forward those who had the will and the means necessary to succeed.

Although my principal work has always been in Belgium, I have continued and even increased my propaganda in Holland, and I am pleased to state that the emigration from that country will give good results this year; already different groups have left for the west, and the month of April will see a still larger number emigrating to Canada.

The most pleasing feature is not so much the number as the quality of the emigrants; very few single men, generally families of 6, 8 or 10, taking with them a sufficient capital to settle on a homestead, in most cases chosen for them by the father or one of the sons who preceded them.

As a result of judicious advertising in a certain number of local papers mostly agricultural, as well in Holland as in Belgium, and through the propaganda made by different teachers, the correspondence of this office has been numerous; not less than 6,290 letters have been received and due attention given to all demands of information.

In conclusion, I may state that according to all information I have received from new colonists, every one of them feels satisfied with his new country, and in no case was any complaint made as to having been deceived by the pamphlets or by official information.

Your obedient servant,

D. TREAU DE CŒLI.

OPERATIONS IN THE UNITED STATES.

No. 13.

REPORT OF MR. W. J. WHITE, INSPECTOR OF AGENCIES AND PRESS AGENT.

OTTAWA, April 15, 1908.

The Superintendent of Immigration.

SIR,—The fiscal year just closed shows that the number of immigrants from the United States was 58,312, a splendid return under existing conditions, fully illustrating the fact that the advantages of Canada as a farming proposition have been well presented to the moving element in the United States, and proving also that it would take more than one year of irregular crops to offset the work that has been so well done in the United States. The most pleasing feature of the work has been the splendid character and quality of the immigrants. The money and effects brought in by these 58,312 people was in the neighbourhood of the total value of $52,000,000, or nearly $1,000 per head. This has been added to the money wealth of Canada in one year. In addition to its money wealth there is the physical wealth which these people bring. Forty-eight thousand of those arriving took up homesteads; most of the balance purchased land and went into farming, a life that 90 per cent of them had been following in their old homes. It has not been thought necessary to point out the moral value of the United States settlers. They have largely been obtained in the western and central western states, where they or their fathers were pioneers. Pioneering is therefore no hardship to them. In fact they rather enjoyed it, as we find many of them desirous of moving as far as they can be carried by railroad. They bring with them a wealth in experience in tilling prairie lands, and are able to take from the soil the best that it will afford. I am satisfied that if a census were taken it would be found that the United States farmer almost always succeeds in having good crops and realizing the highest price for his products. His presence in a neighbourhood is welcomed for the experience he brings with him and is willing to impart to his neighbour, and in this way the new-comer from other parts, be it eastern Canada, Great Britain or the continent, is taught lessons in farming that are valuable to himself and the country.

During the past year only two or three of the states in the American Union have not been represented in the homestead entries. There is not a state in the Union in which Canada is not advertised. The offices of the government are located in the best agricultural sections, with a view to being in easy touch with the surrounding country so as to make it possible for the agents to cover their respective districts with the least trouble. The offices are located as follows:—

M. V. McInnes, 6 Avenue Theatre Block, Detroit, Mich.
C. A. Laurier, Marquette, Mich.
Jas. N. Grieve, Spokane, Wash.
J. S. Crawford, 125 West Ninth street, Kansas City, Mo.
T. O. Currie, 108 Third street, 2nd floor, Milwaukee, Wis.
J. M. McLachlan, Box 626, Watertown, South Dakota.
E. T. Holmes, 315 Jackson street, St. Paul, Minn.
W. V. Bennett, 215 Board of Trade Building, Omaha, Neb.
Chas. Pilling, Clifford Block, Grand Forks, N. Dakota.
H. M. Williams, 413 Gardner Building, Toledo, Ohio.

C. J. Broughton, 412 Merchant's Loan & Trust, Chicago.
Benj. Davies, Room 6, Dunn Block, Great Falls, Montana.
W. H. Rogers, 316 Traction-Terminal Building, Indianapolis.
Thos. Hetherington, 73 Fremont street, Boston, Maryland.
Thos. Duncan, 30 Syracuse Bank Building, Syracuse, N.Y.
Geo. A. Hall, 210 House Building, Pittsburg, Pa.

The work of these agents is very much the same in character. At almost all the offices there are one or two assistants, whose duty it is to look after the correspondence, issue the certificate which entitles the applicant to the reduced rates afforded by the Canadian railroads to the actual settler and give to the caller all available information. At the end of the week the assistant keys the letters received according to post offices and districts. The agent then selects the district that he should visit during the next or coming weeks and advises one or more of the correspondents that he will meet them and their friends at some given place on a set date, or, if this is not possible, when necessary, he visits the individual correspondent. He carries with him samples of the grains and grasses of Central Canada, has with him a supply of literature and quotes rates from their home to such a point in Western Canada as they may desire to go to. He assists the intending settler by securing him the lowest freight rates for his stock and effects, advises him the best way in which to get cars and afterwards follows the course of the car to its destination. Very often the male members of the family move in advance of those dependent. When this occurs it is the duty of the agent to assist the family in every way possible in order to get a start.

During the fall of the year exhibits of grain and grasses, roots, vegetables, etc., with which the agent has supplied himself, are taken from fair to fair and tastefully arranged, then the agent's time is pretty well occupied in this way for from two to three months. A chain letter system is adopted which is very effective in getting the names of those in a neighbourhood who would likely be interested in Canada. To the names thus secured literature and circulars are sent, and it is surprising the amount of effective work that is done in this way. It is sometimes the case that the manner in which one state may be worked will differ from another state. In each case, however, the agents keep me advised as to what they feel is the best course to pursue, and I am always prepared to accept and act upon such suggestions as may be safely adopted. In some cases it is found that the management of a fair does not care to allow our exhibits to be placed, but these cases are so rare that it is scarcely necessary to refer to them. In most cases there is no difficulty whatever in securing space, and in others managements have requested that we exhibit, offering a space free of charge. Generally, however, we rent a space in some building, and sometimes, unable to do this, ground space is rented. On this ground a temporary structure is sometimes erected, and in other cases a tent is secured in which exhibits are placed. It is often necessary, in order to interest people in a certain district, to secure the assistance of one or two or more responsible men. Various ways are adopted in order to do this. One of the best methods is to secure transportation for these people and send them through to our western provinces to report to their friends. The agent fills up his report very carefully, and in this way gets in touch with a good class of people. Again, parties are accompanied as far as the boundary line, as there is a possibility that in passing through some of the western states towns some of the people who may have been directed by the efforts of local agents to Canada may become interested in American lands.

I referred in my last report to the inducements held out by Texas land agents. The railroad rates from St. Paul, Chicago, Des Moines, Omaha, Kansas, Indianapolis and other points to Texas lands were much lower than those to Canada. The Western Passenger Association, however, has adjusted this, so that the rates are now more even; therefore, some of this difficulty has been overcome. There is still opposition, and considerable of it is owing to the fact that Texas lands are reasonably low in price and an army of agents at work throughout the country setting forth the advantages in Texas from a settlers' standpoint.

Besides the inducements held out by land owners in Texas, those offered by holders in Colorado, Montana, Wyoming and South Dakota were sufficient to arouse a disturbing sentiment amongst possible movers, and divert the attention of land seekers. These lands do not carry the advantages that Canadian lands do, but the desire to keep within one's own country is something that is hard to overcome. There is the wish to know what it has to offer before going outside. It is true that Canada has the 'last best west,' but there is sufficient of the American west (whatever the character of the land may be) to keep the department and its corps of agents busy in the presentation of the superior advantages and opportunities afforded by Canada.

The results of Canada's immigration work in the United States for the fiscal year ending March 31, 1908, have been as satisfactory as was expected. They have been more than normal, and, as will be seen by reference to the official report published elsewhere, a splendid increase in number is shown as compared with the previous year. The department and the people of Canada have reason to feel pleased that the work has been so effective. It is only fair to say that the conditions of the spring of 1907, and the unusually embarrassing climatic conditions of the succeeding summer were very unfavourable. These conditions and the adverse reports sent back to friends by some of the unfortunate ones at the critical period required to be met by strenuous work on our part, but the fact that it was possible to secure a fair percentage of increase over 1906-7 will fully justify the extra trouble with which we were taxed.

The advertising that has been done during the past year has been of the same character as that done during the past several years. Space is purchased in about 7,000 newspapers throughout the United States, farm journals and the country weeklies being preferred. Reading notices and display advertising are both used freely. As in the past, I can see no better way of reaching the people.

A party of eleven editors of the British Provincial Press saw Canada to such good advantage that these papers published hundreds of columns of matter setting out their views on the conditions of Canada. These articles reached the class of people we were desirous of reaching and already good results are seen in consequence.

The correspondence at the various offices has increased from ten to thirty per cent. From the nature of it and the direct inquiries made I feel safe in making the statement that the year 1908-9 will show a much greater increase in numbers from the United States. It would not be surprising if the number would reach the 75,000 mark.

Although homestead lands near lines of railway are month by month becoming scarcer, those amongst whom the agents are working are finding out that the best land does not always lie contiguous to the railway line. They are willing to go back fifty and even a hundred miles, taking the chances of getting railway advantages in a short time. The number last year seeking lands to purchase was not as large as the previous year. The movement was made up of those who had homesteaded during 1907. At the time of writing, however, the number desiring to purchase lands is increasing, and those having large blocks of lands for sale may expect a fairly good season, if they do not set too high a price on their lands.

Your obedient servant,

W. J. WHITE.

SESSIONAL PAPER No. 25

OPERATIONS OF IMMIGRATION OFFICIALS IN WESTERN CANADA.

No. 14.

REPORT OF THE COMMISSIONER OF IMMIGRATION.

WINNIPEG, MANITOBA, April 1, 1908.

W. D. SCOTT, Esq.,
Superintendent of Immigration,
Ottawa.

SIR,—I beg to submit the following report for the fiscal year ending March 31, 1908.

During the year, by means of the employment bureau in this office, aided by agents at every point of importance in Manitoba, Saskatchewan and Alberta, a thorough system of distributing and finding suitable employment for immigrants was successfully conducted; and it is to be noted as showing the steady and increased demand for farm labourers that, throughout the whole year, unfilled applications for farm hands were on file at this office. The number of applications for farm hands received was 6,442, of which 3,579 were filled. In addition to this, 512 applications were received for married couples, of which 378 were filled.

A large number of intending settlers from Eastern Canada, the United States, the British Isles and continental Europe called at this office in quest of information and advice in order to enable them to secure suitable locations in which to settle; and I have much pleasure in reporting that, so successfully and satisfactorily has the work of locating settlers been conducted, no complaints have been received at this office that parties have been directed to undesirable locations.

In this connection, it might be well to mention that homesteads well adapted for both grain and cattle farming can be secured in Manitoba, Saskatchewan and Alberta within twenty miles of existing railways and railways now under construction. Among these districts may be specially mentioned: Prince Albert; the district north of the Canadian Northern Railway from Battleford to Vegreville; along the Grand Trunk Pacific and Canadian Pacific Railways between Saskatoon and Edmonton; along the South Saskatchewan river north of the Canadian Pacific Railway main line from Moosejaw to Irvine; also south of the same line between the same points.

ENGLISH.

The immigrants from England were, generally speaking, of a class likely to succeed in western Canada, with the exception of a number sent, mostly from the slums of London, by charitable and philanthropic institutions. Measures, however, have been taken to deport every undesirable who came or was brought to our notice.

WELSH.

The class of Welsh immigrants was unexceptionable. A large proportion of these people went to farm work, for which they are well adapted.

SCOTCH.

With the exception of a number of Scotch labourers, mostly from Glasgow and district, sent to work on railway construction, who drifted into the city last fall, and appear determined to remain here, the large majority of arrivals went to farm work, with satisfactory results, few seeking employment at this office a second time.

IRISH.

Immigrants from Ireland were mostly of the agricultural class and accepted farm work almost to a man. It is to be regretted that a larger number of these people do not come to Canada, as they are very popular with the farmers here.

GERMANS.

Germans who arrived during the last fiscal year were a very desirable class, and most of them went to farm work, or took up land in western Canada; and the reports we have received from these newly-arrived immigrants are very satisfactory.

SCANDINAVIANS.

The Scandinavians who arrived during the year were, with few exceptions, of a very desirable class. Many went direct to the land; and the others to employment on railway construction, and other work, at which they received high wages.

ICELANDERS.

During the year a considerable number of Icelanders came from their native country, and a few from the United States. They have mostly engaged in agriculture.

SWISS.

The immigrants from Switzerland practically all went to farm work.

DUTCH.

The arrivals from Holland went mostly to farm work and railway construction. These people make excellent settlers and learn the English language quickly.

HEBREWS.

Of the Hebrews who arrived during the past year many went to friends and relations in country districts, and a few remained in Winnipeg. On account of the arrangements made by their friends these people give very little trouble to the officials.

GALICIANS.

The largest number of Ruthenians and Poles came from the Austrian provinces and a few from Bohemia and Russia. Most of the people from Austria were farmers and went immediately to homesteads. The majority of the others went to railway construction work. Quite a number came from the United States, nearly all of whom entered for homesteads.

FRENCH AND BELGIANS.

The French and Belgian immigrants who came here last year were a very desirable class; and, as nearly all were agriculturists, they went to work upon farms or took homesteads.

IMMIGRATION ACCOMMODATION, WINNIPEG.

Seventy-six thousand three hundred and ninety-three days' accommodation was given to immigrants at buildings Nos. 1 and 2 during the year.

IMMIGRANT HOSPITAL.

The services of this hospital have proved of great benefit to immigrants. 321 cases of sickness having been treated during the year. A full report by Dr. Corbett, Dominion Health Officer, has been forwarded to you.

NEW IMMIGRATION HALLS.

During the year immigration halls were erected at North Battleford, Vermilion, Swift Current and Wilkie.

CORRESPONDENCE.

During the year there were sent from this office 2,454 registered and 31,290 unregistered letters, besides many thousands of pamphlets and maps. The number of letters received was 27,810.

EXHIBITS.

During this period 875 cases of agricultural exhibits were sent to agents in the United States, Great Britain and British colonies, besides 95 sacks of samples of grain to public schools in the United States.

DEPORTATIONS.

There were 255 undesirable immigrants deported from the 1st of April, 1907, to 31st March, 1908.

Annual reports have been received from officers and agents stationed at Port Arthur, Ontario; Brandon, Dauphin, Swan River and Teulon, Manitoba; Regina, Moosejaw, Saskatoon, Yorkton, Battleford, North Portal, Maple Creek, Estevan, Lloydminster and Duck Lake, Saskatchewan; Edmonton, Calgary, Medicine Hat, Lethbridge, Strathcona, Red Deer, Vegreville, Stettler and Sedgwick, Alberta. These reports deal fully with the duties performed by the officers, and besides contain much valuable information as to the number of settlers who arrived during the year, the number and value of carloads of stock and effects brought by them, the increase of acreage under crop, the output of grain and number of animals shipped to market, the number of homestead entries and other statistical information, which, as a whole, shows that, although last year's crops in some districts were partially damaged by frost, much material progress was made throughout Western Canada during 1907.

Since taking charge of the work of Commissioner of Immigration at Winnipeg and throughout the west I have given some attention to the conditions under which the work is carried on. I believe the organization generally is in a very satisfactory condition, and I think it only fair to say that much of the success that has attended the work in this department is due to the faithful and conscientious services both of the inside staff at Winnipeg and of the various officers at outside points.

Your obedient servant,

J. BRUCE WALKER,
Commissioner of Immigration.

No. 15.

REPORT OF THE MEDICAL OFFICER AT WINNIPEG.

OFFICE OF THE COMMISSIONER OF IMMIGRATION.

WINNIPEG, MANITOBA, April 13, 1908.

W. D. SCOTT, Esq.,
Superintendent of Immigration,
Ottawa.

SIR,—I beg to submit a report of the medical attendance and inspection service at this point for the fiscal year, ending March 31, 1908.

Daily visits were made to the immigration halls and hospital; and, in many cases, I was obliged to visit new arrivals at their homes in the city and elsewhere.

Medical attendance was given to the following cases of sickness:—

Measles	25	Neuralgia	4
Diarrhœa	15	Quinsy	2
Bronchitis	21	Pneumonia	9
Rheumatism	23	Gastritis	2
Influenza	31	Gout	1
Biliousness	29	Carbuncle	2
Injuries	31	Dysentery	5
Tonsilitis	13	Asthma	3
Cellulitis	9	Frost-bites	7
Stomatitis	1	Adenoids	1
Synovitis	2	Eczema	2
Phlebitis	1	Pleurodynia	1
Debility	3	Phthisis	1
Neurasthenia	1	Chicken-pox	2
Confinement	1	Nephritis	3
Pleurisy	6	Convulsions	1
Varicose Veins	2	Epilepsy	3
Scarlet fever	1	Conjunctivitis	4
Heart disease	3	Diphtheria	3
Corneal opacity	1	Skin diseases	9
Mastitis	1	Chorea	1
Dyspepsia	3	Dropsy	2
Ulcers	5	Abscess	3
Inflammation of ear	3	Inflammation of breast	1
Erysipelas	1	Scabies	7
Rupture	1	Otorrhœa	1
Dressings	8		

Certificates were given for the purpose of deporting 129 undesirable immigrants.

I am pleased to report that the incoming immigrants for the past year have been exceptionally free from all infectious and contagious disease.

Your obedient servant,

S. C. CORBETT,
Dominion Health Officer.

No. 16.

REPORT OF THE GENERAL COLONIZATION AGENT.

BRANDON, MANITOBA, April 17, 1908.

W. D. SCOTT, Esq.,
Superintendent of Immigration,
Ottawa.

SIR,—I have the honour to submit the following report:—

During the month of April, 1907, I made an extended tour through Manitoba, Saskatchewan and Alberta, inspecting the condition of our immigration halls, and also assisting belated settlers who were detained on their journey by the different railways through heavy storms, incurring much hardship to live stock, as well as detention to settlers. Many points were congested with cars of settlers' effects, owing to the very heavy snowfall and late spring. The Canadian Pacific Railway and the Canadian Northern Railway did all in their power on this occasion to relieve the settlers. They supplied food for both man and beast and did everything possible for the comfort of the people.

In addition to the above, during the same month I took up the question of colonizing the districts north of Prince Albert, being a country specially adapted for eastern Europeans, report of which was submitted, dated Prince Albert, April 25, 1907. The foregoing work incurred much correspondence with the Saskatchewan legislature and the Board of Trade, Prince Albert.

During the month of May reports were forwarded to the department, dealing with general conditions in the west, at points on the Canadian Northern Railway, and also setting forth the particulars of seed grain advanced to settlers, and referring to accommodation to immigrants at different points.

The Canadian Northern Railway, during March and April moved 1,376 carloads of settlers' effects over their line, compared with 933 cars for the corresponding two months of the year previous. Considering the extraordinary conditions, much work was involved in assisting settlers to their destination, providing accommodation for them at different points, and reaching some outlying districts isolated from railway facilities to see that the settlers had fuel and food.

Under instructions from the minister literature was placed in the hands of the Doukhobor community, each head of a family receiving a pamphlet.

During the same month, under instructions from the secretary of the department, dated June 4, 1907, I revisited the townsite of Lloydminster, and adjusted the rights of certain residents to claims they had for town lots.

During the same month the question of immigration furnishings, seed grain advances and other departmental matters were attended to.

I submitted a report on the general conditions existing in the west, pointing out new districts for colonization purposes, as well as reporting on the different nationalities, their progress and prospects.

I also reported on the final revision of the British settlement at Lloydminster.

I also submitted a report on some colonies in the west, with statistical information.

During the month of July, I submitted a report setting forth the outlook as to crops, &c.

I also made a report on the Medicine Hat district, showing the production of lands that were formerly considered semi-arid, now irrigated.

I also prepared a report on the Doukhobor community, dated July 18, 1907, and a full report, dated July 22, 1907, pointing out the improved conditions in the west.

Report to W. J. White, dated July 30, 1907, concerning the completion of the itinerary of the British editors visiting Western Canada.

In August I completed the itinerary for the British editors, arranging for their entertainment and reception at thirty-two different towns in Manitoba, Saskatchewan

and Alberta, notifying the boards of trade and civic representatives at the various places. A universal response was given by all communicated with to entertain the distinguished visitors. I accompanied the editors throughout Manitoba, Alberta, Saskatchewan and Ontario. They represented the leading journals of the British islands. The reception accorded them was most friendly. I was ably assisted by the officials of the Canadian Pacific Railway, the Canadian Northern Railway and the Grand Trunk Railway. They supplied private cars, literature and intelligent men, who made the trip very instructive to the newspaper men. I endeavoured to point out, not only the fertility, but the great possibilities of the country, particularly through the districts in the western provinces, where many people from the British isles are now making homes on the prairie.

During the month of September I visited the United States and assisted in placing the Western Canada exhibit at Springfield, Ill. Having assisted at that state fair for some years in succession, I beg to say that a very great interest is manifested there in our products, and also a great many inquiries are made there every year by intending settlers.

These exhibitions do a great deal of good, as they arouse an interest in the minds of people who are somewhat undecided as to the best place to emigrate to, for I have observed that other agencies are very diligent and spare no expense in holding out the advantages that they claim can be secured by moving into Texas, Oklahama, Mexico and other countries. Our exhibits and distribution of literature are indispensable to combat these influences and direct people to a better country.

Under instructions from the minister, I examined the conditions as to food and fuel and the prospects of settlers throughout the west.

During the month of October I examined and investigated certain departmental matters at Mortlake.

Made a report also relating to United States work.

During the month of November, under instructions from the department, I inspected the crofter colonies at Wapella.

I submitted a report to the secretary of the department relating to the lien security at Battleford, Sask.

I also submitted a report pointing out the fact that our country had suffered from a premature frost, which had affected the production, and placing the production of our milling wheat at 40,000,000 of bushels; and also showing that many districts of Western Canada had been specially favoured with a good crop. By way of comparison, I pointed out the stringency and financial depression in the United States, and expressed the belief that thousands of Americans would come to Canada as the result of conditions in that country.

During the month of November I made an extended tour through the Tramping Lake district, south of Battleford, in compliance with instructions from the Minister of the Interior. I drove some two hundred miles and personally ascertained the existing conditions.

During the month of December I supervised the distribution of supplies to needy settlers in conjunction with the Royal Northwest Mounted Police. This involved considerable work. I found it necessary to place small emergency rations at Tramping lake, fifty miles south of Battleford; at Sounding lake, eighty miles south of Lashburn, and also north of Jackfish lake. These supplies were placed in the care of the Northwest Mounted Police to be used in emergency. I am pleased to observe, however, that very little was required by the settlers and that my former reports have been fully verified.

During the same month, under instructions from the secretary of the department, I had all the lien securities forwarded to Ottawa.

Believing that many districts in Alberta and Saskatchewan would require seed grain in the spring of 1908, I submitted a report to the minister, calling attention to this fact, outlining the possibility of the obligation being a heavy one, and suggesting by way of recommendation, a *modus operandi*.

During the month of January, 1908, I assisted in investigating the requirements of the settlers in the way of seed grain.

In addition to this, I let the tenders for new immigration buildings at Swift Current, Vermilion and North Battleford, as well as examined the condition of our immigration halls at different points.

In February, 1908, I reported on the condition of the old immigration buildings at Battleford.

Also made a report of isolated cases throughout Saskatchewan, at Bruno, Wadena, and Prince Albert, requiring attention.

Also a report relating to certain Italian immigration.

Also a report relating to matters of importance in connection with immigration work, dated February 11, 1908.

A complete report of the settlers north of Swift Current, with a map, showing location.

A report on the condition of our immigration buildings, addressed to the Commissioner of Immigration, dated February 29, 1908.

During the month of March, 1908, I submitted a report reviewing conditions in Saskatchewan.

I also reported to the Commissioner of Immigration the conditions of the immigration buildings at Craig and Davidson, and made a report on the requirements of our department at Warman, Sask.

I also reported, at the request of J. O. Smith, the condition of certain land in Saskatchewan. I reported also to the Superintendent of Immigration particulars pertaining to the construction of the new immigration hall, to be built at Wilkie, Sask., south of Battleford, on the Canadian Pacific Railway, which work I let by tender on March 4, 1908.

In connection with the distribution of seed grain to settlers in the unorganized portion of Manitoba, full report submitted to the Commissioner of Immigration, dated March 30, 1908.

The foregoing is the eleventh annual report that I have had the honour to submit to the department. During these series of years, our population has very greatly increased, and the development of western Canada is simply astounding. The uniform colonization of the west is very significant. Eleven years ago a few people could be found, far remote from each other, settled in little groups, along the rivers, at places such as Edmonton, Battleford, Prince Albert, Qu'Appelle, and other points. At the present time, our country is well filled with progressive and thrifty agriculturists. Great areas have been brought under cultivation. Towns have sprung up, and centres of commerce established, and in reviewing these eleven years one is struck with the fact that the country has been wonderfully prosperous.

The prospects too were never better. All our districts are accessible by railway communication, and I might safely say that we have under construction, and in embryo, under contemplated construction, railways that will mean an expenditure of over $50,000,000. This in itself should inspire hope in the individual, as there will be plenty of money to earn for many years to come. The agricultural classes will find a good market for their cattle, their hogs, their grain, their poultry, and all the products of the farm, and this fact should impel greater energy on the part of the producer, and still greater confidence in the country. Last year we produced above 40,000,000 bushels of wheat for milling purposes, and more of an inferior grade. True, it was not well distributed. Many of our people got rich, and others suffered, but our people are all hopeful for the future. We have just experienced a very mild winter. The spring has opened unusually early. Seeding is general throughout the entire west; a largely increased area will be put in crop; the ground is in good condition, and the settlements throughout western Canada are in good shape, and hopeful for the future.

Your obedient servant,

C. W. SPEERS.
General Colonization Agent.

JUVENILE IMMIGRATION.

No. 17.

REPORT OF G. BOGUE SMART, CHIEF INSPECTOR OF BRITISH IMMIGRANT CHILDREN AND RECEIVING HOMES.

The Superintendent of Immigration,

Ottawa. Ottawa, March 31, 1908.

Sir,—I have the honour to submit my ninth annual report as chief inspector of British Immigrant Children and Receiving Homes. The work of my office continues to grow with each year's immigration from the British Isles.

The children are segregated throughout the length and breadth of our settled agricultural districts, and their inspection, for each child must be personally seen and privately interviewed, necessitates not merely an enormous mileage but considerable time.

The following statement indicates the progress of the work of inspection during the year:—

January	148
February	244
March	184
April	183
May	269
June	152
July	175
August	*62
September	163
October	146
November	105
December	10
Total	1,841

Delightful weather and good roads greatly facilitated the completion of the work, and early in December the last child received its annual inspection.

It is a matter of satisfaction to know that the work of this branch of the public service has met with the approval of the local government board of London.

The Parliamentary Secretary to the Board in a communication to the Right Honourable the Prime Minister of Canada stated in part :—

'I should like to say what very real pleasure it has given me to note the extraordinary kindness with which your people in Canada treat these children, and to say also how very much I appreciate the care which your officers of the Department of the Interior take to keep an eye on them, nothing has given me such real pleasure during my three months at the Local Government Board as the reading of the reports.'

Only a small proportion of the children dependent on the ratepayers of Great Britain reach the goal of immigration to Canada, to which I found, during my visit to England, so many aspire. From the latest available statistics one learns that on January 1, 1907, there were 60,427 children in the various state homes and schools of England and Wales. It is to be regretted that an increased number of children could not have been sent to the Dominion in order that the pressing demand for juvenile farm labour and splendid opportunities available for carefully selected and trained children of this class might have been taken advantage of. For some years the total emigration has been wholly inadequate to the demand. A larger emigration

* Holidays.

was prevented only by lack of funds. The labour of saving the lives of orphaned and neglected children for a better and more useful service to the state is dependent in a large measure, on the voluntary offerings of the charitable and benevolently inclined. Thousands of pounds are raised annually for maintenance and emigration from various sources. Owing to her long established civilization and her over populated cities and rapid development, Great Britain is famed amongst the nations of the world for her wide established and useful charities, both of private and state origin, for the purpose of alleviating juvenile want and suffering.

The most ancient institutions of a benevolent nature are to be found in the United Kingdom. Some of them have risen from small and most discouraging beginnings to a degree of prosperity which has augmented their sphere of benevolence far beyond the bounds anticipated by their long departed founders. Excluding all calculation of casual beneficence, the money voluntarily given reaches, as I have already stated, an enormous sum, but notwithstanding these heroic efforts on the part of philanthropists and the contribution of the Imperial Government, a vast work has yet to be done, as dire distress and wretchedness still exist to a painful degree, and the cry of neglected, suffering children is still to be heard in the cities of the old land.

It was as a partial remedy for these distressing conditions that the emigration of children at an early age to our shores was inaugurated in the year 1869 by the late Miss Annie Macpherson and Miss Rye.

The work has gone forward unostentatiously all these years, amidst much hostility and discouragement both at home and abroad, until the present time, and, notwithstanding the obstacles placed in its way, over 60,000 boys and girls have been settled on our shores, and hundreds of these are on the highway to prosperity. Had it not been for the outlook emigration afforded, incalculable numbers of most deserving children would have been practically lost to the nation, would have been swallowed up in the social maelstrom, and would have gone to the ranks of the unemployed and unemployable of the old land, and thus have added to the great economic problems that are continually engaging the attention of His Majesty's Imperial Government.

As illustrating the benefits of emigration for a worthy class of children, I might mention the following cases which were recently brought to my attention:—

Nine years ago a lad of ten, who had lost his mother, was left with his stepfather. It was found that he was being treated shamefully, and he was then sent to his grandparents, but they were too old and poor and quite unequal to his proper upbringing. Finally he was placed in the Children's Home and Orphanage, Bonner Road, London, and in due time was sent to Canada and placed in an excellent farm home. The farmer describes him as a smart, intelligent boy, with a splendid reputation in the neighbourhood, and in fact states that a finer, nicer lad never came under his roof.

Sixteen years ago W.B., then a lad of ten years of age, poor and unbefriended, applied at the Manchester and Salford Boys' Homes for a helping hand. He was admitted and in time developed into a sturdy lad. Expressing a desire to go to Canada, he was sent out in 1896 with a party of boys, a friend of the home personally defraying the expenses of his emigration. On his arrival in the Dominion he was placed with a farmer in one of the central counties of Ontario, and soon earned for himself an excellent reputation. After completing his indentures he decided to go to Western Canada, which he did, settling in British Columbia, where he has prospered. Last year this young 'Canadian' paid a four-months' visit to England, returning at the end of that time to this country. He has not forgotten to express, personally, his gratitude to those connected with the Manchester Homes for the help they gave him in sending him to Canada.

Many similar cases might be mentioned showing how boys, who were homeless and unbefriended in England, have reached positions of independence in this country through pluck and perseverance.

A few weeks ago I received the following letter from a young man who had come to Canada through the agency of one of our societies:—

'I came to Canada about the first of September, 1895. In December of that year I obtained a position with a farmer in the province of Quebec, for whom I worked until the fall of 1902, and in which time I practically learned the rudiments of farming. In that year I took a trip to England, but the condition of the country prevalent at that time not being any too bright on account of the British-Boer war, I made a short stop and was back in Canada and with the same farmer by the end of January, 1903. In May following I entered the employ of a provincial lumberman with a slightly better monetary remuneration, and remained there until May, 1905. In that year I had two or three good offers for work when an opening presented itself on one of the railroads as baggage master. The wage was not as good as the offers I previously received, but I saw the chance to get a step higher, and accepted it. The days were long, and with the exception of a few hours the work was hustling. While there I also took care of the offices. I thought I would like to take a course at a business college, and in September, 1905, I entered the college, where after five months of hard studying I obtained a position with a prominent company in a large city in Ontario, which position I have held for the past two years, and I am making a good living.'

This youth's employer drew my attention to the case as an illustration of what a well-behaved, steady young fellow can do in Canada by perseverance.

The demand of our farmers for English juvenile labour has been incessant, and the societies were able only to satisfy a small percentage of the applications they received. In fact some of these agencies received as many as six applications for each child. This speaks well for the children, and illustrates the fact that the Canadian farmer appreciates the usefulness of the home boy as a farm labourer.

Considering the thousands of these young immigrants who have been settled in Canada, and the continuous demand for their labour, their value to the country from a national and economic view point is beyond question. They soon settle down to work and adapt themselves to their altered conditions, and while one hears of other immigrants drifting into our cities out of work, it is a most significant fact that amongst such derelicts one does not find the so-called 'home boys.'

Under the existing agreement with the British government, the cost of the first annual inspection is borne by the Canadian government, and each subsequent inspection is provided for by the government of Great Britain on a fixed scale of fees regulated according to the age of the child at the time of its emigration, as upon the age of the child depends the number of visits of inspection that would be required. Under the terms of the agreement up to December 31, 1906, 2,112 children have received first and recurrent inspections. The following statement shows the number of Poor Law or Union Children emigrated to Canada under the authority of the Boards of Guardians since 1898:—

Year Emigrated.	Year Reported Upon.	Number.
1898	1899	63
1899	1900	123
1900	1901	162
1901	1902	166
1902	1903	116
1903	1904	360
1904	1905	334
1905	1906	419
1906	1907	369
Total		2,112

Whenever circumstances have permitted I have made special journeys to the centres of distribution for the purpose of inspecting newly arrived parties of juveniles. The number so individually inspected are not included in the statistics already given. These inspections have confirmed, in a large measure, my opinion that every care is exercised in the old land in selecting the children for colonial life. This is important and far-seeing.

If a child is sent to the Dominion, the Home authorities must stand in *loco parentis* to it until it reaches its 18th year. There must also be reasonable grounds for judging that it is the right subject to send abroad. This knowledge is to be gained only by a period of probation in an atmosphere different from what it has been accustomed to before final arrangements had been effected for its emigration. This procedure, I learned during my visit to Great Britain, is adopted by most, if not all, of the agencies.

Further, a stringent medical examination is conducted in the homes during this probationary period.

From my personal acquaintance with the authorities of the English homes and schools, I am free to report that reasonable precautions are taken to send to Canada only such children as are free from moral and physical taint. How far these philanthropists have succeeded may be judged by the fact that only two home children, both boys, were formally charged with offences in our courts during the year. One of these unfortunates who had previously conducted himself respectably, and bore a good character, was permitted to leave the court on the guarantee of the home to return him to England at their own expense. From recent information I learn that he has settled down and is working steadily in the old country. The action of the home in returning him was, in my opinion, a wise decision, not only for the boy himself, but for other young immigrants. In the other case, the offender will be deported by process of law. This youth, as far as I have been able to ascertain, was not, strictly speaking, a home boy, but had been brought to Canada under some private auspices.

Little need be said concerning the general health of the children. Six deaths occurred during the year, and in these cases it is a significant fact that they were all young children and had been in this country less than two years. Two boys came to their death by accident; one by drowning and the other dying under an anaesthetic whilst undergoing a surgical operation as the result of a cut received at his work in the lumber woods. I made both cases the subject of official investigation, and they were found to have been purely accidental.

It happens inevitably that each year some chidren are temporarily lost track of by the agencies. They are usually boys of about 16 years of age and able to take care of themselves. However, every effort is made to locate them and they are eventually found. Since the inauguration of this branch of the service a successful supervision has been maintained, as may be inferred from the fact that out of the large number of children inspected there have been only twenty-nine absconders, *i.e.*, those who have left their situations and whose whereabouts have not been discovered.

Thirteen children, four girls and nine boys, have been returned to England during the past two years.

Three children have removed to the United States.

It may be well to observe that the juvenile emigration movement is conducted without financial gain by accredited and responsible persons and agencies, who are actuated by the highest motives. For well nigh forty years it has occupied a unique position in relation to our general immigration system, in that each individual member of every band of young immigrants, under the age of seventeen years, must pass an examination at the hands of Canadian government officers in Great Britain before being permitted to set sail for these shores.

The procedure, in brief, is as follows:—The emigration agency advises the Dominion emigration agent of the proposed emigration party and the date of their

sailing. As the children approach the gangway in single file they are individually examined by the medical officer of the board of trade and subsequently by the ship's physician. The Dominion emigration officer is furnished with a list of the names, ages and intended destination, together with other data concerning the children. He calls out the names and carefully scrutinizes each child. This official then signs a certificate, which reads as follows:—

I hereby certify that the above-named children—in number, are of a desirable class, and have been duly placed on board the SS. in charge of

Liverpool, 190 .

Dominion Immigration Agent.

A similar procedure is followed on the ship's arrival in Canada:—

This is to certify that the within-named (number) ( ) children are of a desirable class and have been duly landed at in charge of

190 .

Canadian Immigration Agent at the port of .

The Canadian port medical officer also examines each child, and detains for a reasonable period any that are, in his opinion, unable at once to pass muster under the Canadian medical regulations.

After successfully running the gauntlet of such recurrent examinations, it has been claimed by many friends of the work that Canada gets only 'hand-picked' juvenile immigrants. Be that as it may, however, I am of the opinion that were it not for the guarantee these precautions afford, the children as a whole would not have been so eagerly sought after by our farmers.

The societies, I am pleased to state, co-operate with the government in respecting to the letter the provisions of the law.

It is quite beyond my recall to mention a single case of a boy or girl, under the supervision of the homes or the department, that has become a public charge during the past few years.

In dealing with such a large number of children it is inevitable that there should be failures. Notwithstanding the fact that each person to whom a boy or girl is entrusted must produce satisfactory credentials as to character, some are subsequently found to be undesirable, and removals are necessary in the interest of the child. Incompatibility of temper is frequently found between employer and employee, and in some cases I have found that the children have contributed to their own discomfort and also that the employer is largely to blame; but taking everything into consideration, there is only an infinitesimal number of these young labourers who are not doing and faring well at the hands of the Canadian farmer.

That a wise discrimination has been shown in the selection of situations is obvious after a perusal of the reports received, which indicate that of 1,816 inspections 1,397 children were found in very good homes and situations, 187 in good or fair homes and situations and 24 in homes designated as doubtful or unsatisfactory.

In this connection it may not be uninteresting to here point out some of the precautions taken by the local government board to safeguard the welfare of these young immigrants in Canada.

When the emigration of a child at the cost of the poor rate is proposed the guardians of the union or parish to which the child belongs are responsible for the fulfilment of the following conditions under which the local board authorize the guardians to incur the expenditure that may be proposed for the emigration:—

(*a*) The production of a justice's certificate of the child's consent to emigrate; also

(*b*) A medical report as to its health, both of body and mind, certifying whether, in the medical man's opinion, the child is in all respects a suitable subject for emigration to Canada; and

(*c*) A cheque (where due) in payment of fees for inspection of the child in Canada by the Dominion Immigration Inspector. It must also be shown:—

(*d*) That the child has been educated at their cost for at least six months. The guardians must also

(*e*) Give the name and address of the agency under whose auspices the child is to emigrate;

(*f*) State whether they are satisfied that the person taking out the child has a reasonable prospect of finding a suitable home for the child in Canada;

(*g*) Specify whether they have obtained from the person taking out the child a written understanding that the child shall be placed with a family of the same religion as that to which the child belongs; and that immediately after the child is placed out the Department of the Interior at Ottawa shall be furnished with a report containing the name and address of the person with whom the child is placed (such address to include the name of the nearest post office, the name of the lot, the concession and the name of the township in which such person resides), and that a report containing similar information shall be furnished to the guardians;

(*h*) Assure the local government board that in connection with the emigration the requirements of the Canadian Immigration Act (or laws) will in no way be contravened.

The local government board deprecate the sending out to Canada of girls above the age of twelve years except under very special circumstances. Such girls, if accompanying a younger brother or sister, are permitted to emigrate, but otherwise the board do not assent to their emigration unless the agency effecting the emigration undertake that each such girl will be looked after in Canada by a lady resident in the neighbourhood of the home in which the girl will be placed, who will undertake to act as her special friend, and who will not at the same time occupy that position in regard to another child.

It will thus be seen that the system by which the work is regulated and carried on shows a very careful selection of emigrants and the rejection of those of a doubtful or undesirable type.

Inspector R. W. Hillyard says in his report for the year:—

'After another year's inspection of immigrant children in the provinces of Ontario and Quebec, I beg to report that I am more than ever impressed with the great importance of child immigration to Canada and with the satisfactory condition in which I found the children placed. One cannot but feel how wise it is to send these children to enjoy the advantages of the Dominion while they are still young and easily adaptable to these new conditions.

'I found the great majority of the children, both boys and girls, comfortably placed and generally well treated. With few exceptions they are a rugged, healthy lot and are fast developing into sturdy and useful helpers. Their intelligence and education are fair, comparing favourably with the generality of our children in rural districts. I found that they readily adapt themselves to their new environments and to the work on farms.

'Complaints of ill-treatment are few and are becoming less frequent probably owing largely to the vigilance of inspectors of the societies and the government. It is also noticeable that the remuneration received by the children is better than in the past; the growing demand for labour and the liberal wages now paid to farm hands is helping the condition of these children.

'Some of the children, who are not very satisfactory, prove so owing to the injudicious method of training adopted by employers. Boys and girls will generally follow a good leader; it is the driver they object to. There is undoubtedly a grave responsibility in dealing with the children of a certain age. They should be moulded rather than coerced. Being fully impressed with the importance of this statement, I do not fail to commend those who are dealing with the children along these lines;

while on the other hand remonstrances are made with parties who adopt harsher methods. One cannot but be interested in the welfare of these children and realize that it is a duty to do what is possible to develop their material and moral welfare.'

Mr. Thomas Cory, Assistant Inspector in Western Canada, reports:—

'I have visited the different boys and girls and have found them doing satisfactorily. Many of the boys are looking forward to the time when they can take up homesteads for themselves. In this I encourage them as it makes them more contented and is an incentive to take advantage of their opportunities.

'As a whole the children give their employers good satisfaction, and I did not receive a complaint concerning a single boy from their masters; neither were there any complaints from the boys concerning their treatment.'

Inspector K. J. Henry says in his report for the year:—

'I resumed the duties of inspection in January last and have visited upwards of fifty counties in the provinces of Ontario and Quebec, besides the districts of Muskoka, Parry Sound, Nipissing and Algoma. I am pleased to state that with few exceptions the children were found in desirable homes and fully appreciated by their employers. The appeal which is met in every district, by farmers and others for both boys and girls is a sure indication that their services are required and that the prejudice against them which formerly prevailed has now almost disappeared.

'I am constantly preaching patience and fair treatment for the children and illustrating by comparisons what is to be expected from the employer.

'The country stands in need of the children. Close and careful inspection such as I believe is being done, is therefore necessary. The children need it and many look anxiously for the inspector's visit, while those with whom they are placed as a rule prefer it, and in many instances are not only pleased but agreeably surprised to learn that the government is taking such a deep interest in this good and noble work.

'My report on each child inspected is in your possession.'

Mr. F. W. Annand, Assistant Inspector in the provinces of Nova Scotia and New Brunswick, reports:—

'The children who have come under my inspection have been found to be generally, both physically and mentally satisfactory. I have already reported upon them individually with regard to the physical condition, general behaviour, and character of the situations provided for them.

'During the past year I visited children in the maritime provinces and found them, with few exceptions, giving general satisfaction and adapting themselves to their new life and conditions.

'In the main, their general behaviour has been satisfactory and, altogether, I find they are making good progress. Generally speaking these children were found to be in good homes, true, some poor, but good honest thinking people who take an interest in the welfare of their children of adoption.

'Their condition of life appeared favourable to their becoming good citizens of the Dominion of Canada. The large majority of the children were upon farms, and seemed to be satisfied with their lot, taking an interest in all pertaining to farm life. The girls, upon the other hand, show that they are being educated to domestic life.

'The children, in the majority of cases, are bright and intelligent, and are well spoken of. I was well pleased with my tour of inspection.

'It is a noticeable fact, each year, the homes in the British Isles realize the importance that Canada wants nothing but the best.'

SESSIONAL PAPER No. 25

Table showing the number of juvenile immigrants who arrived in Canada during the past six years, together with the number of applications received by the various agencies during the same period:—

Fiscal Year.	Children Immigrated.	Applications Received.
1900-1	977	5,783
1901-2	1,546	8,587
1902-3	1,979	14,219
1903-4	2,212	16,573
1904-5	2,814	17,833
1905-6	3,258	19,374
1906-7 (9 months)	1,455	15,800
Total	14,235	98,169

The following statement will show the number of children emigrated to Canada during the fiscal year by some of the principal societies, and the number of applications received for children during the same period:—

Society or Agency.	Children Emigrated.	Applications received for Children.
Dr. Barnardo's Homes, Toronto and Peterboro', Ontario, and Winnipeg and Russell, Manitoba	950	11,060
Miss Macpherson, Stratford	166	660
Mr. J. W. G. Fegan, Toronto	73	(a) 500
Rev. Dr. A. E. Gregory, Hamilton	76	458
Rev. Robert Wallace, 'Marchmont Home,' Belleville	80	702
'Fairknowe' Home, (Mr. Quarrier's,) Brockville	183	937
The Misses Smyly, Hespeler	25	212
Mrs. Birt, Knowlton	173	929
The Catholic Emigration Association	332	805
Church of England Waifs' and Strays' Society, Sherbrooke	45	133
Church of England Waifs' and Strays' Society, Niagara-on-the-Lake	81	415
*Bristol Emigration Society	.....	.....
Mr. Middlemore, Halifax	145	300
Salvation Army Emigration Agency	.....	.....
Mrs. Wallis, Toronto	12	53
Mrs. Close, Nauwigewauk, N.B.	3	25
Women's National Immigration Society, Montreal	31	50

Juvenile immigration has certain obvious advantages over adult immigration in that juveniles are sent to Canada at the impressionable age and are placed in the country districts, where they receive elementary education in the public schools and early acquire Canadian sentiments. In the great majority of cases they remain on the land, and assist in developing our agricultural resources. They come with no exaggerated ideas of the country, have no prejudices to surmount and their adaptability to farm life is beyond question.

The records of the various societies show that many of the home boys of a few years since are now the owners in fee simple of the soil they till, and rejoice in an independence of the most sturdy character.

It is a recognized fact that juvenile immigration cannot be properly conducted in the absence of receiving and distributing homes; indeed it has been a decision of both the British and Canadian governments of many years standing that these young immigrants must have a home to which they may return while out of employment or during illness. Each indenture contains a definite clause to the effect that in case an employer finds a boy or girl unsuitable, it may, after a reasonable notice has been given, be returned to the home.

* Did not emigrate. (a) Approximate.

It is significant that on the occasion of my annual inspections of these homes I have found a surprisingly small number of children in residence.

The work of these centres has so expanded, that in addition to a superintendent a permanent staff of 'visitors' are employed by the societies for the purpose of maintaining a continuous supervision of their wards in their homes and situations. In this connection it is my desire to say that all matters concerning the welfare of the children, and suggested improvements or alterations which I have proposed, have been promptly acknowledged and acted upon.

During the past year changes have occurred in the personnel of the executive of some of the homes, and one agency has been added to my list—Mrs. James Wallis, of the Hurst Training Home, London, S.E. This lady has established a receiving and distributing home at Toronto for boys. From her agent who accompanied the first party to Canada, I learned that her young immigrants are gathered from a class other than the exceptionally poor, and many are connected with families of respectable tradespeople and artisans. On their arrival at Toronto and before the party was broken by distribution I inspected the children, and found them of good physique and intelligence and of such a type as should be acceptable to the Canadian farmer. The Reverend Robert Hall, a prominent Toronto clergyman, has undertaken the responsibility of placing the children in situations, and will act as agent for Mrs. Wallis.

DR. BARNARDO'S HOMES—TORONTO AND PETERBOROUGH, ONTARIO.

Mr. Owen, the Canadian representative of the Barnardo Homes, advises me that their operations of the past year were the most successful and satisfactory in the history of their work. It has witnessed a steady increase in the demand for their young immigrants and with this increase is recognized an advance not only in the quantity but in the quality of the openings that are offering. It is rare, the superintendent stated, to find one of their wards who is not abundantly fed, well clothed, decently housed and enjoying not only the necessaries of life but a fair share of its comforts.

During the year exceedingly few complaints of neglect, overwork or any kind of mis-usage have been reported; on the whole, satisfaction with their lot prevails.

Their boarding-out system is still in active operation and showing good results. There are now 1,350 boys and girls placed in foster-homes where their maintenance is paid for by the Barnardo organization. This department alone involves the disbursement of money drawn from English sources to the extent of over $80,000 annually.

The demand for girls is insatiable and the wages paid useful and competent girls are higher than ever.

Two visits of inspection have been made to Hazel Brae, Peterborough, the distributing centre for girls, and I can only repeat what I have stated in former reports, that the comforts and accommodation for the girls are all that could be desired. The home is in charge of a large staff of sympathetic ladies who are devoted to the interests of the children.

The boys' headquarters, 52 Peter St., Toronto, is splendidly adapted for its purpose. The building is spacious, comfortable and conveniently situated. At the time of my inspection workmen were engaged in making alterations which will afford accommodation for a larger number of boys. A large clerical staff is permanently employed and an enormous correspondence carried on with the children.

Since the inauguration of Dr. Barnardo's emigration system over 19,000 children have been placed out in the Dominion.

MR. J. W. C. FEGAN'S RECEIVING HOME, TORONTO.

On May 30 I inspected this home, and personally inspected a party of 60 boys of an average age of 12 years that had just reached Canada. In health and type they were acceptable immigrants. This home is splendidly arranged for the reception of children.

I had previously seen many of the boys in training in Mr. Fegan's excellent schools at Stony Stratford and Southwark, London. Each boy had a trunk or box filled with a well assorted supply of clothing and other necessaries. Five hundred applications were on file for this spring's parties.

Between 1,800 and 1,900 children have been sent to Canada by Mr. Fegan, and of this number, I understand 400 have voluntarily repaid their passage money for the purpose of assisting other juveniles to Canada.

MR. QUARRIER'S FAIRKNOWE HOME, BROCKVILLE.

Mr. Burges reports a most satisfactory year's work. The children are cordially received by the people of Brockville. I have inspected some of their young immigrants during the past year, and have found them a sturdy, promising lot. The work of this agency is held in the highest esteem by the people of Brockville and surrounding country. The home is well equipped and splendidly maintained.

MISS MACPHERSON'S HOME, STRATFORD, ONTARIO.

During the past year two parties of children were received and distributed from this centre totalling one hundred and seventy nine boys and girls of the average age of twelve years. These juveniles were distributed in the farming districts of western Ontario.

On May 2 last, I paid a special visit to Stratford and had an ample opportunity to individually inspect these youthful immigrants—their ninety-first emigration party —and found them a promising lot. They were all well supplied with clothing and other necessaries.

A large number of their wards are under departmental supervision and the report speaks in satisfactory terms of their progress and adaptability for their new occupation. I am again pleased to report that the work of this agency is conscientiously and efficiently carried on.

MR. J. T. MIDDLEMORE'S CANADIAN HOME, FAIRVIEW, HALIFAX, N.S.

Mr. Middlemore's Canadian receiving home was visited by me on June 7. I found a number of young children in residence, who had within a few days of my inspection arrived from the Birmingham homes. The ocean journey had told rather heavily on the children and it was considered advisable not to send them out for a few days.

This home is well managed and the superintendent, I believe, exerts a beneficial influence over his wards.

There are 900 children under 18 years of age under active supervision.

REV. ROBERT WALLACE, MARCHMONT, BELLEVILLE, ONTARIO—MANCHESTER AND SALFORD BOYS' AND GIRLS' REFUGES.

The first annual party of juveniles, for 1908, will it is expected sail for Canada in April next.

The children are carefully selected and their physical fitness is always given first consideration. This important feature is borne out by the satisfactory reports of the last departmental inspection. Another fact worthy of notice is that no child is sent to the Dominion without the consent of its relatives or other persons who should be consulted.

The young immigrants are placed out under indenture with farmers in central and eastern Ontario.

Mr. Wallace has an extensive clientèle and for many years has supplied the same farmers with juvenile help. Marchmont is the pioneer receiving home for British children in Canada.

MRS. C. L. CLOSE'S FARM HOME SCHOOL, NAUWIGEWAUK, N.B.

This institution was established in 1905, by Mrs. C. L. Close of 101 Eaton Square, London, England, and is situated within 18 miles of the city of St. John. The farm consists of 180 acres partly cleared and is charmingly situated. It has been stocked with horses, cattle and poultry. A practical Canadian farmer oversees the work. Mrs. Close's policy is to combine the English poor law system with emigration, and to establish from time to time similar farm schools throughout the maritime provinces.

At present the Nauwigewauk farm is at the experimental stage. Mrs. Close hopes, however, to prove by its success the feasibility of her scheme, from an economical point of view.

The boys are to be taught general farm work as soon as they are old enough to perform labour, and the girls dairy, kitchen and house-work. The children all attend the public school of the district, an excellent country school presided over by a capable and painstaking teacher. I called at the school and examined the children in their various forms and found their progress very fair indeed. Their personal appearance indicated proper attention. A peculiar feature of the scheme, and one which may not prove to be advantageous to the children, is that after reaching the age of 16 or 18 should situations be found for them in Great Britain they are expected to return. During the past summer, owing to the great demand for juvenile labour in New Brunswick, it was decided to place the boys with neighbouring farmers, at a fair wage. This policy I learned from Miss Close resulted satisfactorily, and it is to be hoped it may be continued. Only one party of juveniles has as yet been sent to Canada. At the time of my visit there were ten boys and two girls in residence. Their ages varied from 7 to 15 years. The home is under the supervision of a resident lady superintendent, assisted by a trained nurse. Keen interest is manifested by the people of the neighbourhood in the success of Mrs. Close's work.

THE CHILDREN'S AID SOCIETY OF LONDON, ENGLAND—CANADIAN BRANCH, SHAFTESBURY HOME, WINNIPEG.

During the past twelve years this influential society has carried on a limited emigration of juveniles. Since 1896 one hundred and eighty-eight children have been received and placed in situations in western Canada. Such gratifying reports as the following have been received :—

'E. L. has turned out a first-class boy. If all the boys turn out as good they are the right sort.'

Another employer wrote :

'P. N. is quite satisfactory, and I think is pleased with his home with us. I am a merchant here and intend to take him into our store.'

The children are placed out under agreements which provide for wages and the majority receive board and lodgings and $4 per month for their first year's service.

OUR WESTERN HOME, NIAGARA-ON-THE-LAKE, ONTARIO.

On May 8 I inspected this interesting and pioneer receiving-home. There were 22 girls in residence here, all were in school at the time. Their general brightness, well-cared for and happy appearance were particularly impressed upon me. The lady superintendent has had years of experience in the management of the home, and she and her assistants perform their responsible duties with efficiency. The home was comfortable and in splendid order throughout.

THE SELF-HELP EMIGRATION SOCIETY, LONDON, ENGLAND.

This society has sent to Canada a small contingent of boys of sixteen years of age. They were placed with farmers in eastern Ontario and Quebec under the direction of Mr. E. Marquette, Provincial Immigration Agent, Montreal. Some of them

are under departmental inspection, and in the main favourable reports have been received concerning them.

THE SOUTHWARK RESCUE SOCIETY, LONDON, ENGLAND—RECEIVING HOME, ST. JOSEPH'S ORPHANAGE, PRINCE ALBERT, SASKATCHEWAN.

On July 18 this society emigrated and sent forward to western Canada six girls and fourteen boys.

MRS. BIRT'S HOME, KNOWLTON, QUEBEC.

For thirty-six years Mrs. Birt has been engaged in the emigration of children to the Dominion and for as many years has personally accompanied parties across the Atlantic. Many of her former proteges have engaged in farming and other pursuits in eastern Canada.

During the past calendar year 258 children have entered her training home in Liverpool, and of this number 192 have been sent to Canada. In a recent report Mrs. Birt stated that 'the attempt to train such a number of children, means constant attention to the task and the utilization of every hour. The history of every child must be gone into in detail, their health and habits must be watched.'

Such a wise precaution has doubtless assisted very materially in the selection of proper homes and situations for the children in Canada.

Fifty marriages were reported since last report.

A party of sixty juveniles is expected to reach Knowlton early in March and I understand situations for all have been arranged. With few exceptions, the departmental inspection shows that the children sent out from this home are doing well.

THE GIBB HOME, SHERBROOKE, QUEBEC.

This home is the Canadian branch of the Church of England Waifs' and Strays' Society of London, England, for boys.

It is well maintained and under the supervision of a conscientious and painstaking lady superintendent. A local committee of management directs the operations of the home. There was but one child in the home on this date and he was merely a lodger, being employed by the day by a dairyman.

Advantage was taken of my visit to Sherbrooke to inspect a number of boys placed in that city. I found, as in other cities, that there is dearth of domestic servants, and in lieu of girls the services of the society's boys when possible are requisitioned. Such occupation for boys is open to criticism, as it keeps them in the cities and towns; but it is doubtful whether the natural ambition of these lads will permit them to remain in such work. It is to be hoped that a short experience will lead the local committee to a change of policy in this regard. Of the boys with farmers in the Eastern Townships, excellent reports have been received.

THE 'COOMBE HOME,' HESPELER, ONTARIO—CANADIAN BRANCH OF THE MISSES SMYLY'S DUBLIN (IRELAND) HOMES.

On the occasion of my annual visit of inspection, I found a particularly bright and well-selected party of children at this receiving home. The party had only recently arrived from the Misses Smyly's Training Schools in Dublin where I understand they had been under training from infancy. The superintendent informed me that they would remain at Hespeler for some months before being sent out to situations. In this period they will attend the Hespeler Public School and become acquainted with Canadian ways. After school hours the children are employed about the premises at gardening, poultry-raising, bee-keeping, &c. In addition to the every day routine the boys under the direction of Mr. Tebbs have done considerable carpentry work, and have erected a splendidly equipped poultry house. Poultry rearing is one of the chief occupations.

The citizens of this stirring little town take a commendable interest in the home and many spoke to me in a complimentary manner of the superintendent and the diligent and well directed training the children receive at his hands.

This is the only home in Canada which receives Irish children exclusively.

ST. GEORGE'S HOME, OTTAWA, ONTARIO—THE CATHOLIC EMIGRATION ASSOCIATION.

The operations of this society are constantly growing. For the year ending December 31, 1907, 263 boys and 68 girls were received and distributed, as follows:—

Boys, Ontario, 110; province of Quebec, 149; Nova Scotia, 4. Girls, Ontario, 34; province of Quebec, 32; New Brunswick, 2. These boys were indentured with farmers and the girls went into domestic service. Including these children there are 1,610 juveniles under supervision. They are all under active supervision and are visited at least once each year.

The home is in charge of four sisters of the English order of St. Paul the Apostle. Since taking over the affairs of the institution many improvements have been made to the interior of the home. The children's quarters were found scrupulously neat and tidy and the home throughout was in splendid condition, affording every convenience for the proper carrying out of the work. The records and visitors' reports are well and systematically kept.

Six parties of young immigrants are expected to arrive on April 30, composed of boys; May 28, composed of boys: June 25, composed of girls; July 23, composed of boys; August 20, composed of boys; September 17, composed of boys.

For the most part the children are from the homes and schools in the Catholic dioceses of Westminster, Southwark, Birmingham and Liverpool.

From the departmental reports of the past year's inspection the society's wards with few exceptions are filling their situations with good satisfaction.

THE NATIONAL CHILDREN'S HOME AND ORPHANAGE (REVEREND DR. GREGORY)—CANADIAN BRANCH, HAMILTON, ONTARIO.

I paid my annual visit of inspection to this home on March 28. The first party for 1908, numbering some sixty boys in all had a few days previously reached Hamilton. The demand being so great the work of distribution began on the day following their arrival. I made an individual inspection of thirty-five of the party, and subsequently witnessed the dispersion of a number. Farmer after farmer called, produced their testimonials as to character, signed their agreement and proudly drove off with their young labourer. Some of these farmers had driven over very bad roads a distance of twenty or twenty-five miles. A number of farmers called for boys but were obliged to return home disappointed as the demand was far greater than the supply. A yearly agreement system is adopted by the governor, *i.e.*, boys are only placed out for one year and at the end of this period if agreeable to all concerned, a new and different agreement is entered into providing for wages according to the boys' actual earning power. These agreements are as far as possible uniform in character and only vary in the case of boys of school age.

In sending the children to Canada each one is supplied with a complete outfit of clothing and other essentials. I carefully took stock of each boy's box or trunk and found them to contain one overcoat, one tweed suit, working clothes, one Sunday suit, three shirts, three caps, four pairs socks, one pair braces, one pair new boots, one pair Sunday boots, one pair slippers, one pair top boots made of strong durable leather, one scarf, four dickies, six handkerchiefs, one tie, one cord suit, one pair overalls, one brush and comb and bag, one toothbrush, boot laces, one bible and text book. I was rather surprised to find that their articles of clothing were of such good durable material and, with care, should suffice for at least eighteen months wear.

The personal appearance and good manners of these lads indicated a wise and intelligent training. The opportunity was afforded me of saying a few words to the young immigrants as they were assembled in one of the recreation rooms, in which I

pointed out to them their opportunities in Canada and what would be expected of them here.

I subsequently made an inspection of the home and found it quite up to its wonted standard of excellence. The work of this receiving home is held in good esteem by the citizens of Hamilton and adjoining counties.

THE SALVATION ARMY.

Twenty-nine juveniles of an average age of 16 years were brought to Canada during the past year by the Salvation Army, and placed in farm work under their immediate supervision. They were located in the provinces of Ontario, Quebec and British Columbia. The interests of these young immigrants are protected by the following indenture which must be entered into :—

I herewith make an application for a boy of about years of age. I agree to provide him with proper lodging, food, clothing and medical attendance. If under school age I will see that he receives the common school education—as provided in the district where I reside—for at least months of the year.

I undertake to retain the boy in my home and service for year or until he is years of age. I will, in addition to providing him with food and clothing, pay him dollars for the first year, and dollars for the second year that he is under my care, and an increase of dollars per year afterwards, until he receives the ordinary wages paid in the district to a farm hand.

If anything should occur that might necessitate his removal or discharge before the expiration of this agreement, I will notify the officer in charge of the home so that the boy can be returned to the home. If he should leave of his own account I will notify the officer at once. He must not be placed in the care of another person without the consent of the officer in charge. I also agree to furnish a report concerning him as often as required on (1) health; (2) general conduct; (3) education and ability to work; (4) wages received.

I acknowledge the Salvation Army to be the guardians of the said boy, and agree to permit the officer in charge of the home, or any authorized officer at all times to have access to the said boy, and I also acknowledge their right to remove him from my care if they consider it in the interests of the boy so to do.

Signature. . . . . .

Address. . . . . .

Witness. . . . . Date. . . . . .

Forty-four boys are under supervision. Having inspected the reports, I find they are doing satisfactorily.

Your obedient servant,

G. BOGUE SMART.

No. 18.

REPORT OF THE CHIEF MEDICAL OFFICER.

OTTAWA, May 14, 1908.

W. W. CORY, Esq.,
Deputy Minister of the Interior,
Ottawa.

SIR,—I have the honour to submit my fifth annual report on the medical inspection of immigrants, being for the twelve months of the fiscal year ending March 31, 1908.

The work carried on by this service includes the inspection of all steerage and second-class passengers landing both at the Atlantic and Pacific seaports of Canada, as well as all similar passengers destined to Canada but arriving at the United States

ports of Portland, Boston, New York, Philadelphia and Baltimore. The latter are examined at these several ports by United States immigration officers, while those, the greater number, arriving at New York are again examined there by a medical officer of this branch. All immigrants arriving at Montreal via United States ports are finally inspected there.

The task of medical inspection further includes much work at Montreal, Winnipeg and the various other points in Manitoba, Saskatchewan and Alberta, where large numbers of immigrants arrive at the different distributing points. This work especially includes sick recent immigrants who require hospital treatment, or who are reported upon, if sick, as regards their deportation. The results of the work done in these several directions will be found referred to in the various tables.

With a view to obtaining yet more accurate knowledge as to the character of the immigrants who have been admitted to Canada, the chief medical officer has undertaken special inquiries to determine the extent of diseases in admitted immigrants, especially as regards insanity, feeble-mindedness, tuberculosis and trachoma. Obviously except as regards the inmates of public institutions, the information to be obtained lacks the definiteness of tabulated statistics; but as the immigrant who becomes sick, if, of limited means, soon must seek charity, we may fairly assume that relatively few cases occur which do not come under the attention of some institution, whether federal, provincial or municipal.

In addition to this there is the trans-Atlantic medical inspection. There has been added what may be considered as an additional medical inspection in Great Britain where the following particulars must be supplied on a regular printed form, in the instance of every emigrant who in any way receives official assistance to emigrate:—

DEPARTMENT OF THE INTERIOR, GOVERNMENT OF CANADA
EMIGRATION BRANCH.

REPORT AND MEDICAL CERTIFICATE.

In respect of . . . . . (the undersigned) assisted by. . . . . .
to the following extent . . . . . .
Age. . . . . Nationality. . . . . Religion. . . . . .
Address in full. . . . . .
Present occupation . . . . . How long in such occupation? . . . . . .
Has applicant ever worked on farm? If so, for how long and where? . . . . . .
. . . . . .
Can applicant drive horses?. . . . . Plough?. . . . . Milk?. . . . . .
Is applicant suitable for:—Farm work?. . . . . Railway construction work? . . . . . Domestic service? . . . . . .
Intended occupation in Canada?. . . . . At what place?. . . . . .
Is applicant willing to accept farm work on arrival in Canada?. . . . . .
Name and address of agent or person in Canada to whom going for employment. . . .
. . . . . .
General appearance of applicant:—Strong? . . . . . Vigorous?. . . . . .
Delicate?. . . . . Ruddy?. . . . . Pale?. . . . . .
Approximate height. . . . . Approximate weight. . . . . .
Has applicant any obvious physical defect or malformation? Give details . . . . . .
. . . . . .

SESSIONAL PAPER No. 25

Is he feeble-minded. . . . . Idiotic?. . . . . Epileptic?
Insane?. . . . . or had an attack of insanity within five years? . . . . . .
Is he deaf and dumb? . . . . . Deaf? . . . . . Dumb?. . . . . Blind?. . . . . .
Infirm?. . . . . If so, give details and state if applicant is going with family or to family already in Canada. . . . . .
Address of such family in Canada. . . . . .
What security is proposed in such case under section 26 of the Immigration Act?. . . . . .
Is applicant afflicted with a loathsome disease, or with a disease which is contagious?. . . . . Is he a pauper, destitute, professional beggar, vagrant, or likely to become a public charge in Canada?. . . . . .
Has applicant been a charge on the public in Great Britain or Ireland?. . . . . .
If so, how long and where?. . . . . .
Has applicant been convicted of a crime or been in prison? Give details. . . . . .
. . . . . .
Is applicant honest?. . . . . Sober?. . . . . Industrious?. . . . . .
Thrifty? . . . . . Of good morals? . . . . . .
What amount of money or money's worth will applicant have on landing in Canada? . . . . . .
Is applicant married or single?. . . . . If married give age and name of wife. . . . . .
. . . . . .
Is wife good housekeeper and tidy? . . . . . .
Give children's names, ages, trade and earnings. Have the girls been in service, or prepared for service, and if so, how?. . . . . .
. . . . . .
Is family accompanying him? If so, what provision is being made for family in Canada?. . . . . .
If family not accompanying applicant what provision is being made for family here? . . . . . .
. . . . . .
Has applicant any relations or friends in Canada, and at what address?. . . . . .
Relationship. . . . . .
Are such relations or friends willing to assist and house applicant temporarily? Or does the assisting society undertake to do so?. . . . . .
What reason has applicant for desiring to go to Canada? . . . . . .
Has applicant applied to any other society? If so, give particulars. . . . . .
. . . . . .
Give name and address of parents or nearest living relatives in England. . . . . .

Signature of applicant certifying correctness of above statement.

. . . . . .

Dated at . . . . . this. . . . . day of . . . . . 19 .

*. . . . . .

. . . . . .

*Signature and designation of responsible officer of society assisting.

NOTE.—In addition to the above report, the original records must be submitted for inspection with this form.

DEPARTMENT OF THE INTERIOR, GOVERNMENT OF CANADA, EMIGRATION BRANCH.

MEDICAL CERTIFICATE.

In respect of..... an assisted emigrant.

Is the physical history of the applicant's family good? If not, state defects.....

Do the sounds of the chest as ascertained by percussion and auscultation indicate a perfectly healthy condition of the lungs?.....

Is there any disposition to tubercular disease of the lungs, hereditary or otherwise?.....

Have any relatives died or suffered from consumption, bronchitis or other lung disease?.....

Is the condition of the heart healthy?.....Is there any tendency to epilepsy or fits of any kind?.....

Has the applicant ever had rheumatic fever?.....Is the applicant ruptured?.....

Has the applicant ever had trachoma or suffered from diseases of the eye?.....

Is applicant's sight good?.....Give condition of applicant's teeth.....

Is applicant suffering from eczema or any other skin disease?.....

Has applicant undergone an operation? If so, what?.....

When was applicant last vaccinated?.....

Has applicant any organic defect or bodily deformity?.....

Is applicant strong—Physically?.....Mentally?.....

Has the applicant or any relation been at any time the inmate of a lunatic asylum? If so, when?.....

Has the applicant had any serious illness or injury? If so, of what nature and at what time?.....

Is any such affliction likely to recur?.....

I hereby certify that the above named person has been examined by me, and that I am of the opinion that he is of good constitution, in robust health, mentally fit, and a suitable person for emigration to Canada.

.....

Address .....

.....

Dated.....19 .

Subsequently each emigrant must pass the inspection of the port officer appointed by the board of trade, as well as the shore medical officer of the ss. line, and finally the medical officer of the vessel before being taken on board. In addition to this the medical officer and the master of the vessel must certify to the following bill of health before the immigrants can be removed from the vessels.

BILL OF HEALTH—CERTIFICATE OF MEDICAL OFFICER.

SS.... ....of.... ....line.
This is to certify that I am medical officer of the steamship.. .. ..of the .. ..S.S. line, and that I have daily inspected all the passengers and crew on the vessel during the passage from.... .. ..to.. .. .., and that to the best of my knowledge and belief there have been no cases of sickness or death on board other than the following :

No.	Name.	Age.	Nature of Sickness.	Cause of Death.	Quantity and description of property and money left by deceased.
1					
2					
3					
4					
5					
6					
7					
8					
9					

Certified correct,

Port of.....

Medical Officer.

Dated.....190 .

CERTIFICATE OF MASTER.

This is to certify, that I am master of the steamship.. .. ..of the .. ..SS. line, and that I have daily inspected all the passengers and crew on board the vessel during this passage from.. .. ..to.. .. .. and that to the best of my knowledge and belief there have been no cases of sickness or death on board other than those certified to by the medical officer of the vessel, as above.

Certified correct,

Port of.....

Master.

Dated.....190 .

REPORT OF MEDICAL INSPECTOR OF IMMIGRATION SERVICE.

Re SS.. .. ..of.. .. ..SS. line. I hereby certify, that I have examined the schedule giving the names and description of passengers thereon, and have inspected the passengers themselves, and beg to make the following statement regarding the sanitary condition of the ship and of the health of the passengers :—

Amount of cubic air space and provision for ventilation.. ....
Number of immigrants to each washbasin.. .. ..

Kind and condition of latrines and closets, and number in relation to the .....number of immigrants.. .....
Condition of ship as regards light and cleanliness.. .....
Statement regarding the correctness of certificates of medical officer and master

..... Signed,

Port of..... *Medical Inspector.*

Dated.....190 .

When in addition to these various measures taken to sift out undesirable immigrants the examination of each person in succession is made by one, and at the large seaports by two medical officers, followed by a thorough civil examination or inquiry into their age, occupation, destination, financial standing and an estimate of their moral qualities and likelihood to succeed in Canada and become good citizens it would appear that little more could reasonably be done to prevent the ingress of improper persons to the country.

In the criticisms which from time to time are made of the work of medical inspection of immigrants, one piece of advice is almost always given, viz., 'Have Canadian officials inspect at foreign ports, all immigrants before they take passage.' Remembering the number of seaports at which immigrants coming from different countries embark, knowing how all those in any way assisted are required to present certificates as to physical and mental health, and realizing that a very large proportion of emigrants go to some one of the thousands of booking agents in these several countries, buy their tickets inland, and arrive at the steamer only a few hours before sailing, it will be apparent that no effective scheme can be devised for dealing with these several classes of cases, other than requiring intending passengers to be present in the seaport towns several days before sailing, to undergo a rigid examination before being allowed to go on shipboard. Apart from the diplomatic difficulties of having, say, at Liverpool, the medical officers of the United States, Canada, Mexico, &c., severally interfering with the rights of citizens of any other country to board a vessel in a home port, it is evident that there would be inconveniences and hardships imposed upon emigrants greatly beyond any actual gain from such examination. As the situation exists at present booking agents in all foreign countries are fully aware of the requirements of the Immigration Act of Canada. Board of trade medical officers at seaports constantly give general supervision of emigrants, and medical officers attached to the several shipping companies are specially engaged in sifting emigrants prior to embarkation, while they are finally looked over by the ship's medical officer as they go aboard. What seems, however, quite practical, is a further detailed and thorough examination during the voyage, and a daily observation by the ship's medical officer of every person on shipboard, subject to inspection. He is required at present to certify in the manner already indicated, and if the company can be compelled to enforce, and such officer can be stimulated to make such examination an exact and serious matter, by filling in a blank form with the particulars of the examination of each individual emigrant, every practical requirement would be fulfilled, since such a signed report containing such an examination would bring to the attention of the medical inspecting officer at the port of landing any person regarding whom any remarks were made and a further special investigation could be made of such after the general inspection was completed. For instance, insane persons or those on the borderland, alcoholics and persons whose actions on board ship show them to be degenerates would in many cases have revealed their true characters during the seven or more days on shipboard. It is therefore not unreasonable to expect that such systematic examinations would gladly be concurred in by every steamship company bringing emigrants to Canada, since subsequently they are required to bear the expense of deporting the undesirables, while it is evident it would make less necessary any long delay at the seaports on landing, resulting from the more detailed examination of every immigrant, such as many who criticise would seem to demand.

TABLE I.

STATEMENT showing the total number of vessels carrying immigrants, arriving at the ports of Quebec, Halifax, St. John, North Sydney, Vancouver and Victoria during the fiscal year 1907-8.

Port.	April.	May.	June.	July.	August.	September.	October.	November.	December.	January.	February.	March.	Totals.
Quebec	1	35	25	32	30	29	28	15	...	...	...	...	195
Halifax	24	10	7	7	10	9	5	8	13	13	12	14	132
St. John	15	4	3	7	4	2	5	8	8	10	11	11	88
North Sydney	10	13	18	15	17	15	17	15	16	17	13	13	179
Vancouver	5	3	4	6	4	4	3	3	3	2	2	5	44
Victoria	8	8	8	9	8	8	9	8	8	6	7	10	97
Totals	63	73	65	76	72	67	67	57	48	48	45	53	735

The above statement shows a notable increase in the vessels engaged in carrying immigrants to Canada, these being 275 more than for the nine months of 1906-7, or 120 more if estimated for the whole year. It is to be noted, however, that the number of vessels arriving is not necessarily a measure of the increase of the immigrants landed, since with the tri-weekly Newfoundland steamer to Sydney the number of immigrants was only 5,376 in 179 vessels, compared with 19,812 in 88 steamers to St. John and 7,049 in 44 vessels to Vancouver. It does mean, however, that the medical officers' time is more engaged year by year at the several seaports, while the more exacting examinations required add further to their duties. As remarked in a previous report, the different distribution of immigrants by months, and the varied nationalities of immigrants make the necessity of different arrangements at the several seaports apparent. Thus, at Quebec the mail steamers are boarded at Rimouski by a medical officer who examines the immigrants en route to Quebec, and so saves delay; but the time of such medical officer so devoted to a single ship is at least two days. A similar arrangement made it necessary for the medical officer of St. John, N.B., to meet the vessel at Halifax and inspect while en route to St. John. At Montreal there are some 14 passenger trains arriving daily from Portland, Boston and New York, and the time of the medical officers there is therefore largely taken up with the inspection of immigrants.

This year has seen the two splendid detention hospitals at Quebec and Halifax completed and put into commission. Their fireproof character and equipment with all modern requirements have made it possible to give the detained immigrants every assurance of safety and comfort, with the best expert medical treatment. Improvements and enlargements have been made at St. John, while the over-crowded wards at the Montreal hospital, where most immigrants being deported are detained till the date of sailing, have necessitated the free use of double walled tents for consumptives and other special cases. It is hoped that the much needed permanent hospital and immigration building at Montreal may be erected during the coming year. At Victoria a splendid fireproof building is being erected which will contain both immigrant quarters and hospital. The detailed characteristics of these hospitals will be found in the report of 1906-7.

It will be noted that while the number of passengers to Canada, inspected at the several seaports was 253,508, including 26,236 arriving at Canadian ports and destined to the United States, the total immigration to Canada for 1907-8 is 262,469, the number of returned Canadians 17,652, and tourists 5,463. It is apparent, therefore, that a very considerable number of immigrants enter Canada via the American border who

hitherto have not undergone regular inspection. Actually, at border points the number entering was 58,312. In my report of 1904-5 it is pointed out that there were nine different areas, beginning with the New Brunswick border to the east, and ending with the British Columbia border on the west, in which there were regular routes, whether by steamboats or rail, by which immigrants came into Canada. Recalling especially at that time some of the immigrants entering Canada via the British Columbia border, that report stated: 'If for many years it has been recognized that there is an essential need for systematic supervision of trans-oceanic immigrants, most of whom are so desirable, if diseased, defective and criminal immigrants are to be debarred, then it must be equally manifest that if Canada is exposed to the same extent from the United States, the necessity for inspection will be equally great and even greater, since the facilities for entrance are so many more.'

The latter half of this fiscal year, during which financial panic and an industrial stasis have taken place in the United States, has made the force of this statement especially evident. At all points along the boundary the unemployed, not infrequently of an undesirable class physically, mentally and morally, have entered Canada, and some have found their way into charitable institutions and others into our common jails. The action now being taken by the department to deal with the situation thus created is as necessary from the medical standpoint as from the social and economic, and may very well be extended to all points where any regular influx of immigrants is taking place. The fact that all such persons who find their way into our asylums are promptly dealt with illustrates how similar reports from superintendents of prisons, charities and other municipal institutions, will aid in relieving our different communities of such persons.

TABLE II.

STATEMENT showing the number of immigrants who were detained and the number debarred at ports since December, 1902, when medical inspection was first begun.

Port.	Fiscal Year 1902-03.		Fiscal Year 1903-04.		Fiscal Year 1904-05.		Fiscal Year 1905-06.		Fractional Fiscal Year (9 months) 1906-07.		Fiscal Year 1907-08.		Totals.	
	Det'd.	Debd	Det'd.	Debd	Det'd.	Debd	Det'd.	Debd	Det'd.	Debd	Det'd.	Debd	Det'd.	Debd
Quebec	15	15	817	179	1,422	454	1,163	320	523	117	873	278	4,813	1,363
Halifax	124	124	705	27	449	36	366	10	392	7	730	274	2,766	478
St. John	134	134	313	68	145	6	396	32	113	13	296	46	1,397	299
Montreal					146	2	137		208	11	589	9	1,080	22
North Sydney											4	4	4	4
Vancouver and Victoria					397	113	1,456	118	2,257	242	2,040	455	6,150	928
New York							52	44	50	50	106	106	208	200
Totals	273	273	1,835	274	2,559	611	3,570	524	3,543	440	4,638	1,172	16,418	3,294
Total Immigration.	128,364		130,331		146,266		189,064		124,667		262,469		1,097,689	

The above statement gives at a glance the story of the work of medical inspection since the passage of the amendment to the Immigration Act in 1902, made necessary by the sudden increase of immigration from 49,149 in 1900-1, to 67,379 in 1901-2. Taking 1903-4 as the first year of regular medical inspection it is found that while the ratios of detained and debarred to the total were 1 in 71 and 1 in 476, in 1907-8 there were 1 in 57 detained and 1 in 224 of those debarred, or to make it more evident, it may be stated that while the immigration of 1907-8 was almost exactly double that of 1903-4,

the increase of the debarred in 1907-8 to that in 1903-4 was 4·28 times. In other tables it is shown that while the rejections in 1903-4 were almost wholly from trachoma, there being 233 of a total of 274 debarred, yet in 1907-8 there were only 362 in a total of 1,172 deported on account of trachoma.

The report of 1903-4 further states:—'Remarkably few indeed of English-speaking people were detained—only 35 out of 50,374,' while it especially deals with the number of detentions and deportations of people from southern Europe, there being 150 out of a total of 510. In 1907-8 the rejections of British numbered 122.

Comparison of the detentions and rejections in table 3 is of little absolute value since immigrants arriving via several points of entry present several important differences. Those arriving via Montreal from Portland, Boston, New York, &c., represent a normal European immigration mostly from continental countries, notably Austria, Russia and Italy; those via North Sydney are nearly all from Newfoundland, while those arriving at Victoria and Vancouver are largely Asiatics. As the Montreal inspection is superadded to that at American ports, few persons have been debarred at that point, but 106 out of 22,381 arrivals were debarred or 1 in 211 or 50 per cent greater than for the total at the ports of Quebec, Halifax and St. John.

Of Pacific coast arrivals 1,143 were detained at Victoria in a total of 8,796 or 1 in 7.7 and 1 in 111 debarred, while at Vancouver of 12,808 arrivals, 897 were detained or 1 in 14, and 376 were debarred or 1 in 34. The causes of refusal to land were in some cases due to diseases, but in many others the clauses of the Act relating to other undesirable classes became operative.

TABLE III.

STATEMENT for the Ports of Halifax, St. John and Quebec, showing the number of Immigrants detained and debarred during the fiscal year, 1907-8.

SS. Line.	Port.	Number Examined.	Detained.		Debarred.	Ratio of detained to Number examined.	Ratio of debarred to Number examined.
			Males.	Females			
Allan SS. Line	Halifax	24,534	461	196	261	1 in 37	1 in 94
" "	St. John	180	.....	1	1	1 in 180	1 in 180
" "	Quebec.	54,057	174	93	102	1 in 202	1 in 530
	Totals	78,771	635	290	364	1 in 85	1 in 216
C. P. R. SS. Line	Halifax	615	3	3	.....	1 in 103	.....
" "	St. John	20,355	220	53	31	1 in 74	1 in 657
" "	Quebec	48,758	257	65	95	1 in 151	1 in 513
	Totals	69,728	480	122	126	1 in 116	1 in 553
Dominion SS. Line	Halifax	6,374	15	25	10	1 in 159	1 in 637
" "	Quebec	29,479	125	84	50	1 in 141	1 in 590
	Totals	35,853	140	109	60	1 in 144	1 in 598
Donaldson SS. Line	St. John	1,411	17	3	13	1 in 71	1 in 109
" "	Quebec	6,570	42	24	26	1 in 100	1 in 253
	Totals	7,981	59	27	39	1 in 93	1 in 205
Other Lines	Halifax	2,566	16	11	3	1 in 95	1 in 855
"	St. John	505	1	.....	1	1 in 505	1 in 505
"	Quebec.	68	7	2	5	1 in 8	1 in 14
	Totals	3,139	24	13	9	1 in 85	1 in 349
Grand Totals		195,472	1,338	561	598	1 in 103	1 in 327

This illustrates several remarkable results due to the varied character of immigration at different seasons of the year. Thus of the large number 24,534 brought to Halifax by the Allan steamship line, 1 in 37 were detained and 1 in 94 debarred; while of 54,057 arriving at Quebec but 1 in 202 were detained and 1 in 530 debarred. As remarked last year, 'the difference is due to the fact that a notably larger number of continentals arrive in winter.' It has been found that such are especially suffering from diseases of the eyes, contracted or made worse during cold weather and under confinement on railways and on shipboard. The Dominion line showed a proportion of detentions and deportations very close to the Allan line, being 1 in 144 detained and 1 in 598 debarred. The Canadian Pacific steamship line showed the detentions 1 in 74 at St. John during the winter months and 1 in 657 debarred. In the large number arriving by both these lines at Quebec, there is much the same proportion detained, the latter having 1 in 151, as also debarred, the ratio being 1 in 513.

The Donaldson steamship line, sailing wholly from Glasgow, presents the anomaly of having the largest detentions and rejections, there being 1 in 93 and 1 in 205. This line has come recently into the field of competition, and shows what has been before commented upon, that being unable to get at first their share of the regular passengers, they are liable to have brought to them doubtful emigrants refused by other lines.

Taking these Atlantic seaport arrivals together it is seen that, whereas last year 1 in 695 only was debarred, this year 1 in 327 was refused admission to Canada, or in all 598 persons in a total of 195,472 arrivals.

TABLE IV.

STATEMENT showing the number of Immigrants detained and debarred from Montreal, New York, North Sydney, Vancouver and Victoria for fiscal year 1907-8.

Port of Entry.	Port of Arrival.	Total Arriving.	Total Detained.	Total Debarred.	Total Released.	Still in Hospital.
Montreal	Philadelphia	918				
	Baltimore	396				
	Portland	3,802	589	9	567	13
	Boston	2,098				
	New York	22,381				
	New York	as above.	106	106	.....	.....
North Sydney	North Sydney	6,837	4	4	.....	.....
Vancouver	Vancouver	12,808	897	376	516	5
Victoria	Victoria	8,796	1,143	79	1,058	6
	Totals	58,036	2,739	574	2,141	24

The medical officer of the branch at New York debars a certain number on inspection.

TABLE V.

STATEMENT by nationalities of number of Immigrants debarred, showing total arrivals of the same nationalities for the fiscal year 1907-8.

Nationality.	Total Arrivals for Canada and U.S.	Atlantic Ports.		Pacific Ports.		Via U.S. Ports.	Totals.		Totals.
		For Canada.	For U. S.	For Canada.	For U. S.	For Canada.	For Canada.	For U. S.	
Austrian, N.E.S.	2,362	19	3			4	23	3	26
Bohemian	121					1	1		1
Bukowinian	2,145	4					4		4
Galician	14,453	11					11		11
Hungarian, N.E.S.	1,568	5				1	6		6
Dalmatian	10					1	1		1
Croatian	256					1	1		1
Bulgarian	3,767	116	48			11	127	48	175
Ruthenian	912					4	4		4
Magyar	321					2	2		2
Servian	53					1	1		1
Norwegian	4,544	1	3				1	3	4
Swedish	3,733	2	3				2	3	5
Danish	709	1					1		1
English	93,228	65	7	1		3	69	7	76
Irish	6,999	14	2				14	2	16
Scotch	23,007	28					28		28
Welsh	1,116	1	1				1	1	2
German	3,030	13	5			8	21	5	26
Hebrew, N.E.S	1,821	11				4	15		15
Belgian	1,343	2				1	3		3
French	2,789	7				1	8		8
Finnish	3,362	4	3				4	3	7
Polish, N.E.S	339	2					2		2
Polish Austrian	587		2			8	8	2	10
Polish Russian	834	10	3			3	13	3	16
Chinese	2,046			21			21		21
Australian	404	1					1		1
Newfoundland	4,780	3					3		3
Russian, N.E.S	10,125	19	28	1		13	33	28	61
Hebrew Russian	5,931	29	4			4	33	4	37
Persian	15		2					2	2
Spanish	63	1					1		1
Turkish	641	8	2				8	2	10
Armenian	624	21	24			1	22	24	46
Syrian	929	15	2			4	19	2	21
Italian	11,423	23	7			28	51	7	58
Japanese	8,317			76	8		76	8	84
Greek	1,269	7	13			2	9	13	22
West Indian	142	1					1		1
U. S. Citizens via Ocean Ports	2,452	2					2		2
From U.S. direct	58,312	1		130			131		131
Hindoo	2,627			218			218		218
Negro	143	1				1	2		2
Totals	283,592	448	162	447	8	107	1,002	170	1,172

This table has always had a special interest for the general observer, since rightly or wrongly many of the public are accustomed to found their judgment regarding immigrants from the particular personal experience they have had with them as domestic servants, farm hands, citizens, clerks or as competitors in the labour market.

Compared with last year, notably more Austrians, Germans, Scotch and Irish were debarred ; twenty times as many Chinese, fewer Japanese, but almost twice as many Hindoos (218), while 133 coming from the United States were debarred compared with 17 last year. It is notable that so much larger a number from the United States have been refused admission this year as compared with last year.

Other tables will show causes for which immigrants were debarred, but it may be said here that the financial distress in the United States has not only been the cause of many persons out of work coming to Canada, but probably explains the increase of some other nationalities who hitherto had not largely come to Canada. Thus the 179 Bulgarians of 1907 were increased to 2,529; the passenger agencies previously sending such to the United States, diverting the stream to Canada and resulting in 175 being debarred, and many more being subsequently deported on account rather of lack of funds and employment than of disease.

TABLE VI.

STATEMENT showing the total number of Chinese, Japanese and Hindoos detained, released and debarred at the Ports of Vancouver and Victoria during the fiscal year 1907-8.

Nationality.	Total No. Arriving.	Detained.	Released.	Debarred.	No. still in Hospital.
Vancouver—					
Chinese	1,255	96	72	21	3
Japanese	2,822	157	120	35	2
Hindoos	2,390	540	322	218	0
Totals	6,467	793	514	274	5
Victoria—					
Chinese	736	160	155	0	5
Japanese	5,483	943	891	52	0
Hindoos	234	11	10	0	1
Totals	6,453	1,114	1,056	52	6

What is notable is the considerable increase in Chinese arrivals both at Victoria and Vancouver. There were detained in all 256 Chinese, of whom 21 were debarred. Thus while 1 in 8 was detained, but 1 in 95 was debarred. The notably large number of detentions was due as last year to returning Chinese, who had contracted conjunctivitis and who were treated and released. Of the 1,100 detentions in 8,305 Japanese, many were for causes other than medical, since only 87 were debarred. Of the 2,624 Hindoos arriving 551 or 1 in 4·8 was detained and of 218, 1 in 12 debarred, a considerable number being diseased or physically unfit.

TABLE VII.

STATEMENT showing the diseases and other causes for which immigrants were detained at the Ports of Quebec, Halifax, St. John, Montreal, North Sydney, Vancouver, Victoria and New York during the fiscal year 1907-8.

Class of Disease.	Cause of Detention.	Number Detained.	Number Released.	Number Rejected.	Still in Hospital.
1. Contagious diseases	Typhoid fever	2	2	....	
	Measles	18	18	.....	
	Parotiditis (mumps)	1	....	1	
	Erysipelas	1	....	1	
	Totals	22	20	2	
			(2 died)		

TABLE VII—*Continued.*

Class of Disease.	Cause of Detention.	Number Detained.	Number Released.	Number Rejected.	Still in Hospital.
II. General diseases	Tuberculosis	27	16	11	
	Lupus	1	1		
	Alcoholism	1	1		
	Rheumatism	4	4		
	Malarial fever	1	1		
	Fever	12	12		
	Puerperal fever	1	1		
	Goitre	1	1 (died)		
	Scurvy	1	1		
	Vaccination infection	2	2		
	Totals	51	40	11	
III. Eye diseases	Trachoma	1,013	635 (1 died)	362	16
	Conjunctivitis	1,810	1,768	3	39
	Corneal opacity	2	1	1	
	Choroiditis	1		1	
	Cataract	3		3	
	Strabismus	3	1	2	
	Ulcer on cornea	1	1		
	Blindness	3	1	2	
	Defective sight	16	5	11	
	Pterygium	3	3		
	Trachomatous cicatrization	1	1		
	Totals	2,856	2,416	385	55
IV. Nervous system	Insanity	20	1 (died)	18	1
	Epilepsy	8	4	4	
	Feeble-minded	18	5	13	
	Paralysis	4	3	1	
	Spinal diseases	1		1	
	Convulsions	1	1		
	Locomotor ataxia	2		2	
	Muscular atrophy	3		3	
	Beri beri	1	1		
	Other nervous diseases	4	4		
	Totals	62	19	42	1
V. Circulatory system	Heart disease	16	10	6	
	Varicose veins and ulcers	1		1	
	Anæmia	11	8	3	
	Totals	28	18	10	
VI. Respiratory system	Bronchitis	3	2 (4 died)	1	
	Pneumonia	13	13 (1 died)		
	Empyema	3	2	1	
	Influenza	2	2		
	Tonsilitis	2	2		
	Totals	23	21	2	
VII. Digestive system	Hernia	8	(1 died)	8	
	Dysentery	4	4		
	Auto infection	3	3		
	Gastritis	1	1		
	Jaundice	1	1		
	Intestinal hemorrhage	1	1		
	Peritonitis	1	1		
	Piles	1	1		
	Totals	20	12	8	

TABLE VII.—*Continued.*

Class of Disease.	Cause of Detention.	Number Detained.	Number Released.	Number Rejected.	Still in Hospital.
VIII. Genito-urinary system	Syphilis	3	.....	3	.....
	Cystitis	1	1	.....	.....
	Uraemia	1	1 (1 died)	.....	.....
	Bubo	1	1	.....	.....
	Diabetes	1	1	.....	.....
	Epididymitis	1	1	.....	.....
	Totals	8	5	3	.....
IX. The skin	Favus	10	5	5	.....
	Alopecia	1	1	.....	.....
	Scabies	2	2	.....	.....
	Eczema	8	7	1	.....
	Tinea (Ring Worm)	64	62	2	.....
	Impetigo sparsa	2	2	.....	.....
	Ulcers	4	4	.....	.....
	Herpes	3	3	.....	.....
	Totals	94	86	8	.....
X. Malformations and diseases of old age and infancy	Deaf and dumb	4	3	1	.....
	Deaf and blind	1	1	.....	.....
	Ankylosis	2	.....	2	.....
	Cripple	4	2	2	.....
	Club feet	1	.....	1	.....
	Curvature of spine	1	.....	1	.....
	Senility	26	13	13	.....
	Totals	39	19	20	.....
XI. Accidents	Fractures	5	4	1	.....
	Injuries	4	2	2	.....
	Wounds	2	2	.....	.....
	Lameness	2	2	.....	.....
	Frost bite	1	.....	.....	1
	Totals	14	10	3	1
XII. Ill-defined causes	Poor physique	35	10	25	.....
	Physical debility	7	6	1	.....
	Exhaustion from sea-sickness	1	1	.....	.....
	Totals	43	17	26	.....
XIII. Other causes	Accompanying patients	364	302	57	5
	Stowaways	163	11 (2 died)	152	.....
	Likely to become a public charge	178	125	53	.....
	Contract labour	24	.....	24	.....
	Waiting for information	2	2	.....	.....
	Held for inquiry	89	88	.....	1
	Pauper	271	20	251	.....
	No passport	3	.....	3	.....
	Vagrancy	3	.....	3	.....
	Contravention of Order-in-Council	195	154	41	.....
	Held for bond	2	2	.....	.....
	Waiting for ticket	1	1	.....	.....
	Under age	13	.....	13	.....
	Held by U.S. officers	7	7	.....	.....
	Child births	3	3	.....	.....
	Criminal	21	3	18	.....
	Moral Turpitude	5	.....	5	.....
	Procurer	2	.....	2	.....
	Prostitution	19	.....	19	.....
	Bad character	4	.....	4	.....
	With illegitimate child	2	2	.....	.....
	Illegal cohabitation	2	.....	2	.....
	Pregnancy	5	.....	5	.....
	Totals	1,378	720	652	6
	Grand totals	4,638	3,403 (14 died)	1,172	63

Of the total 311,820 who arrived in Canada, 58,312 crossed at border ports of the United States boundary, and were not medically inspected, but 26,236 others who arrived at Canadian seaports, and were detained for the United States were inspected. Hence of 253,508 undergoing medical inspection 4,638 were detained and 1,172 were debarred.

All causes for which immigrants were debarred are set forth in the last statement, whether medical or otherwise. The usual cases (18) of measles, 14 of which occurred in children infected on shipboard were detained with parents. Of the general diseases, class II., notably the largest number 27 was of tuberculosis; some of these were detained for observation, others having the disease in its initial stages, and having funds or going to friends, were admitted while 11 were rejected. How far the excluding clauses of the Act should be made operative in this sad but interesting class of cases by our medical officers at the seaports, is a matter which has received very careful attention. While the infectious nature of this disease in its advanced stages, and under certain conditions is fully recognized, yet in no country is it being dealt with as severely as the acute contagious diseases, and experience shows that it need not be if intelligent precautions are taken.

But in the case of the immigrant, there are two other phases of the matter which cannot be overlooked. The first is, if he comes seeking health, advised by his physician, say in England, is not in an incurable stage, and has a reasonable amount of money or is coming to friends who have sent for him and who are willing and able to take care of him, then there is every reason why such an one should, viewing the matter from the humanitarian standpoint and the higher law, be given a chance for life, just as the Canadian goes south to Jamaica, California and Florida in search of health. On the other hand, if the immigrant is in an advanced stage of the disease, or is without funds, both causes unfortunately for which individual cases have been sent to Canada, there can be but one course to pursue and that is to reject. Other cases where a member of an otherwise good family is infected, where a wife or child is coming to a husband or father already settled in Canada, have each to be dealt with separately and the course of action to be determined on with due regard to the best interests of the individual and of Canada.

TABLE VIII.

STATEMENT showing number of suspected tubercular immigrants detained, released and rejected; also number who died at ocean ports during the fiscal year 1907-8 by nationalities.

Nationality.	Detained.	Released.	Rejected.	Died.
Galician	1		1	
English	8	6	2	
Scotch	3	3		
Irish	2		2	
Greek	2	2		
Hebrew, N.E.S.	1		1	
Hebrew Russian	1			1
Italian	2	1	1	
Polish Austrian	1		1	
Polish Russian	2	1		1
Russian, N.E.S.	1		1	
Danish	2	1	1	
Servian	1		1	
Totals	27	14	11	2

The only other important cause for detention in this class was fever, and all were released. These cases were largely the effects of seasickness and the confined life on shipboard, and were in no sense infectious.

Class III. as usual contains the chief number of detained persons, there being 1,013 cases of trachoma, of whom 362 were debarred; 1,810 cases of conjunctivitis, of whom 3 were debarred, and 16 cases of defective sight, of whom 11 were debarred. In all 2,856 cases were detained on account of eye disease, and 385 were debarred. While still a very important factor in the work of medical inspection at Atlantic seaports, it has become yearly less so, since the booking companies in Europe and Asia have instituted the practice of a routine medical examination of continental and Asiatic immigrants either in their home countries or at ports of sailing, especially as regards trachoma.

Class IV.—Of the 62 cases in this class of nervous diseases, 20 were cases of insanity. Remembering that this is a disease which the Act absoutely excludes, and that in most cases nothing less than close and prolonged observation and examination will suffice to detect cases of insanity, it is gratifying to state that our officers succeeded in detecting 20 cases in the necessarily short examination at the ports of entry. In view of the criticism which here and there is made of the work of medical inspection, the following table illustrating comparative progress in detecting insanity is given, as taken from Annual Reports of the United States Commission:—

TABLE IX.

STATEMENT showing the number of Insane detained at the seaports of Canada and the United States.

	1903-04.	1904-05.	1905-06.	1906-07.	1907-08.
Canada	6	7	7	15	20
United States	33	92	139	189	.....

Remembering that the number of immigrants coming to the United States in 1906-07 was 1,298,413, added to which were 153,120 non-immigrant aliens as cabin passengers who were also inspected, we find that 1,451,533 had 189 insane or 1 in every 7,680 inspected as compared with 1 in every 11,187 coming to Canada. There is, however, a difference in the comparative number of immigrants from different countries to Canada and the United States which is of interest in this connection.

TABLE X.

STATEMENT showing number of British immigrants arriving in Canada and the United States.

	1906-07.	1907-08.
Canada—English and Welsh	43,590	94,344
Scotch	11,355	23,007
Irish	3,706	6,999
	58,651	124,350 (1)
United States—English and Welsh	59,404	Report not yet received.
Scotch	19,740	
Irish	34,530	
	113,674	

Thus the remarkable fact is developed that the total immigration from the British isles in 1907-8 to Canada was greater than that to the United States in 1906-7. Of the total 18 insane rejected at Canadian ports 8 were English, 2 Scotch, 2 Irish, or together 67 per cent of the whole; 2 French and 1 each of Galician, Russian Hebrew, Newfoundlander and Negro race. Of those at United States ports debarred on account of insanity there were in 1906-7 26 or 1 in 2,284 English, 7 or 1 in 2,820 Scotch and 44 or 1 in 784 Irish. In other words in a total of 113,674 British or in one eleventh of the total immigration to the United States there were 77 insane rejected or 40 per cent of the whole rejected insane, while the total rejected at Canadian ports is thus seen to be comparatively as 6 to 12. There is, as seen in the British rejections at the ports of both countries, seemingly good evidence to show that the same influences tend to send to both Canada and the United States certain ill-balanced persons of erratic habits, who at times of their own caprice and at others at the suggestion of others come to these countries, reached as easily and almost as cheaply as is London from Aberdeen, and where the language and customs present no difficulties to be overcome, and where, too, many are sent to friends, or have been advised to try America for their health whether financial or physical. That the rate of progress of detentions of the insane and rejections at the Canadian ports, has been at any rate comparatively satisfactory, may be concluded from the fact that three times as many were detained at Canadian ports in 1907-8 as compared with 1903-4.

As regards the numerous other causes for detention or rejection, little need be said from the purely medical standpoint; cases of poor physique and physical debility are readily detected, and when to these are added evident moral defects of character or lack of funds, the line of action indicated is easily determined.

TABLE XI.

STATEMENT showing diseases and other causes for which Immigrants were deported during the fiscal year 1907-8.

Class of Disease.	Cause of Deportation.	
I. General diseases	Tuberculosis	70
	Rheumatism	21
	Alcoholism	1
	Malarial fever	1
	Hip disease	1
	Bright's disease	1
	Hodgkin's disease	1
	Total	96
II. The eye	Defective sight	3
	Trachoma	2
	Cataract	1
	Total	6
III. Nervous system	Insanity	122
	Feeble minded	13
	Epilepsy	10
	Paralysis	2
	Locomotor Ataxia	2
	Total	149
IV. Circulatory system	Heart disease	6
	Varicose veins	4
	Total	10

TABLE XI.—*Continued.*

Class of Disease.	Cause of Deportation.		
V. Respiratory system	Haemoptysis		3
	Bronchitis		1
		Total	4
VI. Digestive system	Rupture		1
VII. Genito-urinary system	Syphilis		3
	Metrorrhagia		1
		Total	4
VIII. The skin	Abscesses		2
	Fistula		1
	Mastoiditis		1
		Total	4
IX. Malformation, diseases of old age and infancy	Old age		7
	Cripple		5
	Deafness		2
	Flat foot		1
		Total	15
X. Accidents	Broken leg		1
XI. Ill-defined causes	Physical debility		33
XII. Other causes	Likely to become public charge		279
	Accompanying patients		116
	Criminality		49
	Prostitution		26
	Vagrancy		23
	Contract labour		6
	Immorality		2
	Drug habit		1
		Total	502
		Grand total	825

However satisfactory the work of port inspection comparatively may have been, it has been supplemented by further action which the department wisely or the opposite laid down of itself, and which the Immigration Act requires all municipalities in Canada to take. Clauses 28 and 33 of the Immigration Act read:—

'28. No immigrant shall be permitted to land in Canada who is a pauper, or destitute, a professional beggar, or vagrant, or who is likely to become a public charge; and any person landed in Canada who, within two years thereafter, has become a charge upon the public funds, whether municipal, provincial, or federal, or an inmate of or a charge upon any charitable institution, may be deported and returned to the port or place whence such immigrant came or sailed for Canada.

'33. Whenever in Canada an immigrant has within two years of his landing in Canada committed a crime involving moral turpitude, or become an inmate of a jail or hospital or other charitable institution, it shall be the duty of the clerk or secretary of the municipality to forthwith notify the minister thereof, giving full particulars. On receipt of such information the minister may, on investigating the facts, order the deportation of such immigrant at the cost and charges of such immigrant if he is able to pay, and if not then at the cost of the municipality wherein he has last been regularly resident, if so ordered by the minister, and if he is a vagrant or tramp, or there is no such municipality, then at the cost of the Department of the Interior. Every such immigrant shall be carried by the same transportation company or companies which brought him into Canada to the port from which he came to Canada

without receiving the usual payment for such carriage. In case he was brought into Canada by a railway company such company shall similarly convey him or secure his conveyance from the municipality or locality whence he is to be deported to the country whence he was brought.'

The history of British emigration legislation for a century had clearly shown the necessity for this legislation, as for instance the Act of 1834 which provided that persons entitled to vote at any public vestry meeting, could vote to direct that money, not exceeding one-half the rate of the preceding year may be applied to assisting its residents to emigrate, and might be borrowed to be repaid within five years. The reason for such a Bill is understood when Horton who introduced the Bill stated that in the parish of Frome 14,000 habitually or casually received relief. 'He said the parish was too poor to keep them and would borrow money if allowed to emigrate them.'

It is not too much to expect perhaps, in spite of the notification and of announcements made in Great Britain by the department of the kind of emigration desired, and what is not wanted, that there have been in the enormous number of British emigrants who came in 1907-8 to Canada, some persons who were of this assisted class. While all of those on arrival who desired work obtained it until the financial crisis occurring in the United States in the autumn of 1907 affected Canadian industries and caused a stoppage of work, which resulted in the least desirable and energetic immigrants, especially in Ontario to which they had largely gone, 61,475 in the calendar year 1907, repeating what was stated in the Immigration Committee's report in the parliamentary papers of Canada of 1858, 'There were more jail commitments in 1858 than in 1857 due to lack of general employment in Canada and the United States.'

It may also be stated that the seven years previous to 1858 had seen a total of 291,134 arriving in Canada, and nearly all in Upper Canada, so that the conditions following the financial crisis of 1857 must have been very serious indeed resulting in immigration to Canada decreasing from 59,716 in 1854 to 6,689 in 1858, and from 193,065 to 43,761 for the same years to the United States.

Under Class I. the chief cause of deportation has been tuberculosis. In order to know to what extent cases of this disease had passed inspection, a circular was sent in January last to every hospital and known refuge in Canada, requesting reply to questions as to the nationality, age, date of arrival in Canada and of admission to hospital, and the final disposition of the case. From Ontario answers were received from 61 institutions; from Quebec 18; from Nova Scotia 49; from Manitoba 6; from Saskatchewan 3; from Alberta 9; from British Columbia 7; from the Yukon 1. Of these only 10 in Ontario reported any cases, there being 21 in all. Seven in Quebec reported 66 cases; three in Manitoba, 25 cases; twelve cases from Saskatchewan; three from Alberta, and none from either British Columbia, Nova Scotia or the Yukon, or in all 127 cases were reported. Most of these, apart from 11 who died, have been reported to the department, and are included in the 70 cases deported during the year. Of those deported up to the date of the circular, I have analysed them according to the information obtained, with the following results :—

Evidently tuberculized on admission to Canada	25
Probably tuberculized on admission to Canada	17
Not tuberculized on admission to Canada	15

Of others, two recent arrivals died in a refuge in Hamilton; two at Port Arthur within a year of arrival, and two others without particulars; four Austrians who were navvies, died in St. Thomas hospital and one in Lethbridge. Of 61 cases of tuberculosis treated in Victoria hospital, Montreal, not born in Canada, 18 had arrived within three years, and 4 in Notre Dame, all of whom had arrived within a year. While it is doubtless true that others may have arrived and been admitted, they have evidently arrived with and been maintained by their families or have come to friends. In Winnipeg the Margaret Scott Nursing Mission had 22 cases of tuberculosis during 10 months,

visited by its nurses, but no information was available as to whether they were immigrants and if so had recently arrived.

In Class II. diseases of the eyes were the cause of but 6 deportations. This is the best illustration possible of the thoroughness of the work of inspection as regards this class of disease. A careful personal investigation instituted during the year developed the following facts: In the general hospital in Winnipeg there were in all 14 cases of trachoma operated upon in 1907, and of these only three judging by their names were immigrants. In the out patient dispensary of 2,941 cases treated in 1907, there were but 17 of trachoma, and 3 for corneal ulcers. Of 25 cases treated in 1907 in St. Boniface, Winnipeg, 6 were French half-breeds; 6 Austrians, two only of whom had arrived within two years, and 4 Russians, of whom 1 had arrived within 2 years. The Montreal General Hospital outdoor clinic treated 102 cases of trachoma; but no particulars were kept, and the report states, 'Quite a number of the cases were natives of French Canada.' These constituted practically all the cases of trachoma found in the country.

Class III.—In all 122 cases of insanity were deported; a very remarkable number indeed, as indicating the activity of the department in relieving the public institutions of this serious source of expense. When it is remembered that it is very difficult to get correct information from some of these unfortunates, whose relatives or friends are often only too reluctant to have them return, it is perhaps surprising that it has been possible to make arrangements for the return of so many.

Reference has already been made to the measures taken for preventing the admission of such cases to Canada. How large is the number of the cases deported may be gathered by comparison with the United States returns which show that in 1906-7, some 360 aliens were deported on the ground of their becoming insane within three years after landing. In Canada within less than two years from the passing of the present Act, 184 were deported, or more than half as many, though our immigration within the two years was but one-sixth of that to the United States.

TABLE XII.

STATEMENT showing the number and year of admission of insane and other immigrants deported during the fiscal year 1907-8.

Province Deported From.	Year of Arrival.									Date Unknown.	Total No. Deported.	Total Insane Deported.
	1900.	1901.	1902.	1903.	1904.	1905.	1906.	1907.	1908.			
Lower Provinces							1	11			12	
Quebec			1		1	3	32	91		3	131	25
Ontario	1		1	1		6	87	243		4	343	50
Manitoba						6	68	151		8	233	25
Saskatchewan								2			2	1
Alberta							4	8			12	2
British Columbia							8	39	8	1	56	6
U.S.A. via Canada					1	2	13	19		1	36	13
Totals	1		2	1	2	17	213	564	8	17	825	122

Class IV. of Table XI. had few deportations, there being 6 of heart disease and 4 of varicose veins.

Class V. of Table VII. had in all 28 detentions and 10 rejections, 6 being from heart disease.

Class VI. had 23 detentions and 2 rejections from diseases of the respiratory system, 13 being acute pneumonit, mostly developed on shipboard, of whom 4 died.

Class VII.—Including diseases of the digestive organs, shows a remarkable immunity from diseases, such as cholera, typhoid, &c., which in the early history of immigration were the causes of serious sickness and mortality.

Classes VIII. and IX.—Detentions in Classes VIII. and IX. are confined almost wholly to two skin diseases peculiarly prevalent amongst the people and schools of the poorer parts of Great Britain and continental cities. They are favus and ringworm (tinea); both difficult to cure and both liable to spread in insanitary houses. In all 5 cases of favus were rejected and 2 of ringworm.

Class X. is an ill-defined group. Had 39 cases detained and 20 rejected. Of these 13 were old persons, senile and unable to care for themselves.

Class XI. contains but few cases whether of injuries or wounds.

Under Class XII. of Table XI. we find for the first time a notable number of immigrants deported as paupers, or those liable to become a public charge. While last year there were but 23, in 1907-8 there were 279, and along with those there were deported 49 as criminals and 52 for other forms of immorality or vagraney.

That there should have been in the stress of a sudden stoppage of work during a Canadian winter so few cases subject to deportation from some one or more of the causes set forth in the Act, is probably the best commentary possible upon not only the industrious qualities of most of our immigrants, but more so upon their moral characters. The paucity of immigrants in public institutions may be best illustrated perhaps from the Ontario annual reports of the Public Charities:—

TABLE XIII.

STATEMENT giving Number of Refugees in Ontario and Admissions thereto in 1905 and in 1907.

	1905.	1907.
Institutions	74	73
Number of inmates	5,507	5,528
Previous Residence.		
Received from city or town where refuge is located	4,020	4,047
Counties	718	464
Received from some other county in Ontario.	651	883
Emigrants and foreigners	118	134
	5,507	5,528

Thus the total increase in two years was only 21, and the immigrant increase but 16,while the total immigrants were less than 3 per cent of the whole. It is further interesting to note that the number admitted into the House of Industry, Toronto, in 1905, was 197, and 152 in 1907; in the House of Providence, Toronto, 320 in 1905, and 299 in 1907. The last annual report of the House of Industry, Toronto, including the hard winter of 1907-8, shows an increase in the cost of outdoor relief from $11,-149 05 to $18,407.18, and as it is to this refuge that most applicants to the city hall are sent, it may be said that the increased calls for help there which began in November with the shutting down of large factories were the measure of official charity exercised. Moreover, this outdoor relief was chiefly to some 200 families, mostly English, who came late in the autumn, of which only two of the number were deported, while outdoor relief ended with March.

TABLE XIV.

STATEMENT showing the Number and Nationality of Immigrants Deported after Admission during the Fiscal Years 1903-4, 1904-5, 1905-6, 1906-7 (9 months), and 1907-8.

Nationality.	Total No. Arriving.	Deported.	Ratio of Deported to Number Arriving.
Bulgarian	2,795	63	1 in 44
Danish	1,939	13	1 in 149
Icelandic	1,120	5	1 in 224
Doukhobor	228	1	1 in 228
Dutch	2,445	10	1 in 245
Hebrew German	306	1	1 in 306
English	281,521	882	1 in 319
Norwegian	6,481	19	1 in 341
Swedish	9,009	23	1 in 392
Irish	22,095	47	1 in 470
Hebrew Polish	447	1	1 in 447
Welsh	3,792	8	1 in 474
Finnish	5,532	11	1 in 503
Hebrew, N.E.S	4,531	8	1 in 566
Polish, N.E.S	1,238	2	1 in 619
Hungarian, N.E.S	4,617	7	1 in 660
Scotch	71,094	80	1 in 889
Australian	949	1	1 in 949
Hindoo	5,179	5	1 in 1,036
French	8,910	8	1 in 1,114
Galician	36,231	32	1 in 1,132
Turkish	1,137	1	1 in 1,137
German	11,684	8	1 in 1,461
Bukowinian	6,430	4	1 in 1,608
Austrian, N.E.S	5,138	3	1 in 1,713
Italian	32,203	17	1 in 1,894
Russian, N.E.S	15,202	8	1 in 1,900
Chinese	1,994	1	1 in 1,994
Syrian	2,344	1	1 in 2,344
Roumanian	2,665	1	1 in 2,665
Hebrew Russian	26,138	10	1 in 2,614
Belgian	4,624	1	1 in 4,624
From U.S	239,481	51	1 in 4,696
Newfoundland	5,452	1	1 in 5,452
Totals	824,951	1,334	1 in 618

As was remarked in a preceding report, the number of immigrants of some nationalities has been too small to draw conclusions from, yet some nationalities show continued freedom from deported cases. As a racial group the Scandinavian, including Norwegian, Swedish, Danish and Icelandic, shows most deported or 1 in every 309 of 18,549 immigrants. The British group, by far the most important, is next highest, and in spite of the very large number of English emigrants, shows 1 in 319 in a total of 281,521, or 882 in all; that is, supplied two-thirds of the total deportations in a number of immigrants a little more than one-quarter of the whole. The Austrian group as before stands well, being 1 in 1,139 of 52,416 returned. Similarly of the Germans, but 1 in 1,461 of 11,684 returned. Of French 1 in 1,114 of 8,910, and but one person in 4,624 Belgians. Of Russian and Russian Hebrews 1 in 2,297 were returned out of a total of 41,340. Similarly a remarkable immunity continues amongst Italians, but 17 in 32,203, or 1 in 1,894 being sent back.

TABLE XV.

STATEMENT showing the Number, Nationality and Cause for which Immigrants were deported during the Fiscal Year 1907-8.

Nationality.	Whence sent for Deportation.	Male.	Female.	Class of Disease.	Cause of Deportation.
Deported at Montreal.					
Galician	Winnipeg	2		General diseases	Tuberculosis.
Dutch	Toronto	1		"	"
German	Winnipeg	1		"	"
English	St. John	1		"	"
"	Montreal	6		"	"
"	Toronto	3	4	"	"
"	Woodstock	1		"	"
"	Port Arthur	1		"	"
"	Meaford, Ont	1		"	"
"	Winnipeg	7	1	"	"
"	U. S. A	1		"	"
Scotch	Montreal	1	1	"	"
"	Winnipeg	1	1	"	"
Irish	Toronto		1	"	"
"	Winnipeg	1	1	"	"
Hebrew, N.E.S	"	2		"	"
" Polish	"	1		"	"
Italian	Montreal	2		"	"
Russian, N.E.S	"	1		"	"
Danish	Winnipeg	2		"	"
Swedish	Montreal	1		"	"
"	Winnipeg	1		"	"
English	Niagara Falls	1		"	Rheumatism.
"	Fort William	1		"	"
"	Winnipeg	7	1	"	"
Scotch	"	2		"	"
Galician	Montreal	1		"	Malarial fever.
English	"	1		"	Hip disease.
"	Winnipeg	1		"	Bright's disease.
"	"	1		"	Hodgkin's disease.
"	Chesley, Ont	1		The eye	Defective sight.
"	Winnipeg	1		"	"
Bukowinian	Montreal	1		"	Trachoma.
English	"	1		"	Cataract.
Austrian, N.E.S	Mimico, Ont	2		Nervous system	Insanity.
Galician	Montreal	2		"	"
German	Peterborough	1		"	"
"	Winnipeg	1		"	"
French	"	1		"	"
English	Stanstead, Que	1		"	"
"	Montreal	6	1	"	"
"	Toronto	10	6	"	"
"	Cobourg, Ont	1	1	"	"
"	Renfrew, Ont	1		"	"
"	London, Ont	4		"	"
"	Ottawa	1		"	"
"	Thamesville, Ont		1	"	"
"	Penetanguishene, Ont	1		"	"
"	Brockville	1		"	"
"	Kingston	1		"	"
"	Winnipeg	7	5	"	"
"	Youkton, Sask		1	"	"
"	Calgary		1	"	"
"	Edmonton	1		"	"
"	New Westminster, B.C	2		"	"
Scotch	Mimico, Ont	1		"	"
"	Toronto	1		"	"
"	Winnipeg		1	"	"
Irish	Montreal	1		"	"
"	Winnipeg		1	"	"
Hebrew, Russian	"	1		"	"
"	U. S. A	1		"	"

TABLE XV.—*Continued.*

Nationality.	Whence sent for Deportation.	Male.	Female.	Class of Disease.	Cause of Deportation.
Italian	Hamilton	1		Nervous system	Insanity.
Norwegian	Montreal		1	"	"
From U.S.A.	"	1		"	"
"	Winnipeg		1	"	"
Dutch	Toronto	1		"	Feeble-minded.
German	Winnipeg	1		"	"
English	Montreal	1		"	"
"	Sherbrooke	1		"	"
"	Winnipeg	1		"	"
Polish	Ottawa	1		"	"
Swedish	Toronto	1		"	"
English	Montreal	1		"	Epilepsy.
"	Toronto	2		"	"
"	St. Catharines	1		"	"
Scotch	Carleton, Ont.		1	"	"
English	Winnipeg	1		"	Paralysis.
"	Montreal	1		"	Locomotor ataxia.
"	Winnipeg	1		"	"
English	"	5		Circulatory system	Heart disease.
Scotch	"	1		"	"
English	Montreal	1		"	Varicose veins.
"	Toronto	1		"	"
"	Ripley	1		"	"
"	Winnipeg	1		"	"
"	Toronto	1		Respiratory system	Hæmoptysis.
"	Winnipeg	2		"	"
"	"	1		"	Bronchitis.
From U.S.A.	"	1		Digestive system	Rupture.
English	St. Andrew's, Que.	1	1	Genito-urinary system	Syphilis.
"	Winnipeg	1		" "	"
"	Montreal		1	" "	Metrorrhagia.
"	Winnipeg	1		The skin	Abscesses.
"	Ingersoll	1		"	Mastoiditis.
"	Toronto	2	1	Malformation,	Old age.
"	Winnipeg	1	2	Diseases of old age and infancy.	"
Hebrew, N.E.S.	"	1			"
English	Montreal	1		"	Cripple.
"	Toronto	2		"	"
"	Brandon	1		"	"
"	Toronto	1		"	Deafness.
Scotch	Montreal		1	"	Flat foot.
Galician	Winnipeg	3		Ill-defined causes	Physical debility.
Hungarian	Montreal	1		"	"
Dutch	Winnipeg	1		"	"
English	Toronto	2		"	"
"	Oshawa		1	"	"
"	Ottawa	1		"	"
"	Winnipeg	14	1	"	"
Swedish	"	1		"	"
Norwegian	Montreal	1		"	"
Hungarian	Winnipeg	1	1	Other causes	Likely to become a public charge.
Bulgarian	Montreal	2		"	"
"	Toronto	27		"	"
English	Montreal		1	"	"
"	Chatham	7	5	"	"
"	Toronto	13	10	"	"
"	Oshawa	11	4	"	"
"	Ottawa	1	1	"	"
"	Clinton	1		"	"
"	Sault Ste. Marie	1		"	"
"	Winnipeg	6	1	"	"
Scotch	"		3	"	"
Danish	Montreal		3	"	"
Turkish	Toronto	1		"	"
Galician	Montreal	3	3	"	Accompanying patients.
Hungarian	"		1	"	"
Dutch	Toronto	2	3	"	"
German	Peterborough		1	"	"
English	Montreal		3	"	"
"	Toronto	8	10	"	"

TABLE XV.—*Continued*

Nationality.	Whence sent for Deportation.	Male.	Female.	Class of Disease.	Cause of Deportation.
English	Oshawa	2	1	Other causes	Accompanying patients.
"	Ottawa	1		"	"
"	Chesley, Ont.	2	2	"	"
"	Renfrew, Ont	3	1	"	"
"	Clinton, Ont		2	"	"
"	Ingersoll		2	"	"
"	Meaford, Ont.	1	2	"	"
"	Winnipeg	13	18	"	"
Scotch	"	1	2	"	"
Irish	Montreal	1		"	"
Australian	"	1		"	Criminality.
Dutch	Winnipeg	1		"	"
English	Montreal	3		"	"
"	Toronto	2		"	"
"	London, Ont.	1		"	"
"	Ottawa	4		"	"
"	Winnipeg	5		"	"
Scotch	Montreal	3		"	"
"	Hamilton		1	"	"
"	Woodstock	1		"	"
"	Toronto	1		"	"
"	Winnipeg	1		"	"
Irish	Ottawa	1		"	"
Hebrew, N.E.S	Toronto	1		"	"
Danish	Montreal	1		"	"
From U. S. A.	"	2		"	"
"	Sherbrooke	1		"	"
English	Winnipeg		3	"	Prostitution.
Scotch	"		1	"	"
Irish	"		1	"	"
"	U. S. A		2	"	"
Galician	Montreal	1		"	Vagrancy.
English	Toronto	1		"	"
"	London, Ont.	1		"	"
"	Ottawa	3		"	"
"	Woodstock	1		"	"
"	Cobourg, Ont	1		"	"
"	Winnipeg	3	1	"	"
"	Lethbridge	1		"	"
Scotch	"	1		"	"
English	Winnipeg	1		"	Drug Habit.
	Totals	325	131		
Deported at St. John.					
English	Montreal	3		General diseases	Tuberculosis.
"	Toronto	3		"	"
"	London, Ont.	1		"	"
"	Oshawa, Ont.	1		"	"
"	St. John	1		"	"
"	Winnipeg	3		"	"
Welsh	Michel, B. C.	1		"	"
Scotch	Toronto	1		"	"
Irish	Winnipeg	1		"	"
"	Vancouver	1		"	"
Hebrew Russian	Montreal	1		"	"
Italian	"	1		"	"
Finnish	"	1		"	"
"	Sault Ste. Marie	1		"	"
Swedish	Montreal	1		"	"
"	U. S. A		1	"	"
Norwegian	Winnipeg	1		"	"
English	Campbellton, N.B.	1		"	Rheumatism
"	Montreal	1		"	"
"	Winnipeg	4		"	"
Irish	"	1		"	"
Italian	Montreal	2		"	"
English	St. John		1	The eye	Defective sight.
Scotch	Winnipeg	1		"	Trachoma.
Galician	New Westminster	1		Nervous System	Insanity.
German	U. S. A	1		"	"

TABLE XV.—*Continued.*

Nationality.	Whence sent for Deportation.	Male.	Female.	Class of Disease.	Cause of Deportation.
English	Wakefield, Que	1	..	Nervous system	Insanity.
"	Montreal	1	1	"	"
"	Toronto	8	1	"	"
"	Hamilton	..	1	"	"
"	London, Ont	1	..	"	"
"	Port Arthur	1	..	"	"
"	Winnipeg	3	..	"	"
"	New Westminster	1	..	"	"
"	Vancouver	1	..	"	"
"	U. S. A	1	1	"	"
Scotch	Montreal	1	1	"	"
"	Port Arthur	1	..	"	"
"	Winnipeg	2	..	"	"
"	U. S. A	1	..	"	"
Irish	Winnipeg	1	..	"	"
"	U. S. A	1	..	"	"
Hebrew Russian	Montreal	..	1	"	"
"	U. S. A	1	..	"	"
Hebrew German	"	1	..	"	"
Italian	"	1	..	"	"
Russian, N.E.S	Toronto	1	..	"	"
Finnish	U. S. A	1	..	"	"
Swedish	Vermilion, Ont	1	..	"	"
"	Winnipeg	1	..	"	"
Norwegian	Ottawa	..	1	"	"
"	U. S. A	1	1	"	"
English	Montreal	1	1	"	Feeble-minded.
"	Ottawa	1	..	"	"
"	Broadview, Sask	..	1	"	"
Irish	Winnipeg	1	1	"	"
English	Montreal	1	..	"	Epilepsy.
"	Winnipeg	2	..	"	"
Scotch	"	1	..	"	"
English	Fort William	..	1	"	Paralysis.
"	Quebec	..	1	The skin	Abscesses.
"	Winnipeg	1	..	"	Fistula.
Russian, N.E.S	Montreal	1	..	Malformation, Diseases of old age and infancy.	Cripple.
English	"	1	..		Deafness.
Scotch	Winnipeg	1	..	Accidents	Broken leg.
Bukowinian	Montreal	1	..	Ill-defined causes	Physical debility.
French	"	1	..	"	"
English	"	2	..	"	"
"	U. S. A	1	..	"	"
Scotch	Winnipeg	1	..	"	"
Bukowinian	"	1	..	Other causes	Likely to become a public charge.
"	U. S. A	1	..	"	"
Galician	Montreal	1	..	"	"
"	Ottawa	1	..	"	"
"	Winnipeg	3	1	"	"
French	"	1	1	"	"
English	Montreal	5	5	"	"
"	Toronto	6	6	"	"
"	Ottawa	1	2	"	"
"	Oshawa	5	1	"	"
"	Peterborough	1	4	"	"
"	St. Thomas	1	..	"	"
"	Chatham	4	9	"	"
"	Winnipeg	16	12	"	"
"	Edmonton	1	..	"	"
"	Vancouver	1	..	"	"
"	Victoria, B.C	1	..	"	"
Scotch	Montreal	1	..	"	"
"	Ottawa	1	..	"	"
"	Toronto	..	5	"	"
"	Winnipeg	5	..	"	"
Irish	"	1	1	"	"
"	Edmonton	4	3	"	"
"	Vancouver	1	..	"	"
Hebrew Russian	U. S. A	2	..	"	"

TABLE XV.—*Continued.*

Nationality.	Whence sent for Deportation.	Male.	Female.	Class of Disease.	Cause of Deportation.
Italian	U. S. A.	1		Other causes	Likely to become a public charge.
Bulgarian	Montreal	5		"	"
"	Toronto	19		"	"
Russian, N.E.S.	Montreal	1		"	"
Doukhobor	"	1		"	"
Swedish	"	1		"	"
Norwegian	U. S. A.	2		"	"
English	Montreal		1	"	Accompanying patients.
"	Oshawa	7	5	"	"
"	Toronto	3	2	"	"
"	Winnipeg	1		"	"
"	U.S.A.	4	2	"	"
Irish	Winnipeg		2	"	"
Italian	Montreal		1	"	"
English	Toronto	1		"	Criminality.
"	St. Thomas	1		"	"
"	Winnipeg	3		"	"
Scotch	Hamilton	1		"	"
Irish	Winnipeg	1		"	"
Italian	Toronto	4		"	"
Syrian	Winnipeg	1		"	"
English	Toronto		1	"	Prostitution.
"	U.S.A.	6		"	Contract labour.
	Totals	212	79		
Deported at Vancouver.					
From U.S.A.	Vancouver		1	Nervous system	Insanity.
"	"	3	1	Other causes	Likely to become a public charge.
Hindoo	"	5		"	"
From U.S.A.	"		14	"	Prostitution,
"	"	3		"	Vagrancy.
	Totals	11	16		
Deported at Halifax.					
English	Burlington, Ont.	1		Nervous system	Epilepsy.
Bulgarian	Toronto	10		Other causes	Likely to become a public charge.
English	Halifax	3	4	"	"
"	Montreal	1		"	"
Scotch	St. Catharines	1		"	"
Irish	"	1		"	"
Deported at Victoria.	Totals	17	4		
From U.S.A.	Victoria	3	1	Other causes	Likely to become a public charge.
"	"	2		"	Criminality.
Chinese	"	1		"	"
From U.S.A.	"		4	"	Prostitution.
"	"	6		"	Vagrancy.
"	"	2		"	Immorality.
Deported at Quebec.	Totals	14	5		
English	Quebec	1		General diseases	Alcoholism.
"	"	2	1	Nervous system	Insanity.
Norwegian	U.S.A.	1		"	"
Hungarian	Quebec	1		Ill-defined causes	Physical debility.
English	"	1		Other causes	Likely to become a public charge.
"	"	2		"	Criminality.
"	Dorchester, N.B.	1		"	"
Irish	Quebec	1		"	"
	Totals	10	1		
	Grand totals	589	236		

Table XV. is a detailed statement of what is summarized in Table XIV., and serves not only to indicate the nationality of those deported, but also the place whence they were sent. How widely distributed is our immigration throughout Canada, and how general is the knowledge of the provisions of the Act regarding deportation, are seen from the list of places whence immigrants have been deported. These places were:—

Winnipeg	232	New Westminster	4
Toronto	190	Meaford	4
Montreal	115	Clinton	3
Oshawa	38	Cobourg	3
United States	36	St. Catharines	3
Vancouver	31	Port Arthur	3
Ottawa	21	Ingersoll	3
Victoria	20	Woodstock	3
Chatham	25	Mimico	3
Quebec	10	St. John	3
Edmonton	9	St. Thomas	2
Peterborough	7	Sherbrooke	2
Halifax	7	St. Andrews	2
London	8	Sault Ste. Marie	2
Renfrew	5	Lethbridge	2
Chesley	5	Port William	2
Hamilton	4		

and one from Brandon, Michel, Campbellton, Wakefield, Vermilion, Ont., Broadview, Burlington, Dorcheser, Stanstead, Ripley, Niagara Falls, Carleton, Ont., Brockville, Kingston, Penetanguishene, Thamesville, Calgary, Yorkton.

Not only does the large number of people from English cities come to our large cities, but it is especially true of that class, 'no'er-do-wells,' social and moral derelicts, and ineffectives in general. They are not only physically unequal to the tasks of farm life, but they are further usually incapable of enduring the quiet of rural life. Hence if sent to the country they too frequently drift back to town, and when winter comes and work fails they seek aid in those institutions set apart for the city poor and helpless. It is not unusual, moreover, for officials of smaller towns and villages to buy a ticket for some individual whom they may have on their hands and with pious good wishes send him to Toronto, Montreal or Winnipeg. That there were not more such during the past winter would seem quite remarkable remembering all the circumstances, and that we have found a means of dealing effectively with the 'no-goods,' the number deported very well proves.

The following statement shows the amount expended on detention hospitals for salaries of medical officers, guards, matrons and other employees, medicines, provisions and other general running expenses, but not including the expenditure for furniture, kitchen utensils, &c., also the amounts refunded by the various steamship companies and the net cost to the government for the fiscal year 1907-1908.

TABLE XVI.

STATEMENT showing hospital expenditures and receipts for 1907-8.

HOSPITAL.	Total Expenditure.	Total Refunds by S. S. Companies.	Net Cost.	Net Profit.
	$ cts	$ cts.	$ cts.	$ cts.
Halifax	8,453 40	6,074 75	2,378 65	
St. John	2,594 68	1,197 50	1,397 18	
Quebec	16,954 92	4,790 75	12,164 18	
Montreal	6,065 81	1,221 02	4,844 79	
Vancouver	6,091 41	5,626 00	465 41	
Victoria	1,488 28	2,215 50		727 12
	41,648 61	21,125 52	21,250 21	727 12
Deduct profit			727 12	
Net cost, 1907 1908			20,523 09	

Such, as summed up in the several tables, is the story of the largest immigration to Canada, viewed from the medical standpoint, which has taken place during any year in her history. It was the culmination of a remarkable influx of people to Canada from other countries, which, comparatively, has never had its parallel even in the history of the United States. Since April of the census year 1900 to April 1, 1908, the immigrant arrivals destined to Canada have numbered 1,066,684, as compared with 6,667,732 to June 30, 1907, to the United States; or to the census population of 5,371,315 has been added almost exactly one-fifth, and but one-eleventh to the 76,303,387 census population of the United States. Thus within these short years one person has had to be found a place for beside every other five workers in Canada, and until the financial stress of last winter, work in abundance has been found for all, as the absence of any notable increase in the inmates of charitable institutions up till then has shown. But if we are to judge by comparative statistics, the machinery for eliminating the undesirables has been so effective that in no class will it be found that even a proportionate number per 1,000 of defectives has been allowed admission to Canada. What nationalities have had the larger number of failures to make good has been shown, and now that the measure of the work of prevention requiring to be done has been fully gauged and experience in methods of working has increased we have a right to conclude, judging from the past, that, whatever number of immigrants may in future years come to Canada, while a welcome will be extended to all who are in earnest to make Canada their home and add to her strength and wealth, yet at the same time an equally positive refusal to allow any to make Canada the scene whether of their ineffectiveness, follies or crimes will be shown.

Respectfully submitted,

P. H. BRYCE,
Chief Medical Officer.

PART III

SURVEYS

SURVEYS

REPORT OF THE SURVEYOR GENERAL.

DEPARTMENT OF THE INTERIOR,
TOPOGRAPHICAL SURVEYS BRANCH,
OTTAWA, August 31, 1908.

The Deputy Minister of the Interior,
Ottawa.

SIR,—I have the honour to submit the following report on the operations of the Topographical Surveys Branch for the fiscal year ended March 31, 1908.

In what was formerly called the fertile belt, that is to say the country lying south of the North Saskatchewan river, the subdivision surveys are practically completed; in fact they extended for some distance north of the river. The homesteads within this area are being rapidly taken up and the newcomers will soon have to look elsewhere for free lands. What direction settlement will take cannot be foreseen with accuracy; it will depend not only upon climatic and soil conditions as yet imperfectly known, but also upon other considerations such as the opening of communications, building of railroads, &c. The department must be prepared to meet the demand for surveys wherever it arises and for this purpose the initial meridians and base lines have to be located over a very large extent of country. These lines governing all subsequent operations, have to be established with the greatest care and accuracy. The difficulties of transportation are enormous. The lines run through dense woods and the extensive marshes peculiar to the northern country are a great impediment. The progress of the work is slow and as a result the cost is very great. The figures which are given in appendix No. 2 show that it varies from $79 to $218 per mile, and averages $140.

Incidentally it may be mentioned that these surveys are a source of wonder to the inhabitants of the outlying settlements. They cannot understand why survey parties are sent out hundreds of miles away in the wilderness while the settlers are waiting for the subdivision of their lands; the only explanation which occurs to them is that there is gross ignorance at Ottawa of the needs of the West. There is, however, no other way of extending the surveys; the benefits of our splendid system of township subdivision are the direct result of these outlying operations.

In comparing items in this report with those in the report for the fiscal year ended March 31, 1907, it is to be noted that in some cases the latter covered a period of nine and in some cases fifteen months, owing to the change then made in the date of the beginning of the fiscal year; in the present report all items are given for a period of twelve months only.

SURVEYS FOR THE YEAR ENDED MARCH 31, 1908.

The spring of 1907 was very backward and the summer unusually wet, which had the effect of greatly retarding survey operations. The sloughs, creeks and rivers

were filled with water, rendering the task of moving an outfit a very difficult one especially in the case of the surveyors paid by the day, who have often long distances to travel from one survey to another. On account of the frequent rains and continuous cloudy weather much difficulty was also experienced in making the necessary observations to determine the astronomical bearings of lines surveyed.

Another cause of trouble to surveyors in charge of parties was the difficulty of retaining the services of good men on their parties under such unfavourable conditions. Owing to the scarcity of feed for horses some surveyors were compelled to close operations much earlier than usual.

The result has been that the amount of survey work done during the year was not as great as estimated at the beginning of the season. The average amount of survey per party, however, compares well with those of previous years.

During the year the complete subdivision was made of two hundred and twenty-three whole and of eighteen fractional townships, while a partial subdivision was made of one hundred and twenty-six other townships. In addition to this a complete resurvey was made of thirty-two whole townships and of one fractional, as well as a partial resurvey of one hundred and thirty-one others.

Sixty-three survey parties were employed, fifty-seven of which were engaged on township work and six on miscellaneous surveys. Of these parties thirty-three were paid by the day while thirty worked under contract.

Of the parties under daily pay, six were employed in Manitoba, four in Saskatchewan, thirteen in Alberta, six in British Columbia, one on the boundary between British Columbia and Yukon Territory and one in the Northwest Territory, while two others were part of the time in one province and part in another. Five of the parties working under contract were located in Manitoba, ten in Saskatchewan and twelve in Alberta, while three were part of the time in one province and part in another.

Five of the parties under daily pay, in charge of Messrs. P. R. A. Belanger, E. W. Hubbell, G. J. Lonergan, Geo. McMillan and C. F. Miles were for the greater part of the season employed in inspecting surveys made under contract, thirty-four of which were examined during the year. In addition to inspection these parties investigated errors reported in survey, and where necessary made corrections. The errors reported in almost every case existed in surveys made years ago when the methods employed were not of a nature to produce the accuracy attained under our present methods.

TOWNSHIP SURVEY.

The reports of the surveyors working under daily pay are given as appendices No 13 to No. 43. These convey, though inadequately, some idea of the methods of carrying on surveys and the dangers and difficulties encountered.

Mr. Johnson in his report says, 'To those who have packed steadily for a month over high mountains any description is superfluous, and, to those who have not, no words of mine could make them realize what it is like.'

The field of survey operations extended from the eastern boundary of Manitoba to the western boundary of Alberta, and in the railway belt as far west as the Pacific ocean. It also extended from the international boundary as far north as the twenty-second base line, about 500 miles.

Mr. C. F. Aylesworth, D.L.S., who was employed on resurvey work in eastern Manitoba, reports that the country around Beauséjour is not very thickly settled, as the land is partly boggy and in many places very stony. A great many large ditches have recently been dug which render land, formerly flooded, now fit for cultivation.

Mr. B. J. Saunders, D.L.S., was engaged on surveys of block outlines in eastern Manitoba in the vicinity of Fort Alexander. This settlement which is an old Hudson's Bay trading post is very prosperous and is well equipped with schools, churches,

saw-mills, &c. The Indians of the adjoining reserve are very industrious and find employment in fishing, cutting cord-wood and railway ties, and other similar work.

About thirty miles north of Fort Alexander there is a gold prospect which has made but little progress owing to lack of capital. During the past winter an iron ore location was being worked on Black island at the mouth of Manigotagan river.

Mr. C. E. Bourgeault, D.L.S., was employed on survey work around the south end of Lake Manitoba. He also did some resurvey near the town of Sewell, and retraced the colonization road north from Teulon.

Base line work in central Manitoba was done by Mr. W. Christie, D.L.S.

Mr. W. J. Deans, D.L.S., made some correction and retracement surveys along the second meridian. He remarks on the phenomenal growth of the town of Yorkton since his former visit there in 1899. The surrounding country contains several well cultivated farms, while the farmhouses are fitted up with many modern conveniences.

Mr. W. R. Reilly, D.L.S., made some surveys along the Saskatchewan river near the fourth meridian. The soil is good for growing wheat, but early frosts are apt to do some damage occasionally. Mr.Reilly advocates mixed farming as being more profitable, for if the wheat be damaged the farmer has something to fall back on.

Mr. David Beatty, D.L.S., resurveyed some townships in eastern Alberta about one hundred and fifty miles north of Medicine Hat. He speaks of the generally good quality of the soil, but reports a scarcity of good water.

Mr. L. E. Fontaine, D.L.S., was engaged in making a traverse and taking levels of Milk river along its course through Canadian territory.

Mr. T. A. Davies, D.L.S., was employed on retracement and correction surveys in central Alberta.

Mr. C. C. Smith, D.L.S., made some subdivisions and resurveys in southern Alberta west of Macleod. This is the great ranching country of the West, but it is fast being fenced up into farms. The land is good and easily worked. Timber for fuel and building purposes can be easily obtained in Porcupine hills, and all conditions tend to make the district very desirable for homesteading.

Mr. W. F. O'Hara, D.L.S., who was working in the Pincher Creek district, reports the existence of a large oil-field, the development of which is yet in its initial stage, although the companies operating there have met with very encouraging results. From tests which have been made the petroleum is said to be of the highest grade.

Mr. W. T. Green, D.L.S., was working in the foothills south of Calgary. He speaks of the extraordinary growth of the town of Claresholm. Five years ago this place could boast of only a station-house, while to-day it is a thriving centre of industry. The surrounding country consists of the best of land, well watered, and suitable for either farming or ranching.

Base line surveys west of the fifth meridian were performed by Messrs. A. H. Hawkins, D.L.S., and Geo. Ross, D.L.S. Mr. Hawkins produced the thirteenth base and Mr. Ross the fourteenth.

Mr. A. Saint Cyr, D.L.S., ran the sixth meridian south from the sixteenth base line to Bullrush mountains. Some idea of the difficulties encountered by surveyors may be obtained from a perusal of his report. He was forced to travel from Edmonton around by Lesser Slave lake in order to reach his destination, as the snow was too deep and feed too scarce to travel directly west to the sixth meridian. As the snow had not yet melted in the bush and the ice along the route was in a treacherous condition it was necessary for him to carry both sleds and wagons in his outfit. To add to the difficulties of his journey some of the ferry boats had been swept away by the high spring floods, which rendered fording the rivers difficult and dangerous. Bad trails up steep hills often covered by fallen trees to a height of several feet also retarded his progress considerably.

Mr. J. B. Saint Cyr, D.L.S., was employed on subdivision and settlement surveys around Dunvegan and Peace River crossing. The fact that surveys are required so

far north goes to prove the extensive settlement of the west. The soil in the Peace River district is of the best quality and the oats and wheat grown are of the highest grade. Timber for fuel and building purposes is easily obtained and the district bids fair to become one of the most prosperous in the west.

Mr. A. W. Ponton, D.L.S., was engaged on the production of the fifth meridian from the twentieth to the twenty-second base line.

Surveys required around the west end of Lesser Slave lake were performed by Mr. H. W. Selby, D.L.S. This district being so far north is generally considered to be subject to summer frosts, but Mr. Selby reports that very little damage was done by frost there last year, although much damage was done in other districts of the west farther south. The great drawback to the settlement of the country is the lack of railroad transportation.

BRITISH COLUMBIA SURVEYS.

During the season of 1907, three regular parties were employed on numerous scattered surveys within the railway belt of British Columbia. In all, 530 miles of line were run, generally in very rough country. On this work Mr. J. E. Ross, D.L.S., spent nearly eleven months, and Mr. A. G. Stacey, D.L.S., eight months, while Mr. A. W. Johnson, D.L.S., took the field early in March and returned in August. The details of these surveys will be found in the reports of the surveyors and elsewhere in this volume. The exeecssive amount of field work does not leave to these surveyors much time for the completion of their returns, and it is probable that at least one more party will be required during the coming season. Mr. Ross was engaged on survey work east of Kamloops, while Mr. Stacey was employed on surveys west of Kamloops. This city is the distributing centre for the north Thompson district and is a place of considerable activity. It operates its own electric lighting plant and waterworks system and has the provincial asylum and hospital located there. The town of Ashcroft is situated about forty miles west of Kamloops. All traffic for the northern interior passes through this place, and great freight wagons, drawn by four or five teams, and a well-equipped stage travel two hundred and fifty miles north.

Vegetation in the Kamloops district is several weeks ahead of that in Ontario, and where irrigation is employed the soil proves very productive. Fruit raising is a very important and growing industry, and of late years exhibits from this district have carried off the highest awards at international exhibitions on both sides of the Atlantic.

Mr. Johnson made some surveys in the railway belt between Yale and Port Moody.

MISCELLANEOUS SURVEYS.

Mr. P. A. Carson, D.L.S., continued the triangulation in the railway belt northeast from Beavermouth.

Mr. A. O. Wheeler, D.L.S., made a photographic survey of the railway belt in the Dogtooth and Selkirk mountains for mapping purposes.

Mr. Lewis Bolton, D.L.S., was engaged in settlement surveys around The Pas and Cormorant lake

Mr. W. Thibaudeau, C.E., made a preliminary investigation of the water-power on the Winnipeg river from the eastern boundary of Manitoba to Lake Winnipeg. In this district there is a large amount of spruce and poplar suitable for the manufacture of pulp and the falls along Winnipeg river furnish an unlimited amount of power for the development of the pulpwood industry. Little was known of the value of this water-power except by some companies in Winnipeg who secured sites along the river, built a control dam at Kenora to regulate the flow of water in the river, established generating stations and supplied power to the city of Winnipeg at a

very small cost. It was accordingly deemed advisable to ascertain the available water-power on this river and Mr. Thibaudeau was sent to investigate it. Comparing the water-power on the Winnipeg river with that on the Niagara the former is about forty-three per cent of that available on the Canadian or Horseshoe falls, but it is more advantageous on Winnipeg river as it is distributed over a very large area.

Mr. J. N. Wallace, D.L.S., ran part of the boundary between British Columbia and Yukon Territory in the neighbourhood of the Dalton trail.

The country along the line of the Grand Trunk Pacific railway west of the sub-divided townships was explored by Mr. P. G. Stewart. He travelled through twenty-six townships between ranges 7 and 16, and townships 51 and 57 west of the fifth meridian. The country generally is rolling, partly opened and partly timbered with poplar, spruce and jackpine. On the hills the land is sandy, while in the valleys it is clay loam. The hills range as high as three hundred feet, while the valleys generally are about six hundred feet wide. Some of the valleys along the larger streams, such as the Macleod river, are about half a mile wide. Mr. Stewart estimates the amount of timber in the townships explored at between two hundred and thirty and two hundred and forty million feet.

The following is a comparison of the mileage surveyed since 1905:—

	April 1, 1907, to Mar. 31, 1908.	Jan. 1, 1906, to Mar. 31, 1907.	Jan. 1, 1905, to Dec. 31, 1905.
	Miles.	Miles.	Miles.
Township outlines	1,674	1,306	1,591
Section lines	13,710	8,962	10,544
Traverse	3,193	1,848	1,809
Re-survey	2,917	4,948	2,579
Total for season	21,494	17,064	16,523
Number of parties	59	56	46
Average miles per party	364	305	359

The following table shows the mileage surveyed by the parties under daily pay and by the parties under contract:—

Work of parties under daily pay.

	April 1, 1907, to Mar. 31, 1908.	Jan. 1, 1906, to Mar. 31, 1907.	Jan. 1, 1905, to Dec. 31, 1905.
	Miles.	Miles.	Miles.
Township outlines	542	756	1,008
Section lines	975	1,035	939
Traverse	1,313	643	421
Re-survey	2,782	4,815	2,499
Total for season	5,612	7,249	4,867
Number of parties	29	29	26
Average miles per party	194	250	187

Work of parties under contract.

	April 1, 1907, to Mar. 31, 1908.	Jan. 1, 1906, to Mar. 31, 1907.	Jan. 1, 1905, to Dec. 31, 1905.
	Miles.	Miles.	Miles.
Township outlines	1,132	550	583
Section lines	12,735	7,927	9,605
Traverse	1,880	1,205	1,388
Re-survey	135	133	80
Total for season	15,882	9,815	11,656
Number of parties	30	27	20
Average miles per party	529	364	583

NOTE.—Owing to the nature of their work, the parties under Messrs. P. A. Carson, P. G. Stewart, W. Thibaudeau and A. O. Wheeler are not included in the statement of mileage for the year ended March 31, 1908.

The following statement shows the average cost per mile of surveys done by contractors and by surveyors under daily pay for the year ended March 31, 1908:—

	Surveys made under day pay.	Surveys made by contract.
Total mileage surveyed	5,612	15,882
Total cost	$247,220 96	$336,230 08
Average cost per mile	$44 05	$21 18

DESCRIPTIONS OF TOWNSHIPS.

Descriptions of the townships subdivided have been compiled from the surveyors' reports received during the year ended March 31, 1908. They are given as Appendix No. 44. The townships are put in order of township, range and meridian, and the descriptions are preceded by a list of all townships described.

A map accompanying this report shows all the townships in the provinces of Manitoba, Saskatchewan and Alberta subdivided prior to April 1, 1907, coloured in buff, those subdivided between April 1, 1907, and March 31, 1908, are shown in green, while those resurveyed during the same period are shown in red.

REMUNERATION OF SURVEYORS.

At the inception of the survey of Dominion lands, nearly forty years ago, Dominion land surveyors were paid five dollars per day. Shortly after six dollars per day was allowed to surveyors of base lines. These rates remained in force until 1901, when they were increased to $6.50 and $7.50, respectively. The advance proved inadequate; in order to induce properly educated men to qualify as Dominion land surveyors, so that there should be no difficulty in securing the services of competent surveyors when they are wanted, a further increase to $8 and $10, respectively, was granted by order in council of March 30, 1908. The increase, it will be observed, is for ordinary surveyors 60 per cent over the rate of forty years ago; for surveyors of base lines it is a little over 60 per cent. Considering the enhanced cost of everything, the increase does not appear too large. By the same order in council the salary of the inspectors of surveys was fixed at $9 per day in the field and $5 per day at office work.

RESERVATION FOR ROADS.

The system of survey of Dominion lands provides road allowances along section lines. When a section line strikes a lake, the cut banks of a river or other obstacle, the road has to be located elsewhere. The location of these deviations is placed under the control of the provinces by the Manitoba Supplementary Provisions Act and the Saskatchewan and Alberta Roads Act. It was represented that the establishment of these deviations involved great expenditure, and that a considerable part of this expenditure consisted in payments for the land to homesteaders and others who, although directly benefited by the new road, frequently exacted a large price for land which they had just acquired for nothing or at a small price. This difficulty was adjusted by order in council of November 20, 1907, which directs that every homestead entry shall be granted and every lease or sale of Dominion lands made subject to the right of the province to take, without compensation, such land as may be required for road purposes, not exceeding 2½ per cent of the area of such Dominion lands.

STAR DIAGRAMS FOR LATITUDE OBSERVATIONS.

In extending the principal meridians and the base lines, surveyors have to observe the latitude from time to time for the purpose of checking their measurements and detecting accidental errors. The most convenient and precise method of observation for this purpose is known as Talcott's method, and consists in measuring differences of stars' zenith distances. The new model of transit theodolite for base lines has been especially designed to make use of this method. The most tedious part of a latitude observation by Talcott's method is the preparation of the observing list, especially when several star catalogues have to be consulted. To facilitate the preparation of these observing lists and save the surveyor's time, star charts have now been compiled. By the use of these charts an observing list of stars for the hours of darkness may be prepared in a very short time. These charts give the mean places of all stars up to and including the fifth magnitude listed in the Berliner Jahrbuch, Greenwich Ten Years' Catalogue of Stars for 1890 and Ambronn's Sternverzeichnis for 1900. Stars smaller than fifth magnitude are not visible with the telescope of the base line transit theodolite. The charts are in four sets of six hours' right ascension each, as follows: No. 1, 0 to 6 hours; No.2, 6 to 12 hours; No. 3, 12 to 18 hours; No. 4, 18 to 24 hours. Each set consists of two sheets, an upper and a lower, each 16 inches by 19½ inches, the lower sheet of thick opaque paper printed in black and the upper sheet of thin transparent paper printed in red. Each sheet is ruled in sections, the arguments being the star's declination for the horizontal lines and right ascension for vertical lines.

As the sections are roughly one-half inch in declination by three-eighths of an inch in right ascension, interpolation by the eye to the nearest ten minutes in declination and the nearest two minutes of time in right ascension is quite easy. On the lower sheet the mean places of stars from 5° south declination to 65° north declination are plotted in their correct positions, the declinations increasing from bottom to top. On the upper sheet are plotted stars from 45° north declination to 90° with the lower transits of stars from 65° north to 90°, the declinations increasing from top to bottom. The right ascensions increase the same from left to right on upper and lower sheets. One symbol is used for stars from 0·0 to 1·0 magnitude, another for stars from 1·1 to 2·0 and so on a different symbol being used for every magnitude. This is of great assistance in quickly identifying the star when afterwards looking for it among the different star catalogues. If now the transparent or upper sheet is placed on the opaque or lower sheet so that the horizontal lines of the upper sheet for that particular declination which is equal to the latitude is directly over the same line of declination through its whole length on the lower sheet, all stars on the upper and lower sheets on the same horizontal lines have the same zenith distance north and south from the observation spot, the black symbols showing through from the lower

sheet representing stars of south zenith distance and the red of upper sheet stars of north zenith distance. The vertical lines show the times of transit of the several stars. Hence the working methods: The approximate latitude of the observation spot and the hours of right ascension during which it is desired to observe being known, those sets are selected which include the desired hours of right ascension. Place the upper sheet of each set on the lower with the vertical or right ascension lines corresponding and bring into coincidence the horizontal or declination line of both sheets for that particular declination which is equal to the latitude. Then select those pairs of south and north zenith stars within the limits of right ascension desired whose zenith distance is not too great, whose difference of zenith distance is no more than one-half the run of the micrometer and which have a suitable interval between transits. Having taken out the stars for limits of time allowed, there will probably be found long intervals in places between different pairs. These may be filled in by extending the limit allowed for the difference of zenith distance to the full run of the micrometer. The pairs having thus been selected, the stars are identified in the several catalogues, and their mean places in right ascension and declination are deduced from the epoch of the star catalogue to the beginning of the year which is sufficiently close for the purposes of the observing list.

CORRESPONDENCE.

The correspondence consisted of :

Letters received	10,092
Letters sent	12,942

The staff consists of the secretary, one clerk, four stenographers and typewriters and two messengers.

ACCOUNTS.

The accountant's record shows :

Number of accounts dealt with	633
Amount of accounts	$766,000
Number of cheques forwarded	3,051

The staff consists of an accountant and an assistant accountant.

OFFICE STAFF.

A list of the office staff of the Topographical Surveys Branch at Ottawa is given as Appendix No. 10.

Many changes have taken place during the year. In the Metcalfe street office Mr. F. Lynch has been added to the secretary's staff and Mr. A. Paquette has been appointed messenger in place of Mr. J. J. O'Leary, who was transferred to the School Lands Branch. Messrs. A. G. Stacey, H. L. Seymour, C. C. Fitzgerald, M. Kimpe, E. H. Phillips, J. M. Empey, R. B. Owens, J. N. Goodall, R. V. Heathcott, J. W. Rochon, F. L. Marriott, H. J. Smith, J. C. Ball and S. H. Shore have resigned. Messrs. F. G. D. Durnford and E. E. Brice have been transferred to the Lands Patent Branch and Messrs J. M. Mudie and W. C. Gillis to the survey records office. Mr. Gillis was appointed to the Metcalfe street office during the year, as were also Messrs. A. Vickery, H. P. Moulton and N. Bawlf all three of whom subsequently resigned. Miss A. Whitehead was employed for a short time during the year as extra typewriter. Messrs. F. W. Rice, A. L. Cumming, W. L. MacIlquham, E. M. Dennis and G. B. Dodge have been absent part of the time acting temporarily as assistants to surveyors, while Messrs. W. T. Green, D.L.S., P. A. Carson, D.L.S., and T. A. Davies, D.L.S., have also been absent part of the time in charge of survey parties in the field.

The additions to the staff during the year are as follows: In the Metcalfe street office, Messrs. A. D. McRae, A. G. Stewart, A. W. Grant, E. C. Rochon, M. J. McLaughlin, G. A. Gaudry, A. Vickery, H. P. Moulton, W. C. Gillis, N. Bawlf, J. R. Akins, F. H. Maynard, H. S. Day, H. E. Sutherland, F. H. Kitto, L. Goodday, F. H. H. Williamson, G. C. Webb, C. H. Wilding, R. P. Bray, E. W. Harrison, A. W. Ault, C. B. Binks, C. H. Holbrook, R. J. Dawson, Jas. Watters and E. Davy; in the office of the geographer, Messrs. J. Beveridge, J. P. McElligott, J. Pigeon and J. R. Merrifield; and in the lithographic office, Mr. J. H. Deslauriers.

OFFICE OF THE CHIEF DRAUGHTSMAN.

A summary of the work executed in the office of the chief draughtsman is given as Appendix No. 5.

The last twelve months have seen a considerable increase in the draughtsmen's work. This is due partly to the fact that the surveys were on a larger scale, but perhaps still more to the constant increase in the miscellaneous business of the office, such as answers to inquiries, both from inside and outside the department, as to surveys made or proposed, areas, corner monuments, errors found or suspected in lines, petitions for resurveys, etc. The draughting office has gradually become of late years, and unavoidably so, to a great extent a correspondence office, a large portion of the letters sent out having to be drafted in this part of the branch.

The staff is larger by three than at the date of the last report, now including eighty-one men, whose time is fully occupied with necessary work in connection with the surveys. The frequent changes of personnel and the location of a part of the force in a separate building at some distance is still the cause of a certain amount of delay, and makes proper oversight of business more difficult. The staff is distributed in five divisions.

First Division—Instructions and General Information.

The staff of this division, which consists of nineteen employees, is in charge of Mr. T. E. Brown, B.A. Instructions were drafted for eighty-one survey parties, which involved the preparation of 879 sketches and 77 tracings and maps; 1,002 progress sketches were received from surveyors in the field, as well as 577 books of field notes, 334 plans, 56 timber reports and 473 statutory declarations; 494 books of field notes of township surveys were transmitted to the survey records office after complete examination, also 476 notes and plans of miscellaneous surveys. Plans were printed for 518 townships, 5 settlements or townsites and 59 sectional sheets. Preliminary plans of 369 townships were issued. A noteworthy feature about the work of this division is the great increase in the number of communications on miscellaneous subjects received and dealt with. The number for the year was 1,296, involving the preparation of 283 sketches and 77 maps and tracings; 3,427 draft letters and memoranda were written.

Second Division—Examination of Surveyors' Returns.

This division is in charge of Mr. T. S. Nash, D.L.S., and the staff consists of twenty-eight employees. The returns of all the surveys of Dominion lands in Manitoba, Saskatchewan and Alberta are examined here. Plans of these surveys are compiled and the accounts for the surveys performed under contract are made out.

Surveyors are required to send in from time to time sketches showing the progress of their work in the field. These sketches show the bearings and lengths of all the lines that have been surveyed together with all the important topography of the country. If on examination they are found incomplete, supplementary sketches are required from the surveyor. During the year 722 progress sketches were examined. When the final returns of surveys are received they are given a cursory examination,

and if found generally incomplete they are sent back to the surveyor for correction. This, however, seldom happens, the returns now received being nearly always carefully made. After cursory examination the work of compiling is begun. This consists in gathering together all the returns of previous surveys in the township, settlement or townsite as the case may be and plotting the whole together as a new plan. During this process a minute examination is made of the field notes of the new survey, the surveyor is notified of all clerical errors, omissions or discrepancies found in his notes and is required to correct them before his survey is finally accepted. A more detailed description of the above work was given in the report for the year ended June 30, 1906. The same system with improvements in the minor details is still in use. During the year 347 subdivisions, 157 township outline and 23 miscellaneous survey returns were examined, 348 memoranda on examination were sent to surveyors, 323 answers to memoranda were received and noted, 857 letters were drafted and 556 plans compiled.

In addition to the examination and compilation mentioned above, a large amount of work is involved in the examination of plans of road diversions in Alberta and Saskatchewan surveyed under instructions from the provincial governments and in the examination of railway right-of-way plans for approval by the Surveyor General before being filed in the records office. During the year 233 plans of road diversions and 112 right-of-way plans were examined.

Third Division—Drawing for Reproduction.

The staff of this division which consists of fourteen employees is in charge of Mr. C. Engler, D.L.S. The most important work of this division is the preparation of copies properly drawn for reproduction by photo-zincography or photo-lithography of the rough plans compiled in the second and fourth divisions. The letters and figures of the plans are stamped with type held in position by means of the stamp described in the annual report for 1906-7. In this way uniformity of style is ensured and at the same time a beginner quickly acquires the skill necessary for speed and neatness. This has proved a decided advantage during the past few years owing to the constantly changing personnel of the staff of this division. The great majority of the plans drafted are township plans. Uniformity exists among these so that the work can be done systematically and occupies much less time than that upon plans of a miscellaneous character.

During the year 568 township plans and 130 miscellaneous plans were made. Although the number of miscellaneous plans is less than one-fourth of the number of township plans yet the time spent upon the former was almost as great as upon the township plans. A noteworthy feature about the miscellaneous plans is their variety. They comprise settlement, group lot and townsite plans, which are made something after the style and manner of township plans. Occasionally maps and plans are made to illustrate some subject under consideration by the House of Commons or the Senate.

There are also drawings of the diagrams of the altitude and bearing of the pole star. These have to be made with the greatest accuracy as the slightest error in drawing destroys the value of the diagrams. These diagrams are issued periodically with the astronomical field tables, the drawings for which are also prepared in this division.

Diagrams and explanatory drawings for the Manual of Survey, and artists' drawings for the illustration of pamphlets, have also been made. In the line of mechanical drawings, may be mentioned all drawings of survey instruments or of additions or alterations to the same, as well as drawings to scale of furniture or apparatus of a special nature required for this branch. Among the drawings of an artistic nature were two for the office, one of a crest and one of a letter head. In this class also may be mentioned the making of diplomas and certificates for the board of examiners for

Dominion land surveyors and the engraving of graduations on instruments when special scales are required. On the small printing press, which forms part of the equipment of this division, a great deal of work has been done. The demand for this work has been so steady that it has been necessary to employ a man experienced in typesetting and presswork. He also takes care of the type used for stamping plans, the printers' ink, the composition rollers, etc. The press is used for printing titles and foot notes, which are pasted on the plans in proper position. In the same way are added the names of any large lakes, rivers, Indian reserves, etc., which cannot be stamped on the plan in the ordinary way. As all the plans are photographed, no traces of the edges of the pieces of paper added by pasting can be seen on the printed plan as the photographer removes them all in retouching the negative. The press is also used to print labels, numbers and letters for shelves, file backs and cupboards in the office, as well as any small blank forms required, circular letters to surveyors when it is impossible to obtain these from the Government Printing Bureau in time to serve the purposes for which they are required.

In order to be able to make suitable titles for all the different maps and plans and also to stamp all the letters and figures on the plans themselves, it has been necessary to procure a variety of type. Eighty-eight styles in all have been procured, but as only a small font of each style is necessary the expense of buying the type has not been great. The expense saved on a single plan by printing a title instead of drafting it often equals the total cost of the type required to print it.

Fourth Division—British Columbia Surveys.

This division consists of eight employees in charge of Mr. Rowan-Legg. The examination of the returns sent in by the three regular surveyors who were working in the railway belt has been proceeded with and is now well advanced. As most of the traverse surveys in British Columbia were made for the purpose of establishing section corners and land boundaries, this portion of the work had to be carefully checked by latitudes and departures, which entailed a great amount of work.

The returns of the survey by Mr. J. E. Ross, D.L.S., tying in various points along the right of way of the Revelstoke and Arrow Lake branch of the Canadian Pacific railway to points on the Dominion lands system of survey have been checked, and the areas of adjacent surveyed Dominion lands as well as the right of way are now obtainable. Returns of small surveys consisting of mineral and other lots, private surveys and special surveys have also been received from Messrs. E. A. Cleveland, J. A. Kirk, W. A. Bauer and others. These have been or are being examined. Four plans of the Canadian Pacific railway right of way from Spatsum to Port Moody were also examined.

Owing to the recent more strict enforcement of the regulations for the survey of timber berths, it was found that more returns were being received by the Timber, Grazing and Irrigation Branch than could be dealt with. It was therefore decided that part of the examination of such returns should be undertaken by the staff of this office. The British Columbia division commenced this work, on the berths lying within the belt, in November, 1907, and completed, during the ensuing five months, the examination of sixty returns of surveys of this class.

In 1906 Mr. A. W. Johnson, D.L.S., made a resurvey of the town of Hope and the compilation of a plan of it was commenced in this office, but it was found that further surveys were required to furnish the information necessary to complete the plan.

In 1907 Mr. Johnson made a resurvey of the Pitt meadow lands and a special plan was made in order that these lands might be dealt with as soon as possible.

When compiling plans of many of the townships in the railway belt in British Columbia it is found that so many details, in connection with the showing of mineral

claims, provincial lots, &c., have to be given that a plan, made to a scale of forty chains to one inch, is too crowded and indistinct. To obviate this difficulty in such cases, plans of quarter townships are made on a scale of twenty chains to one inch, which show the information clearly and make more useful plans. During the year 573 letters and memoranda have been received and dealt with, 330 sketches and plots made, sixty plans compiled for printing and 709 draft letters and memoranda prepared.

Fifth Division—Mapping.

The number of employees in this division is ten, the staff being in charge of Mr. J. Smith. The principal work of the fifth division is the preparation of sectional maps for publication, as shown in Appendix No. 6 and the registering and compiling of surveys in the Yukon Territory as shown in appendices Nos. 3 and 4.

In addition to the above, other maps that may be required by the department are drawn and proofs of maps being printed are examined.

The method of producing a sectional map is as follows : All available information, such as Dominion lands surveys, railroad locations, road surveys, &c., is drawn on good mounted paper on a scale of two miles to an inch; a clean tracing on cloth is then made, reproduced and printed by photo-lithography on a scale of three miles to an inch, then a reduced copy is made by photo-lithography on a scale of six miles to an inch.

During the present rapid development of the northwest provinces these prints are quickly 'out of date' and another edition becomes necessary. The original drawing is then revised, all new information being added and corrections made, the tracing is then corrected to agree with the original and the printing is repeated.

The corrections sometimes entail so much erasing, on the original and tracing, that after a few editions it is necessary to make entirely new drawings. During the past year two originals and four tracings had to be redrawn on this account.

The work on the Yukon surveys consists of keeping a register of all returns of surveys received, the examination of the field notes and plans and the plotting of the work on a general plan so as to show the relative positions of different claims and to ascertain if they encroach on claims previously surveyed. The plans accompanying the surveyors' returns are usually on a scale of two hundred feet to an inch and the general plan on a scale of forty chains to an inch.

In addition to the sectional maps and Yukon work a map of Churchill harbour was drawn for photo-ligthgraphy and a large diagram was made for office use showing the closings of surveys on base lines from the sixteenth to the twentieth base between the fifth and sixth meridians.

SURVEY RECORDS OFFICE.

A card system of indexing files relating to trails and roadways, in the provinces of Manitoba, Saskatchewan and Alberta, has been introduced. All communications in connection with these trails or roadways and the preparation of replies giving the areas deducted from the different quarter-sections affected, as given by the Patents branch, are dealt with in this office. As the files are kept in this office and are rapidly increasing in number, the index above referred to enables us to readily find the correspondence relating to any of these trails or roadways.

A loose leaf alphabetical index of the plans kept in this office, numbering about 14,000, has been established, which enables a ready reference to all the plans recorded. The installation of these indexing systems was rendered necessary by the large increase in volume of the work of the office.

The following plans, showing the Dominion lands agencies, were prepared in this office and forwarded to their respective destinations:—

1. Five homestead maps showing Dominion lands agencies and sub-agencies in the provinces of Manitoba, Saskatchewan and Alberta.

2. Thirteen homestead maps showing on each one sub-agency and the lands district agency to which it is subordinate.

3. Sixteen maps on a scale of one mile to an inch showing on each one sub-agency of Dominion lands, with the lands disposed of as shown on the latest homestead map preceding the date of compilation.

All these maps are mounted and bound on cotton for the use of the different agents in the provinces of Manitoba, Saskatchewan and Alberta.

A statement of the work executed by this office during the year is given in Appendix No. 7.

PHOTOGRAPHIC OFFICE.

The amount of work executed in the photographic office during the year has been the largest in the history of the office. Several changes are being made in the equipment, which it is hoped will result in a further increase in the quantity of work and an improvement in quality.

The photo-zincograph process has produced a marked improvement in the plans turned out. A new power press now being installed in the lithographic office for handling large plates will, it is expected, result in a still greater improvement.

During the summer one of the photographers made a trip through Nova Scotia for the purpose of procuring for the immigration branch photographs illustrative of the industries of the province. Hitherto they had to depend for these photographs on the local photographers, and the results were not always satisfactory.

A schedule of the work executed in the photographic office is given as Appendix No. 8.

LITHOGRAPHIC OFFICE.

This office was equipped with a power press and several hand presses. The increase of the work has been such that a second power press became necessary; this is now being installed. It is a rotary transfer press, taking zinc plates 28 x 48 inches. The impression is transferred from the zinc to a rubber blanket and from the latter to the paper. As an adjacent to the press, a machine for graining zinc plates had to be set up, as well as a large flat bed-press equipped with an electric motor. It is hoped that when the whole is in proper working order any lithographs that may be required will be turned out with despatch and efficiency.

The new power press requires two additional men—a printer and a feeder. One of the vacancies has already been filled by the appointment of J. H. Deslauriers as transferrer; he takes the place of J. Bergin, who has been put in charge of the press as printer. By reason of the general increase in the work, another lithographic artist will be needed; this will bring the staff to nine, as follows:—

One foreman.
Two lithographic artists.
One transferrer.
Two power press printers.
Two power press feeders.
One stone polisher and zinc grainer.

Part of the plant had to be placed in the Imperial Building on Queen street, which is somewhat inconvenient.

A statement of the work executed is given as Appendix No. 9.

GEOGRAPHIC BOARD.

Mr. A. H. Whitcher, D.L.S., the secretary, is attached to the staff of the Surveyor General. The board consists of representatives from the different departments, and its duties are to decide the proper spelling of names throughout the Dominion. The

decisions of the board are published in the *Canada Gazette*, and are then printed in bulletin form for distribution. The seventh annual report of the board is in course of preparation.

BOARD OF EXAMINERS FOR DOMINION LAND SURVEYORS.

Special meetings of the board were held on April 29, from May 2 to June 3, inclusive, on November 12 and on December 4, 1907; and the regular annual meeting from February 10 to March 13, inclusive, 1908.

During the meeting in May examinations were held at Ottawa, Kingston, Toronto and Calgary. Dr. Klotz presided at Kingston; Professor L. B. Stewart, D.L.S., at Toronto; and A. O. Wheeler, D.L.S., at Calgary.

During the regular meeting in February examinations were held at Ottawa, Vancouver, Calgary, Edmonton, Winnipeg, Toronto, Montreal and St. John. E. B. Hermon, D.L.S., presided at Vancouver; A. O. Wheeler, D.L.S., at Calgary; J. N. Wallace, D.L.S., at Edmonton; J. L. Doupe, D.L.S., at Winnipeg; Professor L. B. Stewart, D.L.S., at Toronto; T. Shanks, D.L.S., at Montreal, and T. S. Nash, D.L.S., at St. John.

At these examinations ninety-seven candidates presented themselves for the full preliminary examination, fifty of whom were successful, as follows:—

J. R. Akins, Ottawa, Ont.
C. B. Allison, South Woodslee, Ont.
M. S. Archibald, Truro, N.S.
E. Bartlett, Smithville, Ont.
H. E. Bates, Mystic, Conn., U.S.A.
G. A. Bennet, New Glasgow, P.Q.
G. H. Broughton, Edmonton, Alta.
H. R. Carscallen, Toronto, Ont.
F. T. P. Cond, Toronto, Ont.
G. C. Cowper, Welland, Ont.
W. P. Dobson, Fordwich, Ont.
M. Dennis, O'Leary, P.E.I.
S. D. Fawcett, Ottawa, Ont.
J. N. Finlayson, Merigomish, N.S.
F. S. Fowler, Winnipeg, Man.
J. R. Graham, Ottawa, Ont.
C. A. Grassie, Smithville, Ont.
C. D. Henderson, Toronto, Ont.
C. M. Hoar, Hopewell Cape, N.B.
H. W. Harris, Kingston, Jamaica.
R. W. Haggen, Revelstoke, B.C.
F. J. Heuperman, Edmonton, Alta.
O. Inkster, Edmonton, Alta.
E. B. Jost, Guysboro', N.S.
L. B. Kingston, Ottawa, Ont.
H. M. Lamb, Montreal, P.Q.
A. Lighthall, Montreal, P.Q.
W. G. McGeorge, Chatham, Ont.
J. H. McKnight, Simcoe, Ont.
L. A. McLean, Hensall, Ont.
J. W. Menzies, Ottawa, Ont.
P. Melhuish, Montreal, P.Q.
C. A. Morris, Vancouver, B.C.
J. S. Mairn, Truro, N.S.
L. Odell, Odell, Ont.

S. K. Pearce, Calgary, Alta.
I. Pounder, Ottawa, Ont.
H. G. Phillips, Saskatoon, Sask.
P. E. Palmer, Dorchester, N.B.
D. F. Robertson, Ottawa, Ont.
L. T. Rutledge, Glen Williams, Ont.
W. B. Redfern, Toronto, Ont.
W. A. Siegner, Tavistock, Ont.
J. J. Stock, Ottawa, Ont.
H. B. Stuart, Calgary, Alta.
R. T. H. Sailman, Malvern, Jamaica.
C. H. Taggart, Ottawa, Ont.
W. E. Taylor, Owen Sound, Ont.
W. R. White, Drayton, Ont.
J. K. Wyman, Rockland, Ont.

Thirty-five candidates presented themselves for the limited preliminary examinations, seventeen of whom were successful, as follows :—

C. D. Brown, Winnipeg, Man.
W. P. Copp, Sackville, N.B.
A. S. Campbell, Kingston, Ont.
W. Dale, Toronto, Ont.
D. J. Fraser, Ottawa, Ont.
J. H. W. Flanagan, Chelsea, London, S.W., Eng.
G. H. Herriot, Souris, Man.
H. Matheson, Armow, Ont.
H. B. Miller, Montreal, P.Q.
J. M. Mudie, Ottawa, Ont.
G. H. McCallum, Smith's Falls, Ont.
G. J. McKay, Owen Sound, Ont.
G. W. MacLeod, Parkhill, Ont.
W. H. Powell, Little Harbour, N.S.
O. Rolfson, Walkerville, Ont.
A. C. T. Sheppard, Ottawa, Ont.
W. D. Stavert, Edinburgh, Scotland.

Twenty-eight candidates presented themselves for the final examination for Dominion land surveyor, of whom twenty-one were successful, as follows :—

H. G. Barber, Ottawa, Ont.
E. P. Bowman, West Montrose, Ont.
W. B. Bucknill, Winnipeg, Man.
A. J. Elder, Ottawa, Ont.
A. Findlay, Winnipeg, Man.
A. C. Garner, South Qu'Appelle, Sask.
R. V. Heatheott, Edmonton, Alta.
M. Kimpe, Edmonton, Alta.
F. H. Kitto, Edmonton, Alta.
H. F. J. Lambart, Ottawa, Ont.
B. F. Mitchell, Hamilton, Ont.
J. E. Morrier, Ottawa, Ont.
T. H. Plunkett, Toronto, Ont.
H. T. Routly, Toronto, Ont.
C. Rinfret, St. Stanislas, P.Q.
E. W. Robinson, Victoria, B.C.

H. M. R. Soars, Edmonton, Alta.
W. M. Stewart, Hamilton, Ont.
A. S. Stewart, Edmonton, Alta.
I. J. Steele, Ottawa, Ont.
W. H. Young, Lethbridge, Alta.

At the February examination one candidate took Part I of the D.T.S. examination. He was not successful.

Oaths of office and allegiance and bonds for the sum of one thousand dollars each as required by clause 36 of the Dominion Lands Act were received from twenty-one candidates who had previously passed the necessary examinations for commissions as Dominion land surveyors and had complied with the other requirements of the Act.

Eighteen commissions as Dominion land surveyors were issued as follows:—

E. P. Bowman, West Montrose, Ont.
F. F. Clarke, Toronto, Ont.
P. C. Coates, Golden, B.C.
A. J. Elder, Ottawa, Ont.
R. V. Heathcott, Edmonton, Alta.
A. C. Garner, South Qu'Appelle, Sask.
M. Kimpe, Edmonton, Alta.
F. H. Kitto, Edmonton, Alta.
H. F. J. Lambart, Ottawa, Ont.
A. J. Latornell, Edmonton, Alta.
J. E. Morrier, Ottawa, Ont.
G. B. McColl, Winnipeg, Man.
N. Ogilvie, Ottawa, Ont.
W. M. Stewart, Hamilton, Ont.
W. H. Waddell, Hamilton, Ont.
J. Waldron, Moosejaw, Sask.
E. W. Walker, Regina, Sask.
W. H. Young, Lethbridge, Alta.

Every Dominion land surveyor in active practice is required by clause 47 of the Dominion Lands Act to be in possession of a subsidiary standard measure of length furnished by the secretary of the board of examiners. Nineteen such standards were issued directly to surveyors during the year, and 24 were supplied to the Surveyor General of British Columbia for use by the surveyors of that province.

A list of the surveyors who have been furnished with standard measures up to March 31, 1908, will be found in Appendix No. 11.

The correspondence of the board amounted to:—

Letters, &c., received	1,328
Letters sent	1,050

The examination questions used at the examination in February, 1908, are submitted as Appendix No. 12.

A meeting of the board was called on April 29 to make arrangements for the special examination in May. The affidavits of the candidates for the final examination were received, and several communications disposed of.

At the meeting from May 2 to June 3, 31 candidates presented themselves for examination. The answer papers of these were read, and the revision of the curriculum of studies for the D. T. S. examination, which had been begun at the February meeting, was completed.

The meeting of November 12 was called to deal with several communications to the board.

At the meeting of December 4 the interpretation of clause 32 of the Dominion Lands Act was discussed. The question had been referred to the Deputy Minister of Justice, who gave as his opinion that graduates in surveying within the meaning of clause 32, are not required to pass any examination previous to being articled. The Dominion Lands Surveys Act, which came into force on March 17, 1907, makes it clear that all must now take this examination.

At the meeting in February 130 candidates were examined, the largest number that has ever appeared before the board.

The Dominion Lands Surveys Act removed certain privileges formerly granted by the Dominion Lands Act to surveyors from other parts of His Majesty's dominions who desire to qualify as Dominion Land Surveyors; and the rules of the board had to be amended accordingly. Another amendment to the rules prescribes the use of Chambers' tables at all examinations before the board.

APPENDICES.

The following schedules and statements are appended:—

No. 1. Schedule of surveyors employed and work executed by them from April 1, 1907, to March 31, 1908.

No. 2. Schedule showing for each surveyor employed from April 1, 1907, to March 31, 1908, the number of miles surveyed, of township section lines, of township outlines, traverses of lakes and rivers and re-survey; also the cost of the same.

No. 3. List of lots in the Yukon Territory surveys of which have been received from April 1, 1907, to March 31, 1908.

No. 4. List of miscellaneous surveys in the Yukon Territory, returns of which have been received from April 1, 1907, to March 31, 1908.

No. 5. Statement of work executed in the office of the chief draughtsman.

No. 6. List of new editions of sectional maps issued from April 1, 1907, to March 31, 1908.

No. 7. Statement of work executed in the survey records office from April 1, 1907, to March 31, 1908.

No. 8. Statement of work executed in the photographic office from April 1, 1907, to March 31, 1908.

No. 9. Statement of work executed in the lithographic office from April 1, 1907, to March 31, 1908.

No. 10. Names and duties of employees of the Topographical Surveys branch at Ottawa.

No. 11. List of Dominion Land Surveyors who have been supplied with standard measures.

No. 12. Examination papers of the board of examiners for Dominion Land Surveyors.

No. 13 to 43. Reports of surveyors employed.

No. 44. Descriptions of surveyed townships submitted by Dominion Land Surveyors from April 1, 1907, to March 31, 1908.

MAPS.

The following maps accompany this report.

1. Map showing surveys and resurveys made from April 1, 1907, to March 31, 1908.

2. Topographical Survey of Canada,—Trigonometrical section.—triangulation in British Columbia to accompany the report of P. A. Carson, D.L.S.

3. Topographical map of part of the main range of the Rocky Mountains adjacent to the Canadian Pacific railway to accompany the report of A. O. Wheeler, D.L.S.

4. Map showing part of the sixth meridian, north of Jasper House, to accompany the report of A. Saint Cyr, D.L.S.

5. Diagram of the ford across the Athabaska three miles below Jasper House, to accompany the report of A. Saint Cyr, D.L.S.

6. Plan of part of the province of Manitoba showing the water-powers on the Winnipeg river to accompany the report of W. Thibaudeau, C.E.

7. Map showing the drainage basin of the Winnipeg river to accompany the report of W. Thibaudeau, C.E.

8. Map of the Winnipeg river from Lake Winnipeg to English river, and from English river to First fall, to accompany the report of W. Thibaudeau, C.E.

9. Plan of a group of eight falls on the Winnipeg river to accompany the report of W. Thibaudeau, C.E.

10. Diagram of the Winnipeg river showing cross-section, discharge, &c., to accompany the report of W. Thibaudeau, C.E.

11. Profile of Winnipeg river from Lake Winnipeg to English river and Pinawa channel to accompany the report of W. Thibaudeau, C.E.

I have the honour to be, sir,
Your obedient servant,

E. DEVILLE,
Surveyor General.

SCHEDULES AND STATEMENTS.

APPENDIX No. 1.

SCHEDULE of Surveyors employed and work executed by them, from April 1, 1907, to March 31, 1908.

Surveyor.	Address.	Description of Work.
Aylsworth, C. F	Madoc, Ont	Re-survey of parts of townships 14, 15 and 16, range 7, and parts of townships 15, 16 and 17, range 8, all east of the principal meridian.
Baker, J. C.	Vermilion, Alta.	Contracts Nos. 2 and 24 of 1907; subdivision of townships 53, ranges 10, 11, 12, 13 and 17, townships 54, ranges 9 and 10, the southerly two-thirds of townships 54, ranges 11, 12, 13, 14, 15 and 16, the northerly two-thirds of township 53, range 16, and the east outlines of townships 55 and 56, ranges 10 and 11, and townships 53, ranges 14 and 15, all west of the fifth meridian.
Beatty, David	Parry Sound, Ont	Retracement survey of townships 27, 28, 29, 30 and 31, range 6, townships 27 and 28, range 7, and traverse in township 32, range 6, west of the fourth meridian; retracement and restoration survey in township 50, range 27, west of the third meridian.
Belanger, P. R. A	Ottawa, Ont	Inspection of contracts Nos. 17, 18 and 19 of 1906, Nos. 2, 16, 22 and part of 24 of 1907, completion of inspection of contracts Nos. 16 and 21 of 1906. Miscellaneous surveys between the second and third meridians and retracement in township 53, range 3, west of the fifth meridian.
Bolton, Lewis	Listowel, Ont	Miscellaneous surveys at The Pas and along Cormorant lake, in the Northwest Territories.
Bourgeault, C. E.	St. Jean Port Joli, Que.	Subdivision and re-survey in townships 11 and 15, range 5, and township 14, range 6; retracement survey in townships 18 and 22, range 4, township 19, range 3, townships 21 and 22, range 5, and township 22, range 6; re-survey of the north boundary of Spruce Woods timber reserve in townships 10, ranges 15 and 16, all west of the principal meridian. Survey of the colonization road, north from Teulon, across townships 16 and 17, range 2, and township 17, range 1, east of the principal meridian, and across townships 17, 18, 19 and 20, range 1, west of the principal meridian.
Bray, Edgar	Oakville, Ont	Contract No. 11 of 1907; subdivision of township 37, range 2, and parts of township 37, range 1, and townships 38, ranges 1 and 3, all west of the second meridian.
Carson, P. A.	Ottawa, Ont	Triangulation surveys in British Columbia in connection with the Trigonometrical Section of the Topographical Survey of Canada.
Cautley, R. H	Edmonton, Alta.	Contract No. 23 of 1907; subdivision of townships 33 and 34, ranges 14, 15, 16, 17, 18, 19 and 20, west of the fourth meridian.
Cautley, R. W	Edmonton, Alta.	Contract No. 28 of 1907; subdivision of townships 41, ranges 15, 16 and 17, and townships 42, ranges 10, 11 and 16, all west of the second meridian.
Chilver, C. A.	Glen Lyon, Man.	Contract No. 6 of 1907; subdivision of townships 37, ranges 5 and 6, townships 38, ranges 4, 5, 6, 10 and 11; survey of the east outlines of townships 37 and 38, range 7, townships 39, ranges 5, 6, 7 and 10, and of townships 40, ranges 5, 6 and 7, all west of the second meridian.

APPENDIX No. 1.

SCHEDULE of Surveyors employed, and work executed by them, from April 1, 1907, to March 31, 1908.—*Continued.*

Surveyor.	Address.	Description of Work.
Christie, W.	Chesley, Ont.	Survey of the eighth base line across ranges 1, 2, 3, 4, 5, 11, 12, 13, 14 and part of 10; the ninth base line across ranges 10, 11, 12, 13, 14, 15, 16, 17, 18 and part of 19, all west of the principal meridian; survey of the principal meridian across townships 26, 27 and 28.
Côté, J. L.	Edmonton, Alta.	Contract No. 9 of 1907; subdivision of townships 65 and 66, ranges 19, 20, 21 and 23, township 66, range 22, north of Athabaska river; survey of the east outlines of townships 67 and 68, ranges 19, 20, 21, 22 and 23, all west of the fourth meridian.
Davies, T. A.	Ottawa, Ont.	Retracement and restoration survey in townships 51, 52, 53 and part of 50, range 26, west of the third meridian; township 41, range 16; townships 41, 42 and 43, range 17; townships 43 and 44, range 18, and township 44, range 19, west of the fourth meridian; correction survey in township 50, range 2; township 52, range 8; township 44, range 17; township 45, range 18, and township 43, range 20, west of the fourth meridian; part subdivision of township 52, range 22, west of the third meridian.
Deans, W. J.	Brandon, Man.	Retracement and restoration survey of township 24, range 30, west of the principal meridian, and township 21, range 1, west of the second meridian; traverse of Whitesand river from the second meridian to the Assiniboine river and of lakes in township 24, range 2, township 32, range 9, and township 34, range 3, west of the second meridian; correction survey in township 14, range 7, west of the second meridian; survey of Doukhobor villages in townships 30, ranges 1 and 5, township 31, range 3, and townships 31 and 32, range 6, west of the second meridian; survey of townships 29 and 30, between Whitesand and Assiniboine rivers and of the south and east boundaries of Coté Indian reserve.
Dumais, P. T. C.	Hull, Que.	Contract No. 33 of 1907; re-survey of parts of township 18, range 20, and township 20, range 22, west of the principal meridian.
Edwards, Geo.	Ponoka, Alta.	Contract No. 19 of 1907. Subdivision of townships 27, 28, 29 and 30, ranges 14, 15 and 16, and parts of townships 27, ranges 17 and 18, all west of the fourth meridian.
Fairchild, C. C.	Brantford, Ont.	Contract No. 8 of 1907. Subdivision of townships 29, 30, 31 and 32, ranges 18, 19 and 20, and townships 29, 30 and 31, range 21, all west of the fourth meridian.
Fawcett, Adam	Gravenhurst, Ont.	Contract No. 30 of 1907. Subdivision of townships 27, 28, 29, 30 and 31, range 14, part of township 31, range 15, and part resurvey of township 30, range 15, all west of the principal meridian.
Fontaine, L. E.	Levis, Que.	Traverse of Milk river through Canadian territory. Survey of part of township 4, range 6, west of the fourth meridian.
Green, W. T.	Ottawa, Ont.	Miscellaneous surveys in townships 13 and 15, range 1; townships 14, ranges 1 and 2; townships 20 and 22, range 4 and township 21, range 5; traverses of Bow and Cascade rivers, of the Canadian Pacific railway canal in township 25, range 11, and of Highwood river in township 18, range 1, all west of the fifth meridian; traverse of Little Bow river in township 13, range 24, west of the fourth meridian; resurvey of Brewster Leasehold in the Rocky Mountains Park.

APPENDIX No. 1.

SCHEDULE of Surveyors employed and work executed by them, from April 1, 1907, to March 31, 1908.—*Continued.*

Surveyor.	Address.	Description of Work.
Grover, G. A.	Norwood, Ont.	Contract No. 27 of 1907. Subdivision of townships 42 and 43, range 9; townships 40 and 43, range 10 and townships 39, 40 and 43, range 11; survey of the east outlines of townships 42 and 44, range 10 and of townships 41, 42 and 44, range 11, all west of the second meridian.
Hawkins, A. H.	Listowel, Ont.	Survey of the thirteenth base line across ranges 18 to 23 inclusive; the twelfth base line across ranges 9 to 14 inclusive, and resurvey of twelfth base line across ranges 1 to 8 inclusive, between the fifth and sixth meridians.
Holcroft, H. S.	Toronto, Ont.	Contract No. 5 of 1907. Subdivision of townships 49, 50, 51 and 52, range 15, and townships 51 and 52, range 16, west of the third meridian.
Hopkins, M. W.	Edmonton, Alta.	Contract No. 4 of 1907. Subdivision of townships 59 and 60, ranges 1, 2, 3 and 4, and townships 59, 60, 61 and 62, ranges 5 and 6; survey of the east outlines of townships 57 and 58, ranges 2 and 3, and townships 63 and 64, ranges 6 and 7, all west of the fourth meridian.
Hubbell, E. W.	Ottawa, Ont.	Miscellaneous surveys in township 46, range 21; townships 44 and 46, range 22; township 46, range 23; township 27, range 24; townships 45 and 49, range 26; townships 17, 20, 21 and 22, range 29 and township 18, range 30, west of the second meridian, and in townships 33, 34 and 35, range 1, and township 34, range 2, west of the third meridian; traverse in township 25, range 25, west of the second meridian. Inspection of contracts Nos. 5, 15, 20 and 21 of 1907. Completion of inspection of contract No. 12 of 1906.
Johnson, A. W.	Kamloops, B. C.	Subdivision survey in township 4, range 28, and townships 2, 4, 9, 10 and 11, range 29, and resurvey in township 3, range 28 and township 4, range 29, west of the sixth meridian, and in townships 5 and 6, range 4, and in townships 4, 5 and 6, range 5, west of the seventh meridian. Traverses in townships 3 and 4, range 28, west of the sixth meridian, and in townships 5 and 6, range 4, and in townships 4, 5 and 6, range 5, west of the seventh meridian. Survey of Pitt meadows in townships 40 and 42, east of the coast meridian. Survey of part of the townsite of Yale, and correction survey of the townsite of Hope in townships 7 and 5, respectively, range 26, west of the sixth meridian.
Kimpe, M.	Edmonton, Alta.	Contract No. 16 of 1907. Subdivision of township 58, range 8; townships 57 and 58, range 9; townships 58 and 59, range 10; townships 59, ranges 11 and 12, and townships 60, ranges 10, 11 and 12, south of Athabaska river. Survey of east boundaries of townships 59 and 60, range 9; township 57, range 10; townships 57 and 58, ranges 11 and 12, and townships 57, 58, 59 and 60, range 13, all west of the fifth meridian.
Kirk, J. A.	Revelstoke, B. C.	Subdivision in township 26, range 20, west of the fifth meridian, and township 23, range 2, west of the sixth meridian.
Knight, R. H.	Edmonton, Alta.	Contract No. 22 of 1907. Subdivision of township 61, range 1; townships 60 and 61, range 2, and township 61, ranges 3, 4 and 5. Survey of the east boundary of township 61, range 6, all west of the fifth meridian.

APPENDIX No. 1.

SCHEDULE of Surveyors employed, and work executed by them, from April 1, 1907, to March 31, 1908.—*Continued.*

Surveyor.	Address.	Description of Work.
Lonergan, G. J.	Buckingham, Que.	Inspection of part of contract No. 15 of 1905, contracts No. 24 of 1906, and Nos. 4, 8, 9, 10, 18, 19 and 23 of 1907. Traverse in township 36, range 19 west of the fourth meridian. Miscellaneous resurveys in township 57, range 10; township 59, range 12; township 26, range 17; township 52, range 21; and townships 51, ranges 25 and 26; part subdivision of township 27, range 17, and township 51, range 21, all west of the fourth meridian.
Magrath, C. A.	Lethbridge, Alta.	Contract No. 18 of 1907. Subdivision of townships 7 and 8, range 12, and township 8, range 13, all west of the fourth meridian.
Miles, C. F.	Toronto, Ont.	Inspection of contracts Nos. 17, 25 and 41 of 1907, and parts of contracts Nos. 10, 13 and 25 of 1906. Survey of the townsites of Ernfold and Chaplin in township 17, range 7, and township 17, range 5, respectively, west of the third meridian. Correction survey in township 6, range 14, west of the second meridian. Retracement surveys in township 23, range 26, west of the second meridian. And in townships 21 and 24, range 1, township 24 and part of township 23, range 2, west of the third meridian.
Molloy, John	Winnipeg, Man.	Contract No. 32 of 1907. Subdivision of township 8, range 14; townships 1, 2, 3, 4, 5, 6, 7 and 8, range 15, all east of the principal meridian.
Montgomery, R. H.	Prince Albert, Sask.	Contract No. 13 of 1907. Subdivision of townships 50, ranges 15, 16 and 17, north of the Saskatchewan river; townships 50, ranges 18, 19, 20 and 21; townships 51, ranges 19, 20 and 21; north one-third of township 49, range 19. Survey of the east outlines of townships 51 and 52, ranges 15, 16, 17 and 18, and townships 52, ranges 19, 20 and 21, all west of the second meridian.
McLennan, A. L.	Toronto, Ont.	Contract No. 20 of 1907. Subdivision of townships 51, ranges 24 and 25; townships 52, ranges 23, 24, 25, 26 and 27, west of the second meridian; and townships 52, ranges 1 and 2, west of the third meridian.
McFarlane, W. G.	Toronto, Ont.	Contract No. 1 of 1907. Subdivision of townships 42 and 43, range 12; the south one-third of townships 45, ranges 1, 2, 3, 4, 5, 6 and 7, and the south two-thirds of townships 45, ranges 8, 9, 10 and 11. Survey of the east outline of township 41, range 12, and miscellaneous subdivision in township 44, range 1, and township 45, range 12, all west of the second meridian. Subdivision of the west half of township 41, range 25; the east half of townships 41 and 43, range 26; the north one-third of townships 44, ranges 28, 29, 30 and 31; miscellaneous. Subdivision in townships 42, ranges 25 and 26; townships 44, ranges 26, 27 and 32, and in township 45, range 32, all west of the principal meridian.
McGrandle, H.	Wetaskiwin, Alta.	Contract No. 10 of 1907. Subdivision of township 60, range 23; townships 66, 67 and 68, range 24. Survey of the east outline of townships 65, 66, 67 and 68, range 25, all west of the fourth meridian.
McMillan, Geo.	Ottawa, Ont.	Inspection of contracts Nos. 2, 9 and 27 of 1906, and contracts Nos. 3 and 12 of 1907. Re-survey of river lots in township 18, range 10, east of the principal meridian. Completion of the survey of the townsite of Gimli. Retracement and restoration survey of Manitoba House Settlement in township 22, range 11, and in township 21, range 10, west of the principal meridian.

APPENDIX No. 1.

SCHEDULE of Surveyors employed and work executed by them, from April 1, 1907, to March 31, 1908.—*Continued.*

Surveyor.	Address.	Description of Work.
O'Hara, W. F	Ottawa, Ont	Survey of the second base line across ranges 2, 3 and part of 4. Subdivision of part of township 5, range 2, and parts of townships 5 and 6, range 3, all west of the fifth meridian.
Ord, L. R	Winnipeg, Man	Contract No. 34 of 1907. Subdivision of townships 64, ranges 21, 22, 23 and 24, and survey of the east outline of township 64, range 25, west of the fourth meridian.
*Parsons, J. L. R	Toronto, Ont	Contract No. 17 of 1907. Subdivision of townships 1 and 2, ranges 17 and 18; townships 4, ranges 23 and 24; townships 9, ranges 25, 26 and 27; township 6, range 29, and townships 4, 5 and 6, range 30. Survey of the east outlines of townships 1 and 2, range 19, all west of the second meridian. Subdivision of townships 4, 5 and 6, range 1; townships 4, 5, 7, 8, 9, 10, 11 and 12, range 2; townships 5, 11 and 12, range 3; townships 12, ranges 4 and 5; townships 11 and 12, ranges 6, 7, 8, 9 and 10; survey of the east boundaries of townships 6, 7 and 8, range 3, all west of the third meridian.
Pearce, W	Calgary, Alta	Re-survey of township 24, range 22, and the east boundaries of sections 27 and 34, township 27, range 27, west of the fourth meridian.
Ponton, A. W	Macleod, Alta	Survey of the fifth meridian from the twentieth base to the twenty-second base; subdivision in township 10, range 29, west of the fourth meridian.
Reilly, W. R	Regina, Sask	Subdivision of townships 54, ranges 27 and 28. Retracement of township 34, range 6; part of township 38, range 13, and townships 51, 52 and 53, range 27, west of the third meridian. Mounding in townships 41 and 42, range 27, west of the second meridian. Traverse of two lakes, one in township 20, range 22, west of third meridian, and one in township 52, range 1, west of the fourth meridian.
Ross, Geo	Welland, Ont	Survey of the fourteenth base line across ranges 13 to 28, inclusive, west of the fifth meridian.
Ross, Jos. E	Kamloops, B.C	Traverse of the Columbia river through townships 30 and 31, range 25; townships 31 and 32, range 26, and township 32, range 27, west of the fifth meridian. Subdivision in townships 19, ranges 6 and 7; townships 18, ranges 7 and 8; townships 17, 18 and 19, range 9; townships 17, 18, 19 and 20, range 10; townships 17 and 18, range 11; township 18, range 12; townships 17, 18 and 19, range 14. Re-survey in townships 19, ranges 15 and 17, and townships 19 and 20, range 18, all west of the sixth meridian. Traverse in township 19, range 6; townships 18 and 19, ranges 7 and 9; townships 17, ranges 10, 12 and 13; townships 17 and 18, range 14; township 19, range 15, and township 20, range 18, all west of the sixth meridian.
Roy, G. P	Quebec, Que	Contract No. 21 of 1907. Subdivision of township 47, range 11; townships 49, ranges 12 and 13; townships 49, 50 and 51, range 14. Survey of the east outline of township 52, range 14, all west of the third meridian.
Saint Cyr, A	Ottawa, Ont	Survey of the sixth meridian from the sixteenth base line to the fourteenth base line; East outline of townships 51 and 52, range 27, west of the fifth meridian; and traverse from the south-east corner of township 51, range 27, west of the fifth meridian, to the north-east corner of township 48, range 1, west of the sixth meridian.

APPENDIX No. 1.

SCHEDULE of Surveyors employed, and work executed by them, from April 1, 1907, to March 31, 1908.—*Continued.*

Surveyor.	Address.	Description of Work.
Saint Cyr, J. B.	Montreal, Que.	Subdivision of township 78, range 3; part of township 80, range 4, and parts of townships 71 and 72, range 6; survey of east outlines of townships 77, 79 and 80, ranges 3 and 4; township 78, range 4; township 80, range 5, and township 72, range 7, all west of the sixth meridian. Survey of Flying Shot Lake settlement, Spirit River settlement, and Peace River settlement, situated respectively in township 71, range 6, townships 78, ranges 5 and 6, west of the sixth meridian, and township 84, range 21, west of the fifth meridian.
Saunders, B. J.	Edmonton, Alta.	Survey of the meridian between ranges 8 and 9 across townships 19A, 19, 20, 21, 22, 23, 24, 25 and 26; the fourth base line across ranges 16 and 17, and part of 15; the sixth and seventh base lines across ranges 8 and 9, all east of the principal meridian.
Selby, H. W.	Toronto, Ont.	Subdivision of townships 74 and 75, ranges 14 and 15, and parts of townships 77, ranges 15 and 16. Survey of the east outlines of townships 73, ranges 14 and 15, all west of the fifth meridian.
Smith, C. C.	Brampton, Ont.	Subdivision survey in township 10 range 29 west of the fourth meridian; also part survey of townships 10 and 11 ranges 2 and 3, and subdivision in townships 7 and 8 ranges 5 and 6 west of the fifth meridian; survey of the townsite of Grassy Lake in township 10 range 13, west of the fourth meridian.
Stacey, A. G.	Ottawa, Ont.	Miscellaneous surveys in townships 20 ranges 18 and 19, townships 19, 20 and 21 range 20, townships 19 and 21 range 21, townships 16, 19 and 20 range 22, townships 15, 16, 20 and 21 range 23, township 20 range 24, townships 17, 22 and 23 range 25 and townships 20, 21 and 22 range 26, all west of the sixth meridian; traverse in townships 20 ranges 18 and 19, township 21 range 20, townships 19 and 21 range 21, township 20 range 22, townships 15, 20 and 21 range 23 and townships 22 and 23 range 25, all west of the sixth meridian.
Stewart, P. G.	Britannia Bay, Ont.	Exploration survey of townships 52 ranges 7 to 16 inclusive, townships 53 ranges 13 to 16, townships 54 ranges 11 to 15, townships 55 ranges 11 to 14, and townships 56 ranges 11 to 13, all west of the fifth meridian.
Teasdale, C. M.	Concord, Ont.	Contract No. 41 of 1907; partial subdivision of township 10 range 4, and subdivision of township 11 range 4, and townships 10 and 11 range 5, all west of the third meridian. Contract No. 26 of 1907; subdivision of townships 25 and 26 ranges 8 and 9, all west of the principal meridian.
Thibaudeau, W.	Ottawa, Ont.	Preliminary investigation of the waterpowers on the Winnipeg river, between lake Winnipeg and the eastern boundary of Manitoba.
Tyrrell, J. W.	Hamilton, Ont.	Contract No. 14 of 1907; subdivision of township 24 range 1, townships 24 and 25 ranges 2 and 3, and township 25 range 4; survey of the east outline of township 25 range 1, and resurvey of the north outline of township 24 range 4, all east of the principal meridian; subdivision of townships 24 ranges 1, 2, 3 and 5, all west of the principal meridian.
Waldron, J.	Moosejaw, Sask.	Contract No. 25 of 1907; subdivision of townships 8 ranges 16, 17, 18, 19 and 20, also part of township 8 range 21, west of the third meridian.
Wallace, J. N.	Calgary, Alta.	Survey of the boundary between British Columbia and the Yukon Territory between Stations 'M' and 'N' across the Dalton trail.

APPENDIX No. 1.

SCHEDULE of Dominion Land Surveyors employed, and work executed by them, from April 1, 1907, to March 31, 1908.—*Continued.*

Surveyor.	Address.	Description of Work.
Warren, Jas.....	Walkerton, Ont.....	Contract No. 15 of 1907 ; subdivision of township 51 range 3, townships 50 and 51 range 4, township 48 range 6 and townships 48 and 49 range 7, and the east outline of township 49 range 8, all west of the third meridian.
Watt, G. H.....	Ottawa, Ont	Contract No. 12 of 1907 ; completion of subdivision of township 16 range 12, townships 13 and 14 range 13 ; subdivision of townships 15, 16 and 17 range 13, townships 13 and 14 range 14 ; survey of the south outline of township 15 range 14, all east of the principal meridian.
Wheeler, A. O.....	Calgary, Alta.....	Topographer of the Department of the Interior. Photo-topographical survey of the railway belt west of Golden, British Columbia, in the Dogtooth and Selkirk mountains.

APPENDIX NO. 2.

SCHEDULE showing for each Surveyor employed from April 1, 1907, to March 31, 1908, the number of miles surveyed of township section lines, township outlines, traverses of lakes and rivers, and resurvey, also the cost of the same.

Surveyor.	Miles of section line.	Miles of outline.	Miles of traverse	Miles of resurvey	Total mileage.	Total cost.	Cost per mile.	Day or contract.
						$ cts.	$ cts.	
Aylsworth, C. F.				217·00	217·00	7,684 31	35 41	Day.
Baker, J. C.	556·43	107·45	95·50		759·38	21,725 50	28 84	Contract.
Beatty, David			44·64	363·00	407·64	4,078 98	10 00	Day.
Belanger, P. R. A.			2·00	100·00	102·00	8,477 68		"
Bolton, Lewis			24·92		24·92	1,898 59	76 19	"
Bourgeault, C. E.	108·00	14·00	49·76	271·00	442·76	8,299 00	18 52	"
Bray, Edgar	120·86	20·23	1·11		142·20	4,360 71	30 66	Contract.
Cautley, R. H.	660·94		138·96		799·90	6,604 49	8 26	"
Cautley, R. W.	261·92		93·53		355·45	7,814 58	21 98	"
Chilver, C. A.	344·13	91·59	48·34		484·06	14,102 17	29 13	"
Christie, W.	117·00	17·00			134·00	10,578 94	78 95	Day.
Côté, J. L.	390·79	96·61	55·13		542·53	15,998 60	29 49	Contract.
Davies, T. A.	2·00			625·00	627·00	9,554 30	15 24	Day.
Deans, W. J.			71·88	278·50	350·38	5,627 53	16 06	"
Dumais, P. T. C.			54·64	91·79	146·43	3,028 77	20 68	Contract.
Edwards, George	641·75		26·17		667·92	5,471 81	8 19	"
Fairchild, C. C.	749·78		96·55		846·33	7,959 81	9 40	"
Fawcett, A.	196·52	25·51	29·57		251·60	5,700 62	22 65	"
Fontaine, L. E.	17·00		510·40		527·40	7,690 89	14 58	Day.
Green, W. T.	79·25	6·00	42·86	9·00	137·11	6,719 35	49 00	"
Grover, G. A.	361·69	47·81	53·60		463·10	12,454 53	26 89	Contract.
Hawkins, A. H.		120·00			120·00	16,750 00	139 58	Day.
Holcroft, H. S.	244·97	12·10	99·84		356·91	7,854 88	22 00	Contract.
Hopkins, M. W.	741·82	100·61	260·10		1102·53	27,197 83	24 66	"
*Hubbell, E. W.			1·45	249·50	250·95	10,178 80		Day.
Johnston, A. W.	6·30	20·60	102·80	29·80	159·50	10,855 73	68 05	"
Kimpe, M.	370·06	114·84	55·66		540·56	16,145 31	29 86	Contract.
Kirk, J. A.	17·40		4·00	2·50	23·90	974 40	40 77	Day.
Knight, R. H.	284·51	29·92	45·92		360·35	10,520 16	29 19	Contract.
*Lonergan, G. J.			8·15	63·50	71·65	7,280 38		Day.
Magrath, C. A.	138·00				138·00	992 28	7 19	Contract.
*Mills, C. F.			20·60	232·50	253·10	9,388 19		Day.
Molloy, John.	618·17	54·77			672·94	20,664 31	30 70	Contract.
Montgomery, R. H.	521·89	122·62	36·15		680·66	20,497 64	30 11	"
MacLennan, A. L.	359·63	12·03	38·05		409·71	10,831 61	26 43	"
McFarlane W. G.	562·89	25·00	17·23		605·12	18,048 36	29 82	"
McGrandle, H.	187·65	36·21	67·56		291·42	7,581 61	26 01	"
*McMillan, Geo.			86·44	24·56	110·94	10,935 56		Day.
O'Hara, W. F.	59·00		2·75		61·75	7,071 98	114 52	"
Ord, L. R.	193·22	30·20			223·42	6,104 47	27 32	Contract.
Parsons, J. L. R.	1821·48	66·13	107·25		1994·86	15,424 52	7 73	"
Pearce, W.				43·84	43·84	221 25	5 05	"
Ponton, A. W.	3·00	48·00			51·00	7,920 00	155 29	Day.
Reilly, W. R.	10·05		34·78	247·00	291·83	4,303 89	14 74	"
Ross, Geo.		90·77			90·77	13,275 34	146 25	"
Ross, J. E.	60·50	16·00	81·20	15.30	173·00	8,224 52	47 54	"
Roy, G. P.	303·07	24·17	77·30		404·54	9,893 90	24 45	Contract.
Saint Cyr, A.		60·50	18·00		78·50	17,100 00	217 83	Day.
Saint Cyr, J. B.	120·00	69·00	114·26		303·26	10,876 21	35 83	"
Saunders, B. J.	30·50	42·50			73·00	10,100 00	138 36	"
Selby, H. W.	176·00	28·00	9·00		213·00	8,254 24	38 75	"
Smith, C. C.	85·50		30·14		115·64	5,573 63	48 19	"
Stacey, A. G.	83·30	10·00	36·00	44·79	174·09	7,729 84	44 42	"
Teasdale, C. W.	339·30	17·80	93·82		450·92	6,766 40	15 00	Contract.
Tyrrell, J. W.	610·70	29·05	34·53		704·28	19,915 81	28 24	"
Waldron, J.	278·51	30·20	8·76		317·47	2,602 24	8 19	"
Wallace, J. N.			17·13	9·21	26·34	9,818 68	372 76	Day.
Warren, Jas.	257·99	6·00	96·94		360·93	9,265 29	25 67	Contract.
Watt, G. H.	586·18	31·15	147·60		764·93	20,480 62	26 78	"
Total	13709·65	1674·37	3192·97	2917·64	21494·63	583,451 04		

Inspecting contract surveys a portion of the season.

APPENDIX No. 3.

List of lots in the Yukon Territory surveys of which have been received from April 1, 1907, to March 31, 1908.

GROUP No. 1.

Lot No.	Area in Acres.	Surveyor.	Year of Survey.	Date of Approval.	Claimant.	Remarks.
40	1·00	C. S. W. Barwell	1907..	Oct. 11, 1907	D. A. McRea *et al.*	Surface.

GROUP No. 2.

345	40·00	T. D. Green	1907..	May 29, 1907..	Chris. H. Authier	Surface.
346	1·29	"	1907..	" 29, 1907..	" "	"
352	91·14	C. W. MacPherson	1907..	Oct. 11, 1907..	H. H. Norwood Co.	"
353	94·25	"	1907..	" 11, 1907..	" "	"
354	114·74	"	1907..	" 11, 1907..	" "	"
355	87·00	"	1907..	" 11, 1907..	" "	"
356	99·75	"	1907..	" 11, 1907..	" "	"
359	51·6	C. S. W. Barwell	1907..	" 7, 1907..	Wm. Elliott *et al*	Mineral claim.
360	38·9	"	1907..	" 7, 1907..	"	"
361	37·1	"	1907..	" 7, 1907..	"	"
362	47·4	"	1907..	" 7, 1907..	"	"
367	29·9	"	1907..	" 7, 1907..	"	"
368	51·6	"	1907..	" 7, 1907..	"	"
369	51·6	"	1907..	" 7, 1907..	"	"
370	51·6	"	1907..	" 7, 1907..	"	"
371	51·6	"	1907..	" 7, 1907..	"	"
372	51·6	"	1907..	" 7, 1907..	"	"
373	51·6	"	1907..	" 7, 1907..	"	"
374	51·6	"	1907..	" 7, 1907..	"	"
383	11·47	C. W. MacPherson	1907..	" 30, 1907..	O. R Brenner	Surface.
384	11·47	"	1907..	" 30, 1907..	"	"
385	11·47	"	1907..	" 30, 1907..	"	"
386	11·47	"	1907..	" 30, 1907..	"	"
388	.....	C. S. W. Barwell	1904..	*	White channel Gold Hill Hyd'c. Co. Ltd	"

GROUP No. 5.

66	32·36	H. G. Dickson	1905..	June 22, 1907..	J. P. Whitney *et al.*	Mineral claim.
67	26·93	"	1905..	" 22, 1907..	"	"
68	51·39	"	1905..	" 22, 1907..	"	"
69	50·10	"	1905..	" 22, 1907..	"	"
71	42·88	"	1907..	Oct. 21, 1907..	"	"
72	40·34	"	1907..	" 21, 1907..	"	"
73	48·17	"	1907..	" 21, 1907..	"	"
74	31·73	"	1907..	" 21, 1907..	"	"
75	42·35	"	1907..	" 21, 1907..	"	"
76	24·60	"	1907..	" 21, 1907..	"	"
77	25·46	"	1907..	" 21, 1907..	"	"
78	49·95	"	1907..	June 22, 1907..	Bryson N. White	"
79	40·08	"	1906..	" 22, 1907..	"	"
80	50·82	"	1906..	" 22, 1907..	"	"
81	17·82	"	1906..	" 22, 1907..	"	"
82	51·65	"	1906..	" 22, 1907..	"	"
83	51·65	"	1906..	" 22, 1907..	"	"
84	49·06	"	1906..	*	C. H. Johnston *et al*	"
85	44·80	"	1907..	*	"	"
86	49·16	"	1907..	*	"	"
87	49·15	"	1907..	*	"	"

* Not yet approved.

APPENDIX No. 3.

List of Lots in the Yukon Territory surveys of which have been received from April 1, 1907, to March 31, 1908.—*Concluded.*

Lot No.	Area in Acres.	Surveyor.	Year of Survey.	Date of Approval.	Claimant.	Remarks.
88	51·02	" ..	1907..	Jan. 23, 1908..	A. C. Robertson *et al*.....	Mineral Claim.
89	51·62	" ..	1907..	" 23, 1908..	"	"
90	18·03	" ..	1907..	" 23, 1908..	"	"
91	45·72	" ..	1907..	" 23, 1908..	"	"
92	51·65	" ..	1907..	*	J. Williams & A. La Rose....	"
93	51·65	" ..	1907..	*	" "	"
94	51·65	"	1907..	Jan. 23, 1908..	" "	"
95	51·54	" ..	1907..	" 23, 1908..	" "	"
96	49·84	" ..	1907..	" 23, 1908..	J. P. Whitney.....	"
97	27·17	" ..	1907..	Feb. 26, 1908..	W. S. Thomas.....	"
98	122·42	" ..	1907..	*	J. Williams & A. La Rose	"
99	145·01	" ..	1907..	*	" "	"
100	144·35	" ..	1907..	*	" "	"
101	159·03	" ..	1907..	*	" "	"
102	158·35	" ..	1907..	*	" "	"
103	32·80	" ..	1907..	Feb. 26, 1908..	W. S. Thomas.....	"
104	24·63	" ..	1907..	Jan. 23, 1908..	Clara L. Walters	"
105	44·05	" ..	1907..	" 22, 1908..	B. J. McGee.....	"
106	46·62	" ..	1907..	" 22, 1908..	W. J. Elmendorf.....	"
107	11·78	" ..	1907..	" 22, 1908	"	"
108	51·65	" ..	1907..	" 23, 1908..	C. P. Seale.....	"
109	28·55	" ..	1907..	" 22, 1908..	Florence Young.....	"
142	33·61	N. A. Burwash..	1908..	*	A. B. Palmer.....	"

GROUP No. 6.

23	51·65	H. G. Dickson..	1907..	*	R. H. Chadwick.....	Mineral claim.
80	36·55	" ..	1907..	*	"	"

GROUP No. 10.

22	10·00	C. S. W. Barwell	1907..	Sept. 13, 1907..	S. Rowlinson.....	Surface.
23	160·00	" ..	1907..	" 13, 1907..	C. E. Miller *et al*.....	"
24	160·00	" ..	1907..	" 13, 1907..	"	"
25	40·00	" ..	1907..	" 13, 1907..	Geo. Delion.....	"
26	120·00	" ..	1907..	Oct. 11, 1907..	A. B. Palmer.....	"

* Not yet approved.

APPENDIX No. 4.

List of Miscellaneous surveys in the Yukon Territory, returns of which have been received from April 1, 1907, to March 31, 1908.

Year.	Surveyor.	Description of Survey.
1907.... ..	T. D. Green....	Base Line on Dago Gulch, a tributary of Hunker creek.
1907	H. G. Dickson..	" Burwash creek, a tributary of Kluane river.

APPENDIX No. 5.

STATEMENT of work executed in the office of the chief draughtsman.

Letters of instruction to surveyors	177
Progress sketches received and filed	1,002
Declarations of settlers received and filed	473
Plans received from surveyors	334
Field books received from surveyors	577
Timber reports received	56
Preliminary township plans prepared	369
Sketches made	1,352
Maps made	22
Tracings and miscellaneous plans made	154
Plans of Yukon lots received	76
Plans of miscellaneous Yukon surveys received	2
Tracings of Yukon survey plans made	87
Yukon lots reduced to 40 chains to 1 inch and plotted on group plans	96
Yukon traverses reduced to 40 chains to 1 inch and plotted on group plans	2
Returns of surveys examined—	
Township subdivision	362
Township outline	157
Road plans	233
Railway plans	112
Mineral claims	32
Timber berths	60
Correction and other miscellaneous surveys	55
Township plans compiled	604
Proofs of plans examined	539
Township plans printed	518
Townsites and settlements printed	5
Descriptions written	7
Pages of field notes copied	244
Traverse reductions made	28
Applications for various information dealt with	1,869
Fyles received and returned	1,980
Letters drafted	4,993
Books received from record office and used in connection with office work	4,870
Books returned to record office	5,254
Plans other than township plans received from record office and used in connection with office work	552
Plans returned to record office	572
Volumes of plans received from record office and used in connection with office work	78
Volumes of plans returned to record office	74
Books sent to record office to be placed on record	494
Plans other than township plans sent to record office to be placed on record	476

APPENDIX No. 5—*Continued.*

Sectional maps (3 miles to 1 inch)—	
Revised	73
Reprinted	28
New sheets compiled	6
New sheets printed	4
New drawings of old worn out sheets	2
New tracings of old worn out sheets	7
Sectional maps (6 miles to 1 inch)—	
Reprinted	24
New sheets printed	3
Proofs of sectional sheets examined	110

APPENDIX No. 6.

LIST of new editions of sectional maps issued from April 1, 1907, to March 31, 1908.
Scale 3 miles to an inch.

No.	Name.	No.	Name.	No.	Name.	No.	Name.
10	Port Moody	67	Maple Creek	215	RedDeer	269	Pr. Albert S.
11	Yale	68	Swift Current	216	Sullivan Lake	*313	Brulé.
15	Lethbridge	111	Kamloops	*263	Jasper	314	St. Ann.
16	Milk River	164	Morley	264	Brazeau	319	Pr. Albert N.
17	Cypress	165	Rosebud	265	Peace Hills	*320	Carrot River.
19	Willowbunch	168	The Elbow	266	Ribstone Creek	365	Victoria.
61	Lytton	171	Duck Mountain	267	Battleford	366	Saddle Lake.
66	Medicine Hat	172	Fairford	268	Carlton	*416	La Biche.

SCALE 6 MILES TO AN INCH.

10	Port Moody	66	Medicine Hat	111	Kamloops	314	St. Ann.
11	Yale	67	Maple Creek	165	Rosebud	317	Fort Pitt.
15	Lethbridge	68	Swift Current	171	Duck Mountain	318	Shell River.
16	Milk River	69	Moosejaw	172	Fairford	319	Pr. Albert N.
17	Cypress	71	Brandon	*263	Jasper	*320	Carrot River.
19	Willowbunch	72	Portage La Prairie	268	Carlton	365	Victoria.
61	Lytton			269	Prince Albert S.		
				*313	Brulé		

* First edition.

APPENDIX No. 7

STATEMENT of work executed in the Survey Records Office from April 1, 1907, to March 31, 1908.

Files received and dealt with	10,466
Letters drafted	4,405
Plans, tracings, &c., copied or compiled	369
Statutory declarations copied or mailed	506
Plans sent to agents, registrars, &c	28,548
Pages of field notes copied	2,348
Prints of plans received and stored	110,785
Original plans received and recorded	1,068
Original field notes received and recorded	433
Letters written to agents	1,306
Registered parcels mailed	1,741

Work done for Topographical Surveys Branch.

Books searched for	8,018
Books sent	5,396
Books returned	6,256
Plans searched for	2,223
Plans sent	1,820
Plans returned	532
Volumes searched for	134
Volumes sent	77
Volumes returned	75

Work done for Patents Branch.

Plans searched for	811
Plans sent	668
Plans returned	757
Field books searched for	61
Field books sent	57
Field books returned	63

Work done for other Branches.

Plans searched for	1,453
Plans sent	1,427
Plans returned	924
Field notes searched for	266
Field notes sent	246
Field notes returned	244

APPENDIX No. 8.

STATEMENT of work executed in the Photographic Office from April 1, 1907, to March 31, 1908.

FOR THE DEPARTMENT OF THE INTERIOR.

—	3¼ x 3¼	4 x 5	5 x 7	8 x 10	10 x 12	11 x 14	16 x 18	18 x 20	24 x 30	30 x 36	36 x 42	42 x 48	Total
Bromide prints		133	435	38	27	758	38	82	36	34	18	8	1,607
Vandyke prints				2	4	17	39	51	49	7	15	12	196
Silver prints		583	2,673	2									3,258
Lantern transparencies	86												86
Dry plate negatives		234	732										966
Wet plate negatives				89		91	703	185					1,068
Zinc transfers						5		814					819
Total	86	950	3,840	131	31	871	780	1,132	85	41	33	20	8,000

FOR THE GEOLOGICAL SURVEY.

—	3¼ x 3¼	4 x 5	5 x 7	8 x 10	10 x 12	11 x 14	16 x 18	18 x 20	24 x 30	30 x 36	36 x 42	42 x 48	Total.
Bromide prints				4		33							37
Silver prints		52											52
Total		52		4		33							89

APPENDIX No. 9.

STATEMENT of work executed in the Lithographic Office from April 1, 1907, to March 31, 1908.

Month.	Maps.		Townships.		Forms.	
	No. of Jobs.	No. of Copies.	No. of Jobs.	No. of Copies.	No. of Jobs.	No. of Copies.
1907.						
April	6	12,400	50	10,000	6	3,450
May	9	8,500	40	8,000	8	9,000
June	4	925	39	7,800	5	2,025
July	19	40,650	32	6,400	5	12,550
August	2	650	58	11,600	4	1,600
September	6	2,050	23	4,600	3	350
October	.....	.....	63	12,600	12	9,490
November	14	2,175	42	8,400	6	2,825
December	8	3,025	45	9,000	3	600
1908.						
January	10	7,550	50	10,000	10	3,525
February	10	3,000	53	10,600	14	6,750
March	1	350	78	15,600	12	6,890
Total	89	81,275	573	114,600	88	59,055

Summary of work for the year.

	No. of Jobs.	No. of Copies.	No. of Impressions.	Cost.	Cost per map or form.
				$ cts.	$ cts.
Maps	89	81,275	185,035	2,363 63	26 55
Townships	573	114,600	250,820	4,361 57	7 60
Forms, &c	88	59,055	63,555	1,270 80	14 45
Total	750	254,930	499,410	7,996 00	

APPENDIX No. 10.

Names and duties of employees of the Topographical Surveys Branch at Ottawa. (Metcalfe street, corner of Slater street).

Deville, E., D.T.S., LL.D., Surveyor General.

CORRESPONDENCE AND ACCOUNTS.

Brady, M., secretary.
Hunter, R. H., accountant.
Wilkinson, Percy, assistant accountant.
Percival, Miss M. F., stenographer and typewriter.
Cullen, M. J., stenographer and typewriter.
Moran, J. F., stenographer and typewriter.
Lynch, F., stenographer and typewriter.
Williams, E. R., clerk.
Pegg, A., messenger.
Paquette, Albert, messenger.

OFFICE OF CHIEF DRAUGHTSMAN.

Symes, P. B., chief draughtsman.
Shonks, T., B.A.Sc., D.L.S., assistant to chief draughtsman.

First Division—Instructions and General Information.

Brown, T. E., B.A., in charge of division.
Weekes, M. B., B.A.Sc., D.L.S., O.L.S.
Umbach, J. E., Grad. S.P.S., D.L.S.
Barber, H. G., Grad. S.P.S., D.L.S.
Green, W. T., B.A., D.L.S.
Rice, F. W., Grad. School of Mining.
McRae, A. D., B.A., B.Sc.
Carroll, M. J., Grad. S.P.S.
Stewart, A. G., Grad. School of Mining.
Grant, A. W., B.A.
Belleau, J. A., D.L.S.
Dodge, G. B.
Sylvain, J.
Cram, A.
Rochon, E. C.
Burkholder, E. L.
McLaughlin, M. J.
Gaudry, G. A.
Grey, G. A.

Second Division—Examination of Surveyors' Returns.

Nash, T. S., Grad. S.P.S., D.L.S., in charge of division.
Henderson, F. D., Grad. S.P.S., D.L.S.
Burgess, E L., Grad. S.P.S., D.L.S., O.L.S.

Dennis, E. M., B.Sc.
Akins, J. R., B.Sc.
Cumming, A. L., B.Sc.
Elder, A. J., Grad. S.P.S., D.L.S.
Hill, S. N., Grad. S.P.S.
Elwell, W., Grad. S.P.S.
Maynard, F.H., Grad. R.M.C.
Day, H. S., B.Sc.
Sutherland, H. E., B.Sc.
Morrier, J. E., D.L.S.
Davies, T. A., D.L.S.
Kitto, F. H., D.L.S.
McClennan, W. D.
Roger, A.
Clunn, T. H. G.
Robertson, D. F.
Spreckley, R. O.
Goodday, Leonard
Williamson, F. H. H.
Webb, G. C.
Wilding, C. H.
Bray, R. P.
Harrison, E. W.
Ault, H. W.
Macdonald, J. A.

Third Division—Drawing Plans for Printing.

Engler, Carl, B.A., D.L.S., in charge of division.
May, J. E.
O'Connell, J. R.
Moule, W. J.
Villeneuve, E. J.
Helmer, J. D.
Archambault, E.
Tremblay, A.
Hutton, J. B.
Brown, A.
Binks, C. B.
Dawson, R. J.
Holbrook, C. H.
Watters, James.

Fourth Division—British Columbia Surveys.

Rowan-Legg, E. L., in charge of division.
Carson, P. A., B.A., D.L.S.
MacIlquham, W. L., B.Sc.
Gillmore, E. T. B., Grad. R.M.C.
Lawe, H., D.L.S.
Morley, R. W.
Weld, W. E.
Wilson, E. D.

Fifth Division—Imperial building, Queen street—Mapping.

Smith, Jacob, in charge of division.
Bégin, P. A.
Lepage, J. B.
Blanchet, A. E.
Davies, T. E. S.
Taggart, C. H.
Perrin, V.
Genest, P. F. X.
Bergin, W.
Davy, Eugene.

OFFICE OF THE GEOGRAPHER.

(Woods building, Slater street.)

White, J., geographer.
Baine, H. E.
Chalifour, J. E.
Dumouchel, G. E
Taché, H.
Darrach, M.
Wilson, H. W.
Akerlindh, A.
Anderson, W.
Blatchley, H. M.
Bennie, J.
Wood, C. G.
Craig, R. W.
Chandler, S.
Groulx, A.
Gagnon, A. S.
Inkster, F. B.
Blue, W.
Beveridge, James.
MacElligot, J. P.
Martin, Miss M. Perley.
Pigeon, Jules.
Waine, Mrs. D. E.
Merrifield, J. R.

SURVEY RECORDS OFFICE.

(Canadian building, Slater street.)

Steers, C. J., clerk in charge.
Currie, P. W., B.A., B.Sc., D.L.S., assistant clerk in charge.
Surtees, W. S., draughtsman.
Sowter, T. W. E., draughtsman.
Smith, F. W., draughtsman.
Routh, C. F., draughtsman.
Ashton, A. W., draughtsman.
Lecourt, Eugène, draughtsman.
Moore, R. T., draughtsman.
Lambart, O. H., draughtsman and typewriter.
Bellean, Eugène, draughtsman.

Yeilding, Miss A., typewriter.
Mudie, J. M., draughtsman.
Gillis, W. C., draughtsman.
Landry, Narcisse, messenger.

LITHOGRAPHIC OFFICE.

(Metcalfe street, corner of Slater street.)

Moody, A., foreman.
Thicke, C., engraver and lithographer.
Thicke, H., power press printer.
Bergin, J., power press printer.
Deslauriers, J. H., transferrer.
Boyle, S., stone polisher.
Gagnon, J., press feeder.

PHOTOGRAPHIC OFFICE.

(Woods Building, Slater street.)

Topley, H. N., photographer in charge.
Carruthers, H. K., photo-lithographer and photo-engraver.
Woodruff, J., photographer.
Whitcomb, H. E., photographer.
Morgan, W. E., photographer.
Kilmartin, A., photographer.
Devlin, A., photographer.
Ouimet, Geo., photographer.

GEOGRAPHIC BOARD.

(Woods building, Slater street.)

Whitcher, A. H., D.L.S., secretary.

APPENDIX No. 11.

List of Dominion Land Surveyors who have been supplied with Standard Measures.

Name.	Address.	Date of Appointment.	Remarks.
Austin, G. F.	Dewdney, Alta	April 14, 1872	
Aylen, J.	Aylmer, Que.	May, 29, 1885	
Aylsworth, C. F.	Madoc, Ont.	" 17, 1886	
Baker, J. C.	Vermilion, Alta.	" 18, 1906	
Barwell, C. S. W.	Dawson, Yukon Territory	Aug. 21, 1894	
Bayne, G. A.	Winnipeg, Man.	April 14, 1872	
Beatty, D.	Parry Sound, Ont.	" 14, 1872	
Beatty, W.	Delta, Ont.	" 14, 1872	
Belanger, P. R. A.	Ottawa, Ont.	May 17, 1880	Inspector of Surveys, Topographical Surveys Branch, Dept. of Interior.
Belleau, J. A.	"	" 15, 1883	Topographical Surveys Branch, Dept. of Interior.
Bigger, C. A.	"	Mar. 30, 1882	Astronomer, Dept. of Interior.
Bolton, L.	Listowell, Ont.	April 14, 1872	
Boswell, E. J.	Winnipeg, Man.	Feb. 18, 1903	
Bourgault, A.	St. Jean Port Joli, Que.	Mar. 29, 1883	
Bourgeault, C. E.	" "	Feb. 21, 1888	
Bourget, C. A.	Levis, Que.	May 14, 1884	
Bowman, H. J.	Berlin, Ont.	Feb. 16, 1888	
Brabazon, A. J.	Ottawa, Ont.	May 12, 1882	
Brady, J.	Golden, B.C.	April 14, 1872	
Bray, S.	Ottawa, Ont.	Nov. 14, 1883	Dept. of Indian Affairs.
Bray, E.	Oakville, Ont.	April 14, 1872	
Bray, L. T.	Amherstburg, Ont.	Feb. 18, 1903	
Bridgland, M. P.	Calgary, Alta.	Mar. 10, 1905	Topog. Surveys Branch, Dept. of Interior.
Brownlee, J. H.	Victoria, B.C.	Apr. 15, 1887	
Burke, W.	Minnedosa, Manitoba.	" 14, 1872	
Burnet, H.	Victoria, B.C.	June 22, 1885	
Burwash, N. A.	Whitehorse, Yukon Territory	Mar. 6, 1907	
Burwell, H. M.	Vancouver, B.C.	Feb. 17, 1887	
Carbert, J. A.	Medicine Hat, Alta.	May 12, 1880	
Carpenter, H. S.	Regina, Sask.	Feb. 20, 1901	Dept. of Public Works for Saskatchewan.
Carroll, C.	Prince Albert, Sask.	April 14, 1872	
Carson, P. A.	Ottawa, Ont.	Feb. 22, 1906	Topog. Surveys Branch, Dept. of Interior.
Cautley, R. H.	Edmonton, Alta.	May 1, 1905	
Cautley, R. W.	"	Sept. 2, 1896	
Cavana, A. G.	Orillia, Ont.	Nov. 16, 1876	
Charlesworth, L. C.	Edmonton, Alta.	Feb. 27, 1903	Dept. of Public Works, Alberta.
Chilver, C. A.	Walkerville, Ont.	" 22, 1907	
Christie, W.	Chesley, Ont.	Mar. 22, 1906	
Coates, P. C.	Golden, B.C.	Apr. 19, 1907	
Cleveland, E. A.	Vancouver, B.C.	June 27, 1899	
Côté, J. A.	Quebec, Que.	May 14, 1884	
Côté, J. L.	Edmonton, Alta.	Mar. 21, 1890	
Cotton, A. F.	New Westminster, B.C.	May 11, 1880	
Craig, J. D.	Ottawa, Ont.	Feb. 24, 1902	Boundary Surveys, Dept of Int.
Cummings, J. G.	Calgary, Alta.	" 17, 1904	
Dalton, J. J.	Weston, Ont.	April 17, 1879	Dominion Topographical Surveyor.
Davies, T. A.	Ottawa, Ont.	Feb. 22, 1906	
Deans, W. J.	Brandon, Man.	May 13, 1886	
Dennis, J. S.	Calgary, Alta.	Nov. 19, 1877	Dominion Topographical Surveyor, Inspector of Irrigation and British Columbia Land Commissioner, C.P.R.

SESSIONAL PAPER No. 25

APPENDIX No. 11.

LIST of Dominion Land Surveyors who have been supplied with Standard Measures.—*Continued.*

Name.	Address.	Date of Appointment.	Remarks.
Denny, H. C.	"	April 1, 1882	
Dickson, H. G.	Whitehorse, Yukon Territory.	May 19, 1889	
Dickson, J.	Fenelon Falls, Ont.	April 14, 1872	
Dobie, J. S.	Regina, Sask.	Mar. 22, 1906	Dept. of Public Works for Saskatchewan.
Doupe, J.	Winnipeg, Man	April 14, 1872	
Doupe, J. L	"	Oct. 6, 1888	Asst. Land Commissioner, C. P.R.
Drewry, W. S.	New Denver, B.C.	Nov. 14, 1883	
Driscoll, A.	Edmonton, Alta.	Feb. 23, 1887	
Drummond, T.	Montreal, Que.	June 24, 1878	Dominion Topographical Surveyor.
Ducker, W. A.	Winnipeg, Man	Mar. 30, 1883	Swamp Land Commissioner.
Dumais, P. T. C.	Hull, Que.	" 29, 1882	
Edwards, Geo.	Ponoka, Alta.	April 14, 1872	
Ellacott, C. H.	Regina, Sask.	Feb. 22, 1899	
Empey, J. M.	Calgary, Alta.	" 23, 1905	
Fairchild, C. C.	Brantford, Ont.	" 20, 1901	
Farncomb, A. E.	Red Deer, Alta.	Mar. 12, 1902	
Fawcett, T.	Niagara Falls, Ont.	Nov. 18, 1876	
Fawcett, A.	Gravenhurst, Ont.	Feb. 22, 1893	
Fontaine, L. E.	Levis, Que.	Aug. 13, 1892	
Foster, F. L.	Toronto, Ont.	April 14, 1872	
Francis, J.	Poplar Point, Man.	June 17, 1875	
Garden, J. F.	Vancouver, B. C.	May 13, 1880	
Garden, G. H.	Lethbridge, Alta.	April 14, 1872	
Garden, C	Winnipeg, Man.	" 14, 1872	
Garner, A. C.	South Qu'Appelle, Sask.	May 27, 1907	
Gauvreau, L. P.	Riviere du Loup, Que.	April 14, 1872	
Gibbon, J.	Dawson, Yukon Territory.	Feb. 12, 1891	
Gordon, M. L.	Vancouver, B.C.	" 18, 1907	
Gordon, R. J.	Stirling, Alta.	Mar. 12, 1902	
Gore, T. S.	Victoria, B. C.	April 19, 1879	
Green, T. D.	Dawson, Yukon Territory.	May 19, 1884	
Green, W. T.	Ottawa, Ont.	Feb. 22, 1907	
Grover, G. A.	Norwood, Ont.	Feb. 18, 1904	
Harris, J. W.	Winnipeg, Man	April 14, 1872	City Surveyor, Winnipeg.
Harvey, C.	Indian Head, Sask.	Feb. 17, 1904	
Hawkins, A. H.	Listowel, Ont.	Mar. 6, 1906	
Heathcott, R. V.	Edmonton, Alta.	May 13, 1907	
Henderson, W.	Chilliwack, B.C.	Nov. 17, 1883	
Holcroft, H. S.	Toronto, Ont.	Feb. 18, 1903	
Hopkins, M. W.	Edmonton, Alta.	" 20, 1901	
Hubbell, E. W.	Ottawa, Ont.	May 19, 1884	Topographical Surveys Branch Dept. of Interior, President of D.L.S. Association.
Irwin, J. M.	Kenora, Ont.	April 14, 1872	
James, S.	Toronto, Ont.	April 14, 1872	
Jephson, R. J.	Winnipeg, Man.	May 12, 1880	
Johnson, A. W.	Kamloops, B.C.	Mar. 12, 1902	
King, W. F.	Ottawa, Ont.	Nov. 21, 1879	Dominion Topographical Surveyor, Chief Astronomer, Dept. of Interior.
Kimpe, M.	Edmonton, Alta.	May 13, 1907	
Kirk, J. A.	Revelstoke, B.C.	May 11, 1880	
Klotz, O. J.	Ottawa, Ont.	Nov. 19, 1877	Dominion Topographical Surveyor, Astronomer, Dept. of the Interior.
Knight, R. H.	Edmonton, Alta.	Feb. 18, 1904	
Latimer, F. H.	Detroit, Mich.	" 13, 1885	
Laurie, R. C.	Battleford, Sask.	April 27, 1883	
Lawe, H.	Ottawa, Ont.	" 14, 1872	
Lemoine, C. E.	Quebec, Que.	Mar. 31, 1882	
Lendrum, R. W	Strathcona, Alta.	May 15, 1880	

APPENDIX No. 11.

LIST of Dominion Land Surveyors who have been supplied with Standard Measures.—*Continued.*

Name.	Address.	Date of Appointment.	Remarks.
Lonergan, G. J.	Buckingham, Que.	Feb. 28, 1901	Inspector of Surveys, Topographical Surveys Branch, Dept. of Interior.
Lumsden, H. D.	Ottawa, Ont.	April 14, 1872	Chief Engineer Trans. Ry.
MacPherson, C. W.	Dawson, Yukon Territory	Mar. 7, 1900	Director of Surveys, Y.T.
Magrath, C. A.	Lethbridge, Alta.	Nov. 16, 1881	Dominion Topographical Surveyor, Land Commissioner, Alberta Railway and Coal Co.
Malcolm, L.	Blenheim, Ont.	April 14, 1872	
Meadows, W. W.	Maple Creek, Sask.	Feb. 23, 1905	District Surveyor and Town Engineer.
Miles, C. F.	Toronto, Ont.	April 14. 1872	Inspector of Surveys, Topographical Surveys Branch, Dept. of Interior.
Moberly, H. K.	Innisfail, Alta.	Feb. 27, 1903	
Molloy, J.	Winnipeg, Man.	April 14, 1872	
Montgomery, R. H.	Prince Albert, Sask.	Feb. 23, 1905	
Moore, H. H.	Calgary, Alta.	Feb. 17, 1904	
McArthur, J. J.	Ottawa, Ont.	" 17, 1879	
McColl, G. B.	Winnipeg, Man.	Mar. 20, 1907	
McFadden, M.	Neepawa, Man.	Feb. 14, 1872	
McFarlane, W. G.	Toronto, Ont.	May 19, 1905	
McFee, A.	Innisfail, Alta.	Feb. 19, 1879	
McGrandle, H.	Wetaskiwin, Alta.	May 30, 1883	
McKenna, J. J.	Dublin, Ont.	April 14, 1872	
McKenzie, J.	New Westminster, B.C.	Nov. 18, 1888	Dominion Lands Agent, New Westminster.
McLean, J. K.	Ottawa, Ont.	April 1, 1882	Dept. of Indian Affairs.
MacLennan, A. L.	Toronto, Ont.	Feb. 23, 1905	
McMillan, G.	Ottawa, Ont.	" 22, 1906	Inspector of Surveys, Topographical Surveys Branch, Dept. of Interior.
McPherson, A. J.	Dawson, Yukon Territory	" 21, 1901	
McPhillips, G.	Windsor, Ont.	June 17, 1875	
McVittie, A. W.	Blairmore, Alta.	Mar. 30, 1882	
Nash, T. S.	Ottawa, Ont.	Feb. 18, 1904	Topographical Surveys Branch, Dept. of Interior, secretary-treasurer of the D.L.S. Assn.
Ogilvie, W.	Ottawa, Ont.	April 14, 1872	
O'Hara, W. F.	Ottawa, Ont.	Feb. 19, 1895	
Ord, L. R.	Winnipeg, Man.	April 1, 1882	
Parsons, J. L. R.	Regina, Sask.	Feb. 23, 1905	
Patrick, A. P.	Calgary, Alta.	Nov. 19, 1877	Dominion Topographical Surveyor.
Pearce, W.	Calgary, Alta.	May 10, 1880	
Phillips, E. H.	Saskatoon, Sask.	Feb. 24, 1902	Dept. of Public Works for Saskatchewan.
Ponton, A. W.	Macleod, Alta.	May 18, 1881	
Proudfoot, H. B.	Saskatoon, Sask.	Mar. 28, 1882	
Rainboth, E. J.	Ottawa, Ont.	May 19, 1881	
Rainboth, G. C.	Aylmer, Que.	April 14, 1872	Boundary Surveys, Dept. Interior.
Reid, J. L.	Ottawa, Ont.	" 14, 1872	Dept. of Indian Affairs.
Reilly, W. R.	Regina, Sask.	Nov. 17, 1881	
Richard, J. F.	Ste Anne de la Pocatière, Que.	May 13, 1882	
Rinfret, E.	Montreal, Que.	Feb. 20, 1900	
Ritchie, J. F.	Nelson, B.C.	Jan. 7, 1889	
Robertson, H. H.	Montmagny, Que.	April 14, 1872	
Roberts, S. A.	Victoria, B.C.	May 16, 1885	
Roberts, V. M.	Sturgeon Falls, Ont.	" 17, 1886	
Robinson, F. J.	Regina, Sask.	Feb. 22, 1906	Dept. of Public Works for Saskatchewan.
Rombough, M. B.	Morden, Man.	April 14, 1872	

APPENDIX No. 11.

List of Dominion Land Surveyors who have been supplied with Standard Measures.—*Concluded.*

Name.	Address.	Date of Appointment.	Remarks.
Rorke, L. V	Toronto, Ont	Aug. 13, 1891	
Ross, G	Welland, Ont	Nov. 21, 1882	
Ross, J. E	Kamloops, B.C.	Feb. 12, 1901	
Roy, G. P	Quebec, Que	Nov. 17, 1881	
Saint Cyr, J. B	Ste. Anne de la Pérade, Que	Feb. 17, 1887	
Saint Cyr, A	Ottawa, Ont	" 17, 1887	
Saunders, B. J	Edmonton, Alta	Nov. 16, 1884	
Seager, E	Kenora, Ont	April 14, 1872	
Selby, H. W	Toronto, Ont	Nov. 15, 1882	
Seymour, H. L	Edmonton, Alta	Feb. 22, 1906	
Sewell, H. de Q	Toronto, Ont	May 16, 1885	
Shaw, C. A. E	Victoria, B.C	" 10, 1880	
Shepley, J. D	Leamington, Ont	Mar. 12, 1906	
Smith, C. C	Brampton, Ont	Feb. 22, 1906	
Speight, Thos	Toronto, Ont	Nov. 16, 1882	
Stacey, A. G	Ottawa, Ont	Feb. 22, 1906	
Starkey, S. M	Starkey's P.O., N.S	April 14, 1872	
Stewart, G. A	Calgary, Alta	" 14, 1872	
Stewart, L. B	Toronto, Ont	Nov. 22, 1882	Dominion Topographical Surveyor, Professor of Surveying, School of Practical Science.
Stewart, E	Ottawa, Ont	April 14, 1872	
Stewart, W. M	Hamilton, Ont	June 26, 1907	
Talbot, A. C	Calgary, Alta	May 13, 1880	
Taylor, A	Winnipeg, Man	June 9, 1904	
Teasdale, C. M	Concord, Ont	Mar. 9, 1906	
Thompson, W. T	Fort Qu'Appelle, Sask	Nov. 19, 1877	Dominion Topographical Surveyor.
Tracy, T. H	Vancouver, B.C.	April 14, 1872	City Engineer, Vancouver.
Tremblay, A. J	Les Eboulements, Que	Feb. 18, 1890	
Towle, C. E	Magog, Que	April 14, 1872	
Turnbull, T.	Winnipeg, Man	Mar. 29, 1882	
Tyrrell, J. W	Hamilton, Ont	Feb. 16, 1887	
Vaughan, J. W	Vancouver, B.C.	June 11, 1878	
Vicars, J	Kamloops, B.C.	May 17, 1886	
Waddell, W. H	Hamilton, Ont	Mar. 25, 1907	
Waldron, J	Moosejaw, Sask	April 2, 1907	
Walker, E. W	Regina, Sask	Mar. 27, 1907	Dept. of Public Works for Saskatchewan.
Wallace, J. N	Calgary, Alta	Feb. 20, 1900	
Warren, J	Walkerton, Ont	April 14, 1872	
Watt, G. H	Ottawa, Ont	Feb. 24, 1902	
Weekes, A. S	Clinton, Ont	" 11, 1892	
Weekes, M. B	Ottawa, Ont	" 18, 1903	
Wheeler, A. O	Calgary, Alta	Nov. 21, 1882	Topographer of the Department of the Interior.
White-Fraser, G. W. R.	Ottawa, Ont	Feb. 21, 1888	Dominion Topographical Surveyor.
Wiggins, T. H	Regina, Sask	" 18, 1886	
Wilkins, F. W	Norwood, Ont	May 18, 1881	Dominion Topographical Surveyor.
Wilkinson, W. D	Toronto, Ont	Feb. 22, 1893	
Woods, J. E	Frank, Alta	Nov. 14, 1885	
Young, W. B	Winnipeg, Man	Mar. 25, 1905	
Young, W. H	Lethbridge, Alta	May 16, 1907	

APPENDIX No. 12.

Examination Papers of the Board of Examiners for Dominion Land Surveyors.

EXAMINATION FOR ADMISSION AS ARTICLED PUPIL—FULL PRELIMINARY.

XXXI.

February 11 to 14, 1908.

PENMANSHIP AND ORTHOGRAPHY.

Write out correctly the following:

The proputty witch sault posesses of preszerving annimle substainses from pewtrifaeshun is reezolved by Liebig into too more jennerel lause, the strong atraeshun of sault for watter, and the nessessity of the presents of watter as a condishon of pewtrefashun. The intermeadiet fennomennon witch is interpollated betwean the remoat caws and the efekt can hear be not mearly infered but sean ; for it is a fammilyer fakt that flesh uppon witch sault has bin throne is speadely fownd swiming in bryne.

Wun has, two a sertin exstent, a powwer to awlter his karaktar. Its being in the ultimmet ressort, fourmd for him, is not inkoncistent with its beeing, in part, fourmd by him as wun of the intermeadget ajence. His karektar is fourmd buy his serkumstanses (inklewding amung theas his partikuller orgenisashun), but his owen desyer to mold it in a partikkeller weigh, is one of thows sercumstanzes, and buy no menes the leest inflewenshel. We kannut, indede dirrektlie wil to bee diferant from wot wee arr. But neether did thows hoo arr supowsd to have fourmd ower karaktres, dyrrektlie wil that we shood bee wot wee arr. There wil hadd no dyrekt powwer exept ovar there owen axions. They maid us wot they did maike us, buy nott the end, butt the rekwisit menes; and we, wen ower habbits are not two invetteret, can, by simmillarly wiling the rekwisit menes, maike owerselfs diferant. If they cood plaice us under the inflewents of sertin serkumstanzes, we, in lyke manor, can plaice owerselfs under the inflewents of other serkumstanzes. Wee arr exaktlie as kaipabel of maiking ower owen karrakter. *if we wil*, as othars arr of maiking it four uss.

SESSIONAL PAPER No. 25

ARITHMETIC AND LOGARITHMS.

Marks.

(Time, 3 hours.)

1. Find the H.C.F. of 126025 and 40115; and of 12321 and 54345. 12

2. Find the Least Common Multiple of 50, 338, 675, 702 and 975. 12

3. How long would a column of men, extending 3420 feet in length, take to march through a street a mile long at the rate of 58 paces a minute, each pace being 30 inches? 12

4. Find the square root of 3 to seven places of decimals; and the cube root of 27054·036008. 16

5. If log sin $a = 9{\cdot}2873193$
log tan $b = 1{\cdot}7854321\ n$
log cos $c = 8{\cdot}9583428$
Find a, b, and c and the angle whose tangent is tan b cos c.
If, further, log tan $d = 1{\cdot}7854321$, find $b + d$. 16

6. Find from the Tables,
log 23·487,
log ·023487,
log sec 97° 23′ 54″
log sin 118° 23′ 37″·3 16

7. Find by logarithms the value of
$(93{\cdot}285)^{\frac{2}{3}} \times (0{\cdot}85)^{-\frac{4}{5}} \times (\cdot 0035)^{\frac{1}{2}} \div (107{\cdot}34)^{\frac{5}{8}}$ 16

ALGEBRA.

(Time, 3 hours.)

Marks.

1. Reduce to its lowest terms
$$\frac{2\ a^4 + 3\ a^2x - 9\ a^2x^2}{6\ a^4x - 17\ a^3x^2 + 14\ a^2x^3 - 3ax^4}$$ 12

2. Find the least common multiple of
$6\ (a^2 - b^2)\ (a - b)^3$, $9\ (a^4 - b^4)\ (a - b)^2$ and $12\ (a^2 - b^2)^3$. 13

3. Simplify :
$$\left\{ \frac{x^2+y^2}{x^2-y^2} - \frac{x^2-y^2}{x^2+y^2} \right\} \div \left\{ \frac{x+y}{x-y} - \frac{x-y}{x+y} \right\}$$ 15

4. A party were to divide their expenses equally. Had there been three persons more and each paid 5 cents more, the bill would have been $3.75 more; but if there had been 10 persons less, and each had paid 7 cents less, it would have been $9.56 less. How many persons were there and how much did each pay ? 15

Marks.

5. Solve the simultaneous equations:

$$x + y + z = a + b + c$$
$$bx + cy + az = cx + ay + bz$$
$$= ab + bc + ca$$

15

6. Solve the equations:

$$2\left(x^{\frac{1}{n}} + x^{-\frac{1}{n}}\right) = 5$$
$$(x^2 + a)\ (x + b) = ab$$

15

7. Divide 40 into two such parts that the sum of their squares shall be 818. 15

PLANE GEOMETRY.

First Paper.

Marks.

(Time, 3 hours.)

1. What is the difference between an axiom and a postulate? What is meant by 'reductio ad absurdum'? 12

2. If two triangles have two sides of the one equal to two sides of the other, each to each, and also the angles included by the equal sides equal, the triangles are equal in all respects. 12

3. In what cases does equality of three of the six parts (three sides, three angles) each to each in two triangles, involve equality of the triangles? 12

4. All the exterior angles of any rectilinear figure, made by producing the sides successively in the same direction, are together equal to four right angles? 12

5. The sum of the angles of a square is equal to four right angles. Is the converse true? If not, why not? 13

6. If a straight line be bisected and produced to any point, the square on the whole line thus produced, and the square on the part of it produced, are together double of the square on half the line bisected, and of the square on the line made up of the half and the part produced. 13

7. What algebraic proposition corresponds to the proposition in Question 6? State the geometric proposition corresponding to the algebraic one: $(a + b)\ (a - b) + b^2 = a^2$. 13

8. Wherein is a geometrical proof of the properties of squares or rectangles with relation to their areas, more complete than an algebraic one? 13

PLANE GEOMETRY.

Second Paper.

Marks.

(Time, 3 hours.)

9. Describe a square that shall be equal to a given rectilineal figure. 12

10. If in a circle two straight lines cut one another, which do not both pass through the centre, they do not bisect each other. 12

11. The opposite angles of any quadrilateral figure inscribed in a circle, are together equal to two right angles. 12

12. From a given circle cut off a segment which shall contain an angle equal to a given rectilineal angle. 12

13. To describe a circle about a given triangle. 13

14. What is meant by incommensurable magnitudes? Give a geometrical instance of incommensurability. 13

15. If an angle of a triangle be bisected by a straight line which cuts the opposite side, the segments into which this side is divided are in the same ratio as the other sides of the triangle; and conversely. 13

16. In equal circles, angles, whether at the centres or circumferences have the same ratio which the arcs on which they stand have to one another; so also have the sectors. 13

PLANE TRIGONOMETRY.

Marks.

(Time, 3 hours.)

1. Deduce the expression for the area of a triangle in terms of its sides. 16

2. Prove that

$$\sin (A + B) \sin (A - B) = \sin^2 A - \sin^2 B,$$

and that

$$\cos (A + B) \cos (A - B) = \cos^2 A - \sin^2 B.$$ 16

3. Given

$a = 35{\cdot}3,\ b = 54{\cdot}7,\ A = 33^\circ\ 25'$

solve the triangle. 17

4. Given

$b = 17{\cdot}34,\ c = 29{\cdot}85,\ A = 125^\circ\ 43'$

find a. (Do not solve by natural trigonometric functions.) 17

5. Given

$A = 25^\circ\ 33',\ B = 117^\circ\ 08';\ a = 125{\cdot}33,$

find c. 17

6. Given

$a = 23{\cdot}5,\ b = 37{\cdot}7,\ c = 31{\cdot}2,$

find the angles. 17

SPHERICAL TRIGONOMETRY.

(Time, 3 hours.)

Marks.

1. State Napier's rules for the solution of right-angled spherical triangles. Deduce similar rules for the solution of triangles in which one side is a quadrant. 20

2. Given $c = 145°$, $a = 25°$, $C = 90°$; solve the triangle. 20

3. Given $b = 123°\ 15'$, $c = 135°\ 10'$, $A = 15°\ 27'$; find a. 20

4. Given $B = 140°\ 10'$, $C = 55°\ 42'$, $a = 63°\ 26'$; find A. 20

5. Given $A = 125°$, $B = 135°$, $C = 85°$; find a. 20

NOTE.—Do not use natural trigonometric functions in the solution of triangles.

MENSURATION.

(Time, 3 hours.)

Marks.

1. The sides of a triangular field are 3·54, 12·62 and 11·38 chains. Find the area in acres. 14

2. The perimeter of a field which has the form of a triangle similar to that in question 1 is 41·31 chains. What is its area? 14

3. What fraction of the earth's surface lies between latitudes 50° and 60°, and between longitudes 90° and 120°? 14

4. On a certain map it is found that an area of 16,000 acres is represented by an area of 6·25 square inches. Determine the scale of the map in miles to the inch. 14

5. A right circular cylinder and a right circular cone stand on equal bases and are of the same altitude, the altitude being equal to the length of a diameter of either base. Find the ratio (*a*) of the curved surfaces; (*b*) of the whole surfaces of the cone and cylinder. 15

6. A cylindric tube 8 feet long and 2 feet 6 inches in diameter is closed at each end by a hemisphere. Find the area of the whole external surface. 15

7. The area of a field determined by chain measurement is afterwards found to be greater than it should be by one-fortieth part. What was the true length of the chain with which the first measurement was made? 14

EXAMINATION FOR ADMISSION AS ARTICLED PUPIL—LIMITED PRELIMINARY.

XIX.

February 11, 1908.

FIRST PAPER.

(Time, 3 hours.)

Marks.

1. Penmanship and Orthography. (Same as in the Full Preliminary Examination.) { 50 / 200 }

Marks

2. Given $\log 1{\cdot}944 = 0{\cdot}28869627$
and $\log 1{\cdot}728 = 0{\cdot}23754373$
find the logarithms of 45 and 75. 50

3. Two travellers A and B set out at the same time from two places, P and Q, and travel so as to meet. When they meet it is found that A has travelled 30 miles more than B, and that it will take A and B 4 days and 9 days respectively to complete their journeys. Find the distance between P and Q. 50

4. Find the value of
$$\frac{\sqrt{a+bx}+\sqrt{a-bx}}{\sqrt{a+bx}-\sqrt{a-bx}} \text{ when } x=\frac{2ac}{b\ (1+c^2)}$$ 50

5. If a quadrilateral figure is bisected by one diagonal, the second diagonal is bisected by the first. 50

6. From the formula $c^2 = a^2 + b^2 - 2ab \cos C$, and the analogous formulæ for the squares on the other sides, prove that
$$\frac{a}{\text{Sin } A} = \frac{b}{\text{Sin } B} = \frac{c}{\text{Sin } C}.$$ 50

7. Prove that
$(\cos A + \cos B)^2 + (\sin A + \sin B)^2 = 4 \cos^2 \frac{1}{2}(A - B)$. 50

8. Similar triangles are to one another as the squares on their homologous sides. 50

Second Paper.

Marks

(Time, 3 hours.)

9. Two chimneys are of equal height. A person standing between them in the straight line joining their bases observes the elevation of the nearer one to him to be 60°. After walking 80 feet in a direction at right angles to the straight line joining their bases, he observes the elevations of the two to be 45° and 30°. Find their height, and the distance between them. 50

10. If the surface areas of a sphere, a cube and a regular tetrahedron are equal to one another, find the ratios of the diameter of the sphere, to the side of the cube and the edge of the tetrahedron. 50

11. Prove that the straight line bisecting an angle of a triangle, either internally or externally, divides the opposite side into parts which are in the same ratio as the other sides of the triangle. 50

12. Apply the preceding proposition to find the locus of a point whose distances from two given points are in a given ratio. 50

13. Given $b = 99° 41'$; $c = 100° 50'$; $A = 65° 33'$, find a. (Do not use natural trigonometric functions.) 50

14. Given $c = 75° 31'$; $a = 90°$; $B = 30° 53'$, find the other parts. 50

15. Find the value of
$$\left(\frac{23}{31}\right)^{\frac{3}{4}} + \left(\frac{13}{17}\right)^{-\frac{4}{5}} + \left(\frac{3}{4}\right)^{\frac{2}{3}} - \left(\frac{28}{39}\right)^{1\frac{1}{2}}$$ 50

FINAL EXAMINATION FOR DOMINION LAND SURVEYOR.

XXXIX.

(February 11 to 18, 1908.)

PENMANSHIP AND ORTHOGRAPHY.

(Time, 3 hours.)

The same paper is used as in the full preliminary examination. Marks. { 50 / 200

ALGEBRA.

(Time, 3 hours.) Marks.

1. Find the G. C. M. of $2x^5 - 11x^2 - 9$ and $4x^5 + 11x^4 + 81$: and the L. C. M. of $x^3 - 6x^2 + 11x - 6$, $x^3 - 9x^2 + 26x - 24$, and $x^3 - 8x^2 + 19x - 12$. 10

2. Simplify $\dfrac{\dfrac{m^2+n^2}{n} - m}{\dfrac{1}{\frac{1}{n} - \frac{1}{m}}} \left(\dfrac{m^2-n^2}{m^3+n^3}\right)$;

and $\cfrac{a}{b + \cfrac{c}{d + \cfrac{e}{f}}}$. 10

3. Solve $\left(\dfrac{x-a}{x+b}\right)^3 = \dfrac{x-2a-b}{x+a+2b}$;

and $4{\cdot}8x - \dfrac{{\cdot}72x - {\cdot}05}{{\cdot}5} = 1{\cdot}6x + 8{\cdot}9$ 10

4. Two persons, A and B, could finish a work in m days; they worked together n days when A was called off and B finished it in p days. In what time could each do it? 10

5. Solve the simultaneous equations:

$$x + y + z = a + b + c,$$
$$bx + ey + az = cx + ay + bz = ab + bc + ca.$$ 10

6. Show that the G. C. M. of two quantities is the G. C. M. of their common measures. 10

7. Solve $x^{-1} + x^{-\frac{1}{2}} = 6$,
and $x + \sqrt{(5x + 10)} = 8$. 10

8. Find that number whose square added to its cube is nine times the next highest number. 10

9. What are eggs a dozen when two more in 24 cents worth lowers the price two cents per dozen? 10

10. Divide a given line into two parts such that twice the square on one part may be equal to the rectangle contained by the whole line and the other part. 10

PLANE GEOMETRY.

(Time, 3 hours.)

Marks.

1. Describe a circle about a given triangle. 18

2. Prove that the perimeter of a triangle is less than the perimeter of any triangle which is drawn completely surrounding it. 18

3. Construct a rectangle equal to the sum of two given triangles. 19

4. In a triangle, BAC is the greatest angle. Prove that if a point D be taken in AB and a point E in AC, DE is less than BC. 19

5. Construct geometrically $a\ (a-x) = x^2$ where a represents the length of a line. 19

6. If two chords of a circle when produced intersect at a point without the circle, the rectangle contained by the segments of one chord is equal to the rectangle contained by the segments of the other chord. 19

7. If one pair of opposite sides of a quadrilateral inscribed in a circle intersect at a fixed point, the other pair of opposite sides intersect on a fixed straight line. 19

8. If an angle of a triangle be bisected internally or externally by a straight line which cuts the opposite side, or that side produced, the ratio of the segments of that side is equal to the ratio of the other sides of the triangle. 19

SOLID GEOMETRY.

(Time, 3 hours.)

Marks.

1. Name the regular solids and give for each the number of faces, corners and edges. 8

2. The sum of any two plane angles of a trihedral angle is greater than the third angle. 8

3. If two intersecting planes be at right angles to the same place, their common section is at right angles to it. 8

4. Polygons formed by cutting the faces of a polyhedral angle by parallel planes are similar to one another. 8

5. If the edge of a tetrahedron is 10 inches, what is the radius in inches of the sphere of equal volume? 11

6. If the edge of a tetrahedron is 10 inches, what is the radius in inches of a sphere of equal surface? 11

7. If the annual rainfall in the Khasi Hills is 610 inches, what is the weight of water yearly received by an acre, a cubic foot of water weighing 62·5 lbs.? 10

8. A cylinder 10 inches in diameter and 20 inches high is half full of water; into it is placed vertically a wooden cone, base 8 inches in diameter, height 10 inches, specific gravity of the wood ·5; how high will the water rise in the cylinder? 11

SPHERICAL TRIGONOMETRY.

(Time, 3 hours.)

Marks.

1. Prove $\cos A = \dfrac{\cos a - \cos b \cos c}{\sin b \sin c}$ 13

2. Deduce $\tan \frac{1}{2}(A+B) = \dfrac{\cos \frac{1}{2}(a-b)}{\cos \frac{1}{2}(a+b)} \cot \frac{1}{2} C$. 14

3. Deduce $\tan \frac{1}{2} a = \sqrt{-\dfrac{\cos S \cos (S-A)}{\cos (S-B) \cos (S-C)}}$ 14

4. Prove Napier's rules 14

5. Given $a = 68° 20'$, $b = 52° 18'$; $C = 117° 12'$, find c. 14

6. The sides of a triangle are 105°, 90° and 75° respectively, find the sines of all the angles. 14

7. Given $B = 70°$, $C = 100°$, $a = 40°$, find A. 14

8. Given $a = 32° 12'$, $b = 30° 15'$, $c = 28° 18'$, find C. 14

9. Taking the radius of the earth as 4,000 miles, what is the approximate area of the triangle in square miles, whose spherical excess is 1″? 14

MEASUREMENT OF AREAS AND SUBDIVISION OF LAND.

First Paper.

(Time, 3 hours.)

Marks.

1. In a triangular field, $AB = 10$ ch., $BC = 14$ ch., $CA = 12$ ch.; through the point within the field distant 8 chs. from A, and 6 chs. from B, a line is drawn bisecting the field; find the length of the dividing line. 17

2. Divide a quadrilateral in a given ratio by a straight line starting from a given point in one of the sides. 17

3. If the diameter of the sun is 800,000 miles, that of the earth 8,000, and their distance apart 92,000,000 miles, what is the limiting value in latitude of the circle of illumination at the time of the equinoxes, and what proportion of the earth's surface is directly illuminated, neglecting refraction. 17

4. Through the northerly part of Sec. 3, Tp. 33, R. 5, W. of 3rd M., runs a railway, width of right-of-way 100 ft.; the centre line crosses the western boundary of the section 10·20 ch. from the N.W. corner, and continues on a course N. 60° E. The part of the section lying south of the railway is to be divided into equal parts by a straight line running from the quarter section post on the southern boundary. What is the azimuth and length of the dividing line? 17

5. A kite-shaped race track is 50 ft. wide. The centre-line, half a mile long, is composed of two tangents, including an angle of 60°, and a circular arc connecting them. What is the length of the tangents, and what is the area of the track? 16

6. What is the ratio of the perimeters enclosing an area of n acres, by a circle, equilateral triangle, square, pentagon, hexagon and octagon? 16

MEASUREMENT OF AREAS AND SUBDIVISION OF LAND.

Second Paper.

(Time, 3 hours.)

Marks.

7. The following are the notes of a survey:
   1. S. 69° 15′ E. 7·06 chains.
   2. N. 37° 15′ E. 5·93 "
   3. N. 39° 30′ W. 6·00 "
   4. S. 57° 45′ W. 4·65 "
   5. S. 30° 00′ W. 4·98 "

   Find the area by the method of Latitudes and Departures, first 'balancing' the survey. 40

8. Express the conditions necessary for a closed survey by two equations.
   (*a*) From these show what missing data in a survey can be supplied.
   (*b*) Show when ambiguity may arise, and how the supplying of missing data affects balancing the survey. 20

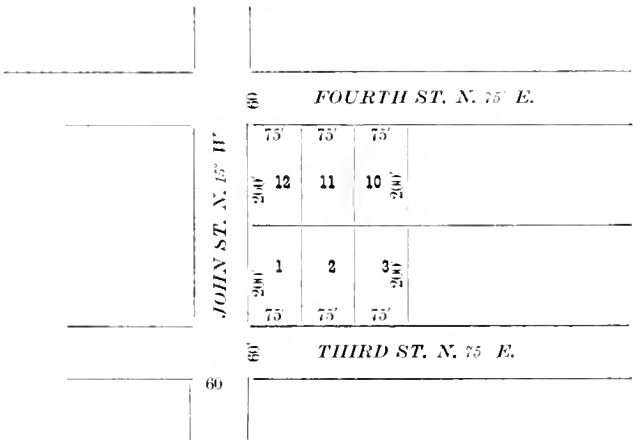
9. Explain by diagram fully the rule: 'Twice the area of the figure is equal to the algebraic sum of the products of the double meridian distances of the several courses into the corresponding latitudes.' 20

10. What is the method of balancing a survey:
    (*a*) On the assumption that the error of closure is as much due to erroneous bearings as to erroneous chaining?
    (*b*) On the assumption of erroneous chaining alone?
    What is the true area of the above field if the chain was one link too short? 20

DESCRIPTIONS.

(Time, 3 hours.)

Marks.



The above is part of the registered plan of the town of Holly in the County of Tweed and Province of Alberta. *A* sells to *B* a part of lot No. 1, and adjoining John and Third streets. The part sold is to have a frontage of forty feet on Third street to extend to the rear of the lot and the dividing line to be parallel to John street. Make a description for a deed. 25

Marks.

2. Using the plan of question 1. Supposing *A* to own lots Nos. 1 and 2, he sells lot No. 2 to *B*, and gives the right of ingress and egress to *B* by a lane, 16 feet wide, running along the whole of the rear limit of lot No. 1. Make the necessary description for the conveyance. 25

3. Moose Creek flows across the N. E. $\frac{1}{4}$ S. 12, T. 13, R. 15 W. in an easterly direction. *B* desires to buy the northerly part of the quarter section lying north of the creek, together with the creek. From measurement the southerly bank of the creek intersects the eastern and western quarter section lines respectively at 22^{ch} 12 and 20^{ch} 18 from the northern quarter section line. The whole area to be conveyed is supposed to contain 85 acres. Make a description for a deed. 25

4. Make a description for the remaining part of the quarter section given in question 3. 25

ASTRONOMY.

First Paper.

Marks.

(Time, 3 hours.)

1. Explain fully the equation of time, why it varies and when it is a maximum. A diagram is desirable. 14

2. The longitude of Ottawa is 5h. 02m. 52s. What kind of time is this? Why? 14

3. In latitude 45° 25′, longitude 75° 43′, what is the standard time of eastern elongation of Polaris, on May 27, 1904? 14

4. Without tables or computation give the approximate local mean time of eastern elongation of Polaris for any place in Ontario on the 20th of each month in the year. 14

5. For the same place and time as question 3, what was the azimuth of δ Urs. Min. at western elongation?
$\delta = 86° 36' 46''$; $a = 18h. 02m. 36s.$ 14

6. On the same date the observed altitude of Arcturus when on the prime vertical was 45° 38′. What is the latitude of the place? 15

7. What is the standard time of sunrise for the place and time of question 3? 15

ASTRONOMY.

Second Paper.

(Time, 3 hours.)

Marks.

8. On the 4th Base Line, R. V-VI, W. of 3rd M. on May 27, 1904, in the forenoon the mean of the observed altitudes of the upper and lower limb of the sun was 42° 13′ 30″ when a watch showed 9h. 02m. 14s. What was the azimuth of the sun, and what was the error of the watch on standard time? 17

9. In question 8, what was the true local sidereal time of observation? 17

10. What is the longitude of the place for which the time shown by the watch in question 8, was at that instant the local sidereal time? 17

11. On the 20th June, 1904, the altitude of the sun's centre at its lower or northern culmination was 10° 32′. What was the latitude of the place of observation? 17

12. What is the standard time of rising for Arcturus for the time and place in question 8? 13

13. What is the right ascension of a star that crosses the meridian of place and date of question 8 at 10 p.m. local mean time? 16

MANUAL OF SURVEY.

First Paper.

(Time, 3 hours.)

Marks.

1. Where are the Initial Meridians now in use? 3

2. Between what townships is the 73rd correction line? 3

3. How is the deficiency or surplus on the meridians between two base lines disposed of? 4

4. Define a bearing and an azimuth. 11

5. To what meridian is a bearing referred in subdividing a township, and how is it deduced from an observed azimuth? 11

6. What is to be done when the road allowance on a correction line is less than 80 links wide? 5

7. In closing a correction line on an initial meridian, what is to be done when the meridian intersects the jog? 7

8. Give the rules to be observed in measuring a distance by means of a triangle. 5

9. When is a quarter section considered as sufficiently surveyed for disposal? 5

10. What are the limits of error in a township subdivision survey? 8

11. Describe the different kinds of posts, mounds, pits and trenches used in the present system of survey; show how and where they are placed. 20

12. How is a settlement surveyed? 11

13. How is a group lot surveyed? 7

MANUAL OF SURVEY.

SECOND PAPER.

(Time, 3 hours.)

Marks.

14. By what considerations is a surveyor to be guided in deciding whether a road allowance shall or shall not be left along the boundary of an Indian reserve when subdividing a township? 4

15. What connections have to be made in a township subdivision survey? 4

16. For what purposes are traverses made in connection with surveys of Dominion lands? 5

17. Define the *bank*, the *shore* and the *bed* of a body of water. 2

18. What are the rights of the owner of a piece of land fronting on a lake or river? 11

19. What are the bodies of water to be surveyed in subdividing a township, and what are those which are not to be surveyed? 9

20. In what cases is the area of the bed of a river to be deducted from the area of a quarter section crossed by it? 6

21. When are both banks of a river to be traversed? 4

22. What is to be done when the edge of a marsh varies ten chains or more according to the height of water? 8

23. How are the following posts to be marked?

(*a*) At the corner between sections 19, 20, 29 and 30, township 59, range 9, east of the principal meridian.

(*b*) At the southerly corner between sections 4 and 5, township 67, range 22, west of the 3rd meridian.

(*c*) At the southerly corner between sections 15 and 16, township 31, range 14, west of the 2nd meridian. (On the north side of the road allowance between two different systems of surveys.)

(*d*) At the southerly corner of township 103, between ranges 13 and 14, west of the 4th meridian.

(*e*) At the witness mound placed 9 chains north of the S.E. corner of section 12, township 47, range 9, west of the 5th meridian. 20

24. Define a resurvey, a retracement, a restoration survey, an obliterated corner, and a lost corner. 8

25. Give the rules governing resurveys, retracements and restoration surveys. 8

26. Under what circumstances is a subdivider justified in resurveying or retracing a township outline without instructions from the head office? 5

EXAMINATION FOR CERTIFICATE AS DOMINION TOPOGRAPHICAL SURVEYOR.

February 11 to 13, 1908.

XI.

ALGEBRA.

(Time, 3 hours.)

Marks.

1. Show that $\underline{/1}\ \underline{/3}\ \underline{/5}\ \ldots\ldots\ \underline{/2n-1>}\ \underline{(/n)^r}$ 6

2. Find the number of ways in which (1) a selection, (2) an arrangement of four letters can be made from the letters of the word 'proportion.' 6

3. Find the sum of the products, two at a time, of the co-efficients in the expression of $(1+x)^n$, when n is a positive integer. 6

4. Prove that $1+\frac{3}{8}+\frac{3\cdot5}{8\cdot10}+\frac{3\cdot5\cdot7}{8\cdot10\cdot12}+\ldots\ldots a=2$ 6

5. Express $\frac{1}{2}(e^{ix}+e^{-ix})$ in ascending powers of x when $i=\sqrt{-1}$. 5

6. The integral part of $\frac{1}{\sqrt{3}}(\sqrt{3}+\sqrt{5})^{2n+1}$ and the integer next greater than $(\sqrt{3}+\sqrt{5})^{2n}$ are each divisible by 2^{n+1} 6

7. A certain stake is to be won by the first person who throws an ace with an octahedral die. If there are 4 persons, what is the chance of the last? 5

8. Find the sum of the fifth powers of the roots of the equation:
$x^4-7x^2+4x-3=0$ 5

9. Calculate the value of the determinant:

$$\begin{vmatrix} 3 & 2 & 1 & 4 \\ 15 & 29 & 2 & 14 \\ 16 & 19 & 3 & 17 \\ 33 & 39 & 8 & 38 \end{vmatrix}$$ 5

PLANE AND SPHERICAL TRIGONOMETRY.

(Time, 3 hours.)

Marks.

1. Sum to n terms the series:
Sin 3 θ sin θ + sin 6 θ sin 2 θ + sin 12 θ sin 4 θ +..... 9

2. If x be the circular measure of a positive angle less than a right angle, sin x is greater than $x-\frac{x^3}{6}$ 9

3. Compute the ratio ($=\pi$) of the circumference of a circle to its diameter. 8

4. Solve the equations (1) sin 9 x + sin 5 x + 2 sin $^2x=1$
(2) $\frac{\cos\ ^3a}{\cos\ x}+\frac{\sin\ ^3a}{\sin\ x}=1$ 9

5. (*a*) Explain the principle and derivation of addition and subtraction logarithms.
(*b*) Give illustrations of applicability. 8

Marks.

6. Given the equation $\tan z = \frac{m \sin a}{1 + m \cos a}$ to express z in a series of multiples of a. 8

7. (*a*) Give the three fundamental equations for the general spherical triangle.
(*b*) Give the solution of oblique spherical triangles by means of a perpendicular, applying same to Case I, given b, c, and A; Case II, given A, C, and b. 8

8. Adapt the expression $a \cos A + b \cos B + c \cos C$ to logarithmic computation, the letters denoting the sides and the angles of a triangle. 8

9. If k is the area of a spherical triangle, show that

$$\tan \tfrac{1}{4} k = \sqrt{\left[\tan \tfrac{1}{2} s \tan \tfrac{1}{2} (s-a) \tan \tfrac{1}{2} (s-b) \tan \tfrac{1}{2} (s-c) \right]}$$ 8

ANALYTICAL GEOMETRY—TWO DIMENSIONS.

Marks.

(Time, 3 hours.)

1. Find the equation of a straight line in terms of its intercepts on the axes of coördinates. 8

2. Define 'anharmonic ratio,' illustrating by a diagram. 8

3. Deduce the equation to the tangent to the circle $x^2 + y^2 = a^2$ at the point x, y. 8

4. Define 'radical axis,' and prove analytically that the radical axes of three circles meet in a point. 8

5. Write down the equation of the ellipse referred to its centre and axes. Prove that the sum of the two focal distances of a point on the curve is equal to the major axis and that the perpendicular to the directrix is in a constant ratio to the focal distance. 8

6. Find the equation to the normal to the ellipse at a given point on the curve. How many normals may be drawn to the ellipse from a point not on the curve? 10

Three Dimensions.

7. Write down the equation to a straight line given the coördinates of two points upon it, and find the angles which it makes with the axes of coördinates. 10

8. Give formulæ for the transformation of coördinates, without changing the origin, in terms of the direction cosines of the new axes as referred to the old. 12

9. Find the condition that the plane $lx + my + nz + p = o$ may touch the conicoid $ax^2 + by^2 + cz^2 + d = o$. 12

10. Prove that the sections of an ellipsoid by parallel planes are similar ellipses. Hence deduce the relation between the radii of curvature of the sections of an ellipsoid made by different planes containing the normal at a given point. 16

DESCRIPTIVE GEOMETRY AND PROJECTIONS.

(Time, 3 hours.)

Marks.

1. Two intersecting straight lines being given by their projections, find the angle of the lines. 8

2. Two straight lines which do not intersect being given their projections, find the shortest line joining them. 9

3. Given the declination and hour angle of a star and the latitude of the place, find the azimuth of the star. 9

4. Give the definition of the picture plane, principal point, horizon line, distance points and vanishing points in a perspective.
   Given the altitude of a point above the ground plane and its horizontal projection, find its perspective. 9

5. It is desired to construct a map of Canada comprised between latitudes 42° and 60° north and longitudes 56° and 141° W. of Greenwich. Comparing the polyconic and the secant conical projections, what are the maximum errors of representation in each case? 15

6. In a perspective projection, explain how you find where the point of vision must be placed in order that the total misrepresentation over a given area be a minimum. 15

7. Define the conical Orthomorphic projection (Gauss' or Lambert's second). What are its properties and for what kind of maps is it best adapted? 10

DIFFERENTIAL AND INTEGRAL CALCULUS.

(Time, 3 hours.)

Marks.

1. Differentiate with respect to x

$$\log \left\{ 2x - 1 + 2\sqrt{x^2 - x - 1} \right\}$$

$$e^x \tan^{-1} x$$

$$\cos^{-1} \left\{ \frac{3 + 5\cos x}{5 + 3\cos x} \right\}$$ 10

2. If A be the chord of any circular arc, B that of half the arc, prove that the length of the arc is equal to

$$2B + \tfrac{1}{3}(2B - A),$$

with an error which, for an arc equal to the radius, is less than 1 in 7680. 10

3. From Taylor's series derive John Bernouilli's series. 10

4. If u is a homogeneous function of x and y of the n^{th} degree, prove that

$$x\frac{du}{dx} - y\frac{du}{dy} = nu$$ 10

5. Find the maximum value of $x^{\frac{1}{x}}$, also its limiting value when $x = o$ or ∞. 10

Marks.

6. Find the radius of curvature of an ellipse at the point where the normal makes an angle of ϕ with the major axis. 10

7. Sum the series

$$p_1 + \tfrac{1}{2}\, p_2 + \tfrac{1}{3}\, p_3 + \ldots\ldots\ldots\ldots\ldots\ldots \frac{1}{n}\, p_n$$

where $\dfrac{1}{p_r} = \dfrac{n}{r} + \dfrac{r}{n}$

when n is indefinitely increased. 10

8. Obtain a formula of reduction for the integral

$$\int e^{ax} \cos^n x \, dx$$ 10

9. State Simpson's Rule and apply it to determining the area of an ellipse included between two ordinates to the major axis. 10

10. Find the volume and moment of inertia about its axis of a section of a paraboloid formed by revolving the parabola $y^2 = 20x$ about the axis of x, the section being bounded by the planes $x = o$ and $x = 10$. 10

PROBABILITY AND LEAST SQUARES.

Marks.

(Time, 3 hours.)

1. Two independent witnesses, A and B, whose probabilities of speaking the truth are p and q, respectively, agree in a statement of which the *a priori* probability of truth is P. What is the probability that the statement is true? 15

2. A phenomenon of which the causes are unknown has been observed to recur at regular intervals. If it has thus happened n times, what is the probability that it will occur m times more? 15

3. Write down the equation to the curve of probability of error of observation. Indicate its form in a general way, and show the relation to the curve of the mean square error, the probable error and the average error. 20

4. Two sets of measurements are made with results a and b, with probable errors r and r_1 respectively. Find the most probable value got by combining them, and its probable error, when (*a*) a and b are measured lengths of the same rod.

(*b*) When a is a zenith distance, and b is a declination from which the latitude is required ($b = a$)

(*c*) When a and b are latitudes determined by moon culminations observed on the east and west limbs of the moon respectively. 25

5. In indirect measurements, when n observations have been made and there are m unknown quantities, describe briefly the process of finding the most probable value of each quantity and its probable error. 25

6. In direct measurements of quantities which are not independent of one another, show how the most probable values are found. Explain the method of elimination, also that of correlates. 25

7. Indicate how the method of least squares is used in finding values for the constants of formulæ, also in the formation of empirical formulæ. 25

PART V

ROCKY MOUNTAINS PARK

ROCKY MOUNTAINS PARK OF CANADA.

REPORT OF THE SUPERINTENDENT.

BANFF, ALBERTA, September 25, 1908.

The Honourable FRANK OLIVER,
Minister of the Interior,
Ottawa, Ont.

SIR,—I have the honour to submit herewith my annual report as superintendent of the Rocky Mountains Park and the Yoho and Glacier Park reserves for the fiscal year ending March 31, 1908.

As you will observe by the report, the predictions made by me a few years ago in regard to the mountain parks have been more than realized and their development has already exceeded our most sanguine expectations.

It is with sincere pleasure that I am able to report to you that judging from past development and present indications it is a difficult matter to estimate the limit of the usefulness of the Rocky Mountains parks as a unique pleasure and health resort, not only for the people of the Dominion, but for visitors and tourists from almost every part of the world. Its increasing popularity may be judged by the comparison of the number of people who have visited the parks each year for the past ten years. These are as follows :—

Year.	No. of Visitors.
1899	7,389
1900	6,533
1901	8,456
1902	8,516
1903	10,696
1904	11,752
1905	17,605
1906	30,136
1907 (9 months)	28,735
1908	32,209

This steady increase of travel has resulted in an equal increase in trade for all classes of business as well as in correspondingly increased revenues to the park. A full statement of the yearly revenues will be found in another part of this report.

Owing to so many counter-attractions in eastern Canada and in Europe, such as the Tercentenary at Quebec and the large exhibitions in Europe, which diverted the tide of tourist travel eastward, as well as this being presidential election year, I do not anticipate so large an increase for next year. During the following year, however, there will doubtless be a greatly increased number of visitors to the park owing to the passing away of the financial stringency, and the fact of the Alaska and other exhibitions being held at the coast, as well as to the large crops of this last season, which so increase the prosperity of the country and are bound to induce travel. Visitors in large numbers to these western attractions will doubtless spend a few days in rest and relaxation at the Rocky Mountains Park.

The tendency nowadays for tourists to enjoy a few days spent in wandering in wilderness is delightful to see and goes to show that mountain parks and reservations are a necessity, not only as fountains of life and health, but as sources of future timber supplies. The growing interest in the care and preservation of forests and wild

places in general is full of promise and cannot fail to have a great influence on the future of the Dominion and the health and happiness of the people.

Popular interest, more practical than sentimental, in whatever touches the welfare of the country's forests is growing rapidly, and a hopeful beginning has been made by the Canadian government in real protection for the reservations as well as for all the parks. The energy and foresight of the government along these lines are greatly appreciated by the people of the western prairies.

There are now six national parks or reserves in the west, all easy of access, having a total area of 15,550 square miles. These are divided as follows :—

	Square miles.
Rocky Mountains Park	4,320
Yoho Park	2,812
Glacier Park	2,304
Buffalo Park	600
Elk Island Park	64
Jasper Park	5,450

Besides these there are a large number of forest reservations, most of which are easily accessible either by railways, trails or open ridges, and as yet are practically in a state of nature which has been unspoiled either by the hand of man or forest fire devastations.

These grand reservations cannot fail to draw thousands of admiring visitors from all parts of the world where their beauties are known. The withdrawal of this large tract from the public domain did no harm to any one, as most of the lands, owing to topographical formation, would never be available for agricultural purposes and are of use only as pleasure and health resorts.

The National parks are not only withdrawn from sale or entry like the forest reservations, but they are efficiently guarded and managed by officers appointed by the Dominion government under careful supervision. Under their care the forests are flourishing, protected from both axe and fire ; and so of course are the smaller shaggy underbrush on the mountain sides and the herbaceous growth of the lower valleys. The furred and feathered tribes, which a few years ago were in danger of extinction, are increasing. Besides these the parks are the homes of a number of the larger game, such as the buffalo, elk, moose, bear and many others, which here, under the efficient protection provided, feel secure and at home and are also rapidly increasing.

Birds of every description known in this latitude enliven the natural groves with their music and add to the pleasure of the visitors.

American visitors are especially enthusiastic as to the beauty of the scenery in the mountain parks, some of whom, who have travelled extensively in every part of the world, declare it to be the grandest they have ever seen. The cosmopolitan character of the people and visitors is also a source of wonder and delight to any student who visits the park for the first time. While he may admire the beauty of the scenery and be amazed at its grandeur, he is more struck by the character of the people he meets in the hotel corridors. In a quiet hour after dinner he may meet men he had known in almost every part of the globe.

Below are given a list and description of the work and improvements made in the Rocky Mountains Park during the past year.

ROADS AND BRIDGES.

Owing to almost continuous rains of the preceding year the roads and trails were badly cut up by slides, washouts and the almost constant travel, which necessitated more than the ordinary amount of repairs to maintain them in good condition.

There are now in operation 80 miles of carriage road at Banff; 16 miles at Laggan and 30 miles at Field. It will be easily understood that to maintain these 125

miles of mountain roads requires careful and frequent inspection and a vast amount of work, so that accidents and delay to travel may be avoided. This, so far, we have been able to accomplish.

Owing to the large amount of water and sewer connections installed last year the streets and roads in the village of Banff were left in very bad condition. This made it necessary that a small force of men should be constantly on this work and it was necessary to practically rebuild some of the streets thus torn up.

The road from Banff to Lake Minnewanka, a distance of 7½ miles, was almost entirely gravelled and new bridges were built over Cascade river and Devil's Head canyon. This work put the carriage road in excellent condition and makes a splendid driveway for tourists, which is greatly appreciated.

Several new streets in Banff were cleared, opened up, graded and gravelled to meet the growing demand of the village.

Three hundred feet of stone protection wall was built on Cave avenue for the purpose of protecting the banks from sliding down in the spring and blocking the road to the Cave and Basin. This has had very effective results.

A new crib and wing dam were built on the Spray river to protect the southern approach to the bridge during the spring freshets.

About 2½ miles of new road was built east of Canmore on what is known as the coaching road from Calgary to Banff. With each succeeding year this road is being put in better condition, and in another year or two, with small appropriations for this purpose, it is hoped to have that part of the road in the National Park in such condition that automobiles and carriages may be able to pass between the two places. The Alberta government, Department of Public Works, are also doing considerable work on that part of the road east of the park.

At Laggan three additional miles of new road were added to the road to Moraine lake, making the total amount of road built 9 miles. It is expected that the whole distance of 12 miles to the lake will be completed next season.

A splendid new steel bridge of 120 feet span was built over the Bow river at Laggan. This bridge was built on solid cement abutments down to bedrock and is a very substantial structure, which will prove a great convenience to tourists driving over that road.

The bridge over the Bow river at Banff and also the Spray bridge were painted and refloored during the season, which greatly improved their appearance.

YOHO PARK, ROADS AND BRIDGES.

During the year two miles were added to the carriage road up the Yoho valley to the Takakaw falls, and the remaining three miles have been located, the right of way for two miles of which has been cleared. We hope to have the entire carriage road up the Canyon completed by August of next year. Besides this, timber was taken out and 300 feet of new bridge was built at Leanchoil across Kicking Horse river. These bridges were first constructed as part of the carriage road to Ice river.

The right of way on the Yoho carriage road to Emerald lake was also widened for a distance of three miles. This work was found necessary so as to allow the rays of the sun to shine in and dry the road.

DESCRIPTION OF YOHO PARK.

The Yoho Park has been often described by tourists as being second to none in natural beauty and grandeur of scenery. The vast territory, which includes several million acres of land, abounds in beautiful mountain streams teeming with trout. Its countless lakes, clear as crystal, are set in the very heart of rugged mountains.

Nearly every kind of wild animal, including the moose, deer, beaver, bears, mountain goat, sheep, marten and birds are increasing very rapidly and are very tame, not having been much disturbed as yet in their native haunts.

The many points of interest that have been opened up by carriage roads and bridle trails, such as the Hoodoo mountains, the Canyons, Glaciers, the Kootney and Ice River valleys, with canoe trips down the Emerald lakes, the Kootney and other rivers; the picturesque falls of the Yoho, the Laughing and Takakaw, the beauty of which is seldom equalled and never excelled, have already made the Yoho valley a favourite resort of the tourists and lovers of nature in its simplicity.

GLACIER PARK.

Little work was done in Glacier Park last year other than repairs to the trail from Glacier House, which suffers every year from slides, and the damming of the stream at the entrance to the Caves so as to make them more accessible.

Ladders were placed in the Caves and bridges were built across the pot-holes so as to lessen the difficulties of exploration.

Some 700 people visited the Caves during the year and on their return all expressed their pleasure and delight with the trip and the natural wonders of the Caves.

It would seem that the government would be warranted in making a reasonable expenditure in building approaches and stairways, so as to allow visitors more easy access to the different caves in the valley.

It is also my intention, subject to your approval, to connect the trail leading north from Rogers Pass to the head waters of Bear creek with the end of our present trail at the Caves, the distance between the two points being about three miles, which can be done with the expenditure of a few hundred dollars. This will make the round trip possible from Glacier House by Rogers Pass around the head of Bear creek, thence to the Caves, returning to Glacier House. The round trip would be about 15 miles in length and be one of great interest and pleasure.

THE CAVE AND BASIN.

The baths at the Cave and Basin continue to grow in popularity, and the revenue from that source will this year be at least 20 per cent over that of any former year, and this has been accomplished notwithstanding the institution of the Hot Springs baths a few years ago. In spite of the additions that have been made in the number of dressing rooms and other accommodation we are still unable to accommodate the swarms of bathers who visit the baths during the months of July and August, and it will be absolutely necessary to greatly increase the accommodation in the near future.

A comparative statement of revenue and also of the number of visitors registered during the year will be found in another part of this report.

I reproduce for ready reference the analysis made by A. McGill, Government Analyst, of the water from the springs :—

	Milligrammes per litre.	Grains per gallon.
Chlorine (in chloride)	6·0	0·42
Sulphuric acid (SO)	550·0	38·50
Silica (SiO)	33·0	2·31
Lime (CaO)	355·0	24·85
Magnesia (MgO)	69·5	4·87
Alkalies (expressed in terms of NaO)	8·9	0·62
Lithium	A decided trace.	Trace.
Sulphuretted hydrogen (HS)	4·3	0·30
Temperature of water	115·5° F.	
Albuminoid nitrogen	None.	None.

AVIARY.

The different varieties of pheasants placed in the Aviary two years ago are all doing well and are a great source of attraction to visitors to Banff. The increase has, however, contrary to expectation been very small. This I attribute almost entirely to

the very limited run which the birds have, an opinion which is shared by experts with whom I have talked on the subject. The birds have been very prolific with eggs, but it has been impossible to hatch them successfully. The young chicks did not appear, in most cases, to possess sufficient vitality to make their way out of the shells, and those which did so were so weak that they lived only a few hours. It is my intention in the near future to add to the runs of these birds. The same results may be said to have attended our efforts with the Canadian wild geese.

The pair of golden eagles are in a thriving condition and appear to have become quite naturalized and satisfied with their changed conditions.

THE FAUNA OF THE PARK.

The animal paddock, in which are kept the buffalo, moose, elk, black-tail and Virginia deer, Persian fat-tail sheep, Angora goats and antelope, continues to be a great attraction to visitors. The caretaker's diary shows that 13,777 visitors passed through the gates during the past twelve months. This does not include the hundreds who view the animals through the fence surrounding the inclosure.

The only additions made to the paddock during the year, outside of the natural increase, were 4 Virginia deer and one antelope.

The animals now in captivity are all in a healthy, thriving condition, the only loss during the year being one buffalo bull and one bull elk, the latter of which was killed while fighting with another bull elk. The supposed cause of the death of the buffalo was pneumonia, as he had been sick for some weeks and none of the others were affected in any way, and are in good condition.

The animals now in the paddock are as follows :—

Buffalo	93,	increase	13
Moose	18	"	4
Elk	12	"	2
Mule deer	11	"	4
Persian sheep	3,	decrease	1
Angora goats	6,	increase	0
Virginia deer	4		
Antelope	1		

As reported last year the caged animals have all been removed to their new quarters in the museum grounds and will be reported on under that heading.

THE FLORA OF THE PARK.

The Flora of the Rocky Mountains Park is year by year attracting more attention and the number of botanical students who come here to study its different varieties is yearly increasing. The botanical specimens on exhibition at different points, such as Banff, Lake Louise, Field and Glacier, also attract a large number of visitors.

The recent publication of Mrs. Henshaw's book on the mountain wild flowers of Western Canada has directed the attention of visitors to a large number of the beauties of natural flowers, which they would otherwise have overlooked.

The following letter descriptive of some of the plants of the headwaters of the Saskatchewan and Athabaska rivers was recently received from Mr. Stewardson Brown, Professor of Botany in the Academy of Natural Science of Philadelphia. This is Professor Brown's second visit to the Canadian mountains in his professional capacity, and he is making a special study of the flora of this part of the Rockies. His letter follows :—

'During the past summer ten weeks were spent in making a collection of the plants in the mountains of Western Alberta near the source of a number of branches of the Saskatchewan and Athabaska rivers.

'The streams, portions of which were traversed, in the Saskatchewan drainage being the North Fork, Bear creek, Brazeau, Cataract and Sifflua, and of the Athabaska drainage, Suwapta, Poboctou and Maligue, the passes crossed in accomplishing this being the Bow, Nigel, Poboctou, Malique, Wilcox, Cataract and Pipestone.

'At this time it has been impossible to give the collections made any adequate study, but the following brief generalities on the results of the trip may be of interest:

'More than 5,000 specimens were collected, represented by 700 numbers and about one-third that number species.

'In the river valleys and along the shores and flats there is in the main a great similarity in the general flora to that of the valleys of the streams of the Rockies contiguous to the line of the Canadian Pacific railway; the same being true of the meadows and passes and slopes above timber with some interesting exceptions.

'On the streams of the Athabaska drainage, heading from the opposite side of the same mountain ranges, still a third species appeared, resembling closely *P. borealis*, a northern form, from which it may not be distinct.

'A great similarity is also noticeable in the flora of the passes from which head the streams referred to; on Poboctou, Maligue, Nigel, Wilcox and Cataract striking plants are a pink flowered species of *Pedicularis* as yet undermined, and *Companula lasiocarpa*, a handsome dwarf species with flowers often an inch long. This latter plant was also collected on the foothills surrounding Maligue lake (Chaba Inine of the Stonies) and in rocky places on the Maligue river.

'*Ranunculus pygmaeus*, another northern plant to which category the above species also belong, was collected on the summit of Wilcox and Cataract passes only.

'Among the trees, the white spruce, *Picea Canadensis*, is the common form at the lower altitudes and not the Alberta spruce, *Picea Albertiana*, which is the predominant species on the river shores farther south.

'STEWARDSON BROWN.

'Academy of Natural Science,
'Philadelphia, Pa.'

I am indebted to the celebrated Mrs. Charles Schaffer, botanist and traveller, of Riverton, N.J., for the photographs and descriptions of flowers attached to this report. Mrs. Schaffer has been an annual visitor to the park for the past sixteen years, and has probably done more than any other person in making known to the world the beauties of the floral and other natural attractions of the Rocky and Selkirk ranges. Her book on 'Mountain Wild Flowers' will be published shortly and will doubtless be read with great interest and give a vast amount of information in regard to the flora of the Rocky Mountains Parks.

THE MUSEUM AND GROUNDS.

The museum and grounds continue to prove a yearly increasing attraction to visitors as evidenced by the increased number of those who registered. Besides these there were a great many who visited the grounds without entering their names on the books. These, as will be seen, include people from almost every part of the globe.

A number of additions have been made to the collection of specimens in the museum, including the bull buffalo which died in the paddock; the elk which was killed in a fight; a number of heads of various animals; stuffed birds, &c.

A large amount of work has been done on the grounds to make them more attractive to visitors. This work consists of levelling and filling in, draining low ground, installing water pipes, fencing, clearing and underbrushing, improving walks and gravelling driveway around the animal cages, &c.

The new permanent cages which were under construction at the time of last year's report have been completed, and are said for their size to be equal to the best in any park on the continent. A New York park official who visited them this year said that they were ahead of any in that city in appearance and design. They are constructed

of iron, cement and rock. The sulphur rock work on the sides is done so as to give them an artistic rustic appearance. The cement floors make it possible to keep them perfectly clean and free from any odours whatever.

Each cage is supplied with water and sewer connections, and there is a constant supply of pure fresh water running through the cages all the time. To ensure the cleanliness and health of the animals confined in them, each cage is furnished with cement tanks for the animals to bathe in.

The animals confined in them at present are :

Black bear	1
Brown bear	1
Cinnamon bear	1
Mountain lions	2
Timber wolves	3
Coyotes	2
Kit fox	3
Red fox	2
Lynx	2
Racoons	2
Badgers	2
Marmots	2
Porcupines	3

All of these are in a perfectly healthy condition and are fat and sleek, and appear to take to their comfortable new quarters very kindly.

THE COAL MINES.

Owing to the very mild winter of last year and the heavy stocks of coal carried over the mines operated by the Bankhead Mines, Limited (successors to the Pacific Coal Company), were working only four or five days per week during two months of the spring, but for the past two months have been working full time.

Since last report the management of the mines have installed one 150 horse-power boiler, their total boiler rating now being 1,510 horse-power.

The second unit of the briquetting plant, which was under consideration at the date of the last report, has now been installed, making the capacity of the two units between 550 and 600 tons of briquettes per day.

A 13½-foot Clifford-Capell ventilating fan, having a capacity of 300,000 cubic feet of free air per minute, has been installed on No. 4 seam for the purpose of providing air for underground men.

The second unit of the breaker has now been equipped with cleaning machinery, thus enabling them to handle a much larger daily tonnage, the breaker now being equipped to handle and clean 1,800 tons of mine run coal in ten hours.

In addition to the above, the high pressure air lines have been extended farther into the mine and new charging stations installed inside the mines for the purpose of charging the compressed air motors, which are used exclusively for hauling coal from the mine to the breaker.

A slope has been sunk to some 300 feet below the present tunnel level and new workings will be driven north and south from the slope level.

The Canmore Coal Mines were worked steadily during the year, the total output being 112,750 tons.

THE EXSHAW CEMENT WORKS.

Exshaw has the largest cement factory in the Dominion of Canada. The company, although in operation for a comparatively short time, find that their present plant is not sufficient to meet the ever-increasing demand for their product and steps have

been taken to increase the plant. The quality of the cement produced has created a demand far in excess of the highest expectations of the directors. Over $1,500,000 has already been invested in the plant and a considerable town containing the usual business interests has grown up around it.

The raw materials of clay and limestone are found right at the plant and the property controlled by the company consists of 1,200 acres in the Rocky Mountains Park. The daily capacity of the plant amounts to 2,600 barrels of finished Portland cement.

PRESERVATION OF GAME.

Although no convictions for violation of the regulations for the preservation of game have been made during the year, it is strongly suspected that game has been slaughtered by both Indians and white men.

Owing to the large extent of territory embraced in the park it is impossible under our present system to keep as careful a patrol as is necessary to fully protect the game. Before this can be properly done it will be necessary to appoint permanent men who can combine the duties of game and fire wardens. This will be taken into consideration at an early date.

THE ALPINE CLUB CAMP.

The annual camp of the Alpine Club of Canada in the Canadian Rockies has become a permanent institution, and has done a great deal towards directing the attention of mountain climbers from every part of the world to the advantages of these mountains along their lines. This is amply proven by the report of the meeting of the camp this year, which is as follows :—

'The third annual camp of the Alpine Club was held at Rogers Pass in the Selkirk range of the Rocky Mountains, from July 7 to 15.

'One hundred and seventy-seven persons attended, being the largest number of any of the three camps that have been held. With the exception of two days upon which rain fell, the weather was all that could be desired.

'Among those present were representatives from the Alpine Club of England, the American Alpine Club, the Netherlands Alpine Club, the Mazamas Club of Portland, Oregon, and the Appalachian Mountain Club of Boston.

'Letters of greeting were received from His Excellency, the Right Honourable James Bryce, Mr. Edward Whymper, Sir Sandford Fleming, Sir William Van Horn, the Rev. James Outram, and others. The official climbs, or those upon which applicants qualified for active membership, were : Rogers and Swiss Peaks of Mount Rogers and Hermit Mountain. They were reached by a two days climb, one night being spent at the Canadian Pacific Railway hut at the timber line on the slopes of Mt. Rogers. Fifty-seven persons qualified for active membership, of whom about half were ladies.

'A number of other peaks in the neighhourhood were climbed under the auspices of the club, notably Mt. Sir Donald, Mt. Avalanche, Mt. Ursa Major, Castor and Pollux, the Dome, Mt. Afton and Mt. Abbott.

'At the close of the camp some excellent work was done by members who prolonged their stay in the vicinity; particularly may be mentioned the first ascent of Mt. Tupper by a lady, Miss Jean Parker, of Winnipeg, librarian of the club.

'In addition to actual climbs a number of expeditions were sent out daily from the main camp. The most important were those to the Asulkan Pass, to the Illecillewaet snow-field and to the Selkirk caves in Cougar Creek valley. To facilitate these expeditions auxiliary camps were placed in the Asulkan valley and at the Caves. On the whole there were displayed a vim, energy and an insatiable desire for hard work that exceeded all previous camps. In fact the members simply would not be denied no matter what the difficulties.

'Early in the week, while making an ascent of Mt. Avalanche, a deplorable accident occurred resulting in the death of a lady member of a party of climbers. The accident happened through an insufficient appreciation of the dangers of mountain climbing and inattention to the instructions of the guide. While it cast a gloom over the camp, it was fully realized that people who play with mountains carry their lives in their hands, and the programme for the week was continued as arranged.

'The climbing was in charge of competent Swiss guides loaned by the Canadian Pacific Railway Company, and hired by the club, and also by members of the Dominion Topographical Survey staff, who had been climbing in the Rocky Mountains for years.

'A word about the club itself: Though little over two years old it is now in its fifth hundred of membership and rapidly increasing. In that membership are not only representatives from all parts of Canada, extending from Halifax to Vancouver, but also from England, Ireland, Scotland, Switzerland, Holland, Australia, South Africa and India; while a full dozen of the United States of America have contributed members. This cosmopolitan membership speaks for the attractiveness of the Alpine regions of the Canadian Rockies. The rapidly increasing membership of the club and the growing popularity of its camps in the mountains show, moreover, that the spirit of mountaineering in Canadians is only latent and needs but the opportunity and knowledge in order to excel. The opportunity is supplied by the club and its activities. This fact is strongly brought out by the reports we hear from time to time of mountains climbed independently of the annual camp by Alpine Club members, unaided by Swiss guides, viz., Crow Nest Mountain, Mt. Stephen, Mt. Edith, Mt. Garibaldi and others; while attempts have been made and are now being made on the highest unconquered peaks of the Main and Selkirk ranges, such as Mt. Robson and Sandford, by way of routes over which Swiss guides have refused to travel.

'The climbing represents the sporting features of the club, but beyond that are influences and interests that are far more important. While the mountaineering features develop and solidify the very best traits of a nation's character: patience, perserverance, courage and skill, the opportunities offered by the Alpine regions to science, art and literature are immense, and it is for development on these lines that the club is now looking, as may be seen by the publication at a very considerable expense of the first two issues of the *Canadian Alpine Journal*. The current issue for 1908, contains probably as fine a collection of views of the highest peaks of the Canadian Rockies as has yet been gathered in any literary production.

'With the end in view of promoting these features of the club's programme, at the recent meeting at Rogers Pass, a permanent salaried secretary was appointed and provision made for building at an early date a club house at Banff to provide suitable headquarters for the executive.'

REVENUE OF THE PARK.

The revenue of the Rocky Mountains Park from all sources continues steadily to increase, and at the present time is greatly in excess of what would be required for the actual maintenance and salaries of the park. This would appear to warrant us in asking for a still larger appropriation, as the revenue has increased to a much greater extent than have the appropriations.

The opening up of new places of interest and the adding of additional mileage to the roads already built mean the holding of tourists here a correspondingly longer time and increased revenue to the park. Taking the number of tourists as over 32,000, of which over half were from foreign countries, and as each, at a low estimate, spends $75, would go to show what a valuable asset the Rocky Mountains Park is to the Dominion in having the money brought into the country for distribution.

The value to the Dominion of the visits of these people as an advertising medium cannot be overestimated. In almost every case they return home delighted with the scenery of the Canadian Rockies, and many of them make investments in Canada

and induce others to come as a result of their visit. It is doubtful whether the government secures better results in the way of emigration for the money expended than the appropriation to the National Park.

BANFF.

The village of Banff has made considerable progress in the building line. Besides a number of new business places and private residences, an addition of twenty-five rooms was added to one hotel and a palatial brick hotel of 100 rooms, fitted with all the latest modern improvements, has been erected and also a fine new opera-house, fitted with first-class equipments and up-to-date in every respect.

The town is well supplied with churches of all the principal denominations, schools, secret and fraternal societies, athletic and social clubs.

Banff has always been considered merely a summer resort, but there is no reason why it should not be made a winter resort as well. Besides the exhilarating air, which makes walking an agreeable pastime, there are a great many other forms of enjoyment; curling, skating, skieing, ice-boating and other forms of outdoor sports are indulged in to a great extent and thoroughly enjoyed.

THE PABLO HERD OF BUFFALO.

Acting under your instructions, in June, 1906, I proceeded to Montana to inspect and report on the purity of breed of a large herd of buffalo, which were being offered for sale by Michel Don Pablo, of Missoula. I did so, and found the herd to be entirely pure-bred and the best of their species. It was further reported that this was the last large herd of these animals remaining on the North American continent.

In January, 1907, negotiations were opened up with Mr. Pablo for the purchase of his herd, an appropriation having been made by parliament for that purpose.

In February I was instructed to proceed again to Montana and purchase the entire herd at the price previously agreed upon; and on February 28 a contract was signed for the purchase of the entire herd, with the exception of 10 head, which were reserved by Mr. Pablo. At that time the owner supposed that he had about 300 buffalo in the mountains, but would only sign the contract for 250. The first shipment was to be made in May, 1907, but on rounding up the herd it was found that there were a great many more than was at first supposed, and it was found impossible to gather all the animals for one shipment. A shipment of 199 head was made from Ravalli, in Montana, at the end of May and the entire number were safely landed in Elk River Park on the line of the Canadian Northern Railway.

In September, I again went to Montana and received a further shipment of 204 head, which were placed in the same park as the first shipment. It was then found that there was still a considerable number left, estimated at about 300. These we expect to ship in October, 1908, and place on a reservation east of the Battle River, along the proposed line of the Grand Trunk Pacific Railway.

The increase of the first shipment to the park has been about 60, and the total loss during the first winter in Alberta was only 4.

The Dominion government is to be congratulated on securing this herd, and in my negotiations I found considerable opposition from parties who were averse to seeing these animals leave the American side. In spite of the many obstacles placed in the way of the purchase and sale of the herd I always found Mr. Pablo perfectly upright in all his dealings, and as soon as he signed the contract he was determined to deliver the entire herd to the Canadian government.

In conclusion I may state that this is my last annual report as Superintendent of the Rocky Mountains Park, as on March 31, I was appointed Commissioner of Dominion Parks. During the eleven years since I assumed the office of superintendent, I have been extremely careful in the expenditure made of the appropriation for

the improvement of Canada's National Park and feel assured that good value has been received for every dollar expended. The work done will bear the closest scrutiny, which goes to show that the money voted by parliament has been judiciously expended.

In the management of the park there has been at no time any adverse criticism on the part of visitors or others, or anything to show that the affairs of the park were not supervised and managed in a systematic and efficient manner.

Although in the future I shall not exercise the same close relations with the Rocky Mountain Park, having to divide my attention with the other Dominion parks, I shall still have full power as to the general details and outline of the improvements and new work to be carried on. Mr. Hunter, the new superintendent, who previous to his appointment was my assistant for four years, will have charge of the carrying out of the details of the work. I shall, however, still take the same interest in the future progress of the Rocky Mountains Park as in the past, and feel assured that its future development will keep pace with the general growth and development of the Dominion.

I desire in giving up the office to acknowledge the loyal support I have always received from the department in the furthering of the work of developing what is one of the most attractive resorts on the continent.

It also gives me pleasure to acknowledge the valuable assistance I have at all times received from the employees under me, as well as from the members of the Royal Northwest Mounted Police stationed at different points in the park, through their services in the maintenance of law and order.

I am, sir,

Your obedient servant,

HOWARD DOUGLAS.

STATEMENT of Revenue for five years ending December 31, 1907.

—	1903.	1904.	1905.	1906.	1907.
	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.
Rent	2,281 83	3,921 29	4,569 31	4,759 05	5,249 01
Timber dues permits	85 75	279 59	631 24	3,478 96	1,109 92
Quarry permits	1 00	0 50	.....	30 50	5 25
Water rates	100 00	.....	300 00	540 00	386 50
Cave and basin	1,047 50	1,669 50	2,891 75	2,528 50	3,285 50
Hot Springs	.....	.....	1,239 00	2,758 75	2,966 25
Fines	.....	105 00	.....	48 50	11 00
Dog licenses	55 00	.....	155 00	198 00	330 00
Livery licenses	212 00	189 00	323 00	334 00	563 00
Peddlers' licenses	4 00	12 00	12 00	16 00	16 00
Pool and billiard licenses	70 00	121 00	70 00	30 00	163 00
Boat licenses	.....	50 00	30 00	32 00	25 00
Butcher licenses	20 00	20 00	20 00	20 00	36 00
Hay dues	305 00	.....	3 00	.....	.....
Camping permits	28 00	7 00	6 00	16 00	19 00
Transfer fees	32 00	82 00	74 00	86 00	64 00
Grazing rent	100 00	177 50	247 50	207 50	230 00
Cemetery lots	11 00	5 00	29 00	20 00	18 00
Casual revenue	1,790 00	517 59	.....	.....	20 00
Coal lands	.....	1,347 49	1,295 84	2,307 61	4,236 50
Rent coal mined	.....	2,252 50	4,236 50	6,563 40	.....
Telephone	.....	.....	.....	.....	235 00
Ground rent (timber)	.....	.....	55 00	36 71	54 10
	6,143 08	8,534 46	14,203 14	21,684 58	25,586 43

Number of visitors registered at the Banff Springs Hotel, from May 15, 1907, to September 30, 1908 :—

Canada	2,114
United States	3,701
England	296
Australia	67
Scotland	61
India	22
Japan	45
China	34
France	10
Honolulu	13
Ireland	12
New Zealand	20
Switzerland	5
Mexico	3
Norway	2
Italy	7
Total	6,412

Number of visitors registered at the Sanitarium Hotel, Banff, from April 1, 1907, to March 31, 1908 :—

Canada	5,994
United States	1,353
England	147
Scotland	37
Ireland	15
Japan	33
New Zealand	67
Denmark	34
Australia	57
India	6
China	7
Holland	6
Germany	12
Chili	2
Italy	2
Switzerland	4
Portugal	8
Korea	2
France	8
Austria	2
Philippine Islands	3
Total	7,789

Number of visitors registered at the Hotel King Edward, from April 1, 1907, to March 31, 1908 :—

Canada	3,911
United States	926
England	31
Scotland	11
Ireland	32

New Zealand	18
Australia	17
South Africa	3
Yukon	14
Denmark	2
Germany	29
Austria	11
Total	5,005

Number of visitors registered at the Hot Springs Hydropathic Hotel, from April 1, 1907, to March 31, 1908 :—

Canada	596
United States	99
England	3
Scotland	2
New Zealand	1
Alaska	3
Total	704

Number of visitors registered at the Alberta Hotel, Banff, from April 1, 1907, to March 31, 1908 :—

Canada	3,960
American	1,296
England	174
Scotland	104
Ireland	62
Sweden	15
New Zealand	35
Australia	39
China	14
India	5
South Africa	11
South Sea Islands	3
Total	5,718

Number of visitors registered at the Grand View Villa, Banff, from April 1, 1907, to March 31, 1908 :—

Canada	897
United States	134
England	18
Japan	3
India	4
Ireland	3
China	3
Scotland	4
Australia	5
Switzerland	2

New Zealand	6
China	2
Total	1,081

SUMMARY.

Banff Springs Hotel	6,412
Sanitarium	7,789
Hotel King Edward	5,005
Hot Springs Hydropathic Hotel	704
Alberta Hotel	5,718
Grand View Villa	1,081
Park Hotel	1,450
Excursionists not registered	2,550
Cottagers	1,500
Total	32,209

Number of bathers at the Cave and Basin, from April 1, 1907, to March 31, 1908:

Canada	4,085
England	205
Scotland	85
Ireland	4
New Zealand	41
South Africa	19
India	2
Ceylon	2
Honolulu	6
United States	3,200
Mexico	4
Bermuda	2
China	22
Japan	13
France	10
Germany	15
Sweden	5
Switzerland	2
Spain	1
Total	7,729

Number of bathers at the Upper Hot Springs, from April 1, 1907, to March 31, 1908 :—

Canada and United States	12,026
Newfoundland	2
England	101
Scotland	43
Ireland	18
Australia	36
South Africa	2
India	2
Hawaiian Islands	2

Germany	2
China	2
Japan	4
Denmark	9
Total	12,249

Number of visitors registered at the Chalet, Lake Louise, Laggan, from April 1, 1907, to March 31, 1908 :—

United States	3,412
Canada	1,302
England	301
Scotland	30
Ireland	12
Japan	3
Russia	8
France	6
Cuba	8
Australia	20
India	5
Holland	5
China	15
New Zealand	10
Honolulu	3
Denmark	3
Jamaica	3
Germany	10
Poland	2
South America	1
Sweden	1
Switzerland	3
Africa	4
Italy	6
Alaska	2
Belgium	3
South Ancholia	2
Hawaii	4
Total	5,184

List of visitors at the Mount Stephen House, Field, April 1, 1907, to March 31, 1908 :—

United States	1,376
Canada	1,497
British Isles	243
Australia	42
New Zealand	39
Germany	10
India	9
Japan	12
China	9
South America	5

France	4
Switzerland	3
Hungary	3
Hawaii	3
South Africa	2
Holland	2
Italy	2
Denmark	1
Jamaica	1
Sweden	1
Tasmania	1
Belgium	1
Total	3,266

MUSEUM.

REPORT OF THE CURATOR.

The number of visitors was over 8,000; and as many do not register, this will likely be a low estimate.

Additions.—The following specimens have been added to the collection during the past year : A full-sized specimen of the elk, with a few smaller mammals and birds, collected by myself.

A collection of several kinds of insects has been started, the arrangement of which kept me busy during the winter, while the summer was occupied in collecting as time allowed.

Donations.—Donations and loans if suitable will be thankfully received.

Improvements.—During the winter and spring I made an improvement in the exhibits of minerals by placing the name on the specimen itself instead of on a card ; also making an improvement in the naming of the Indian curios.

Ways of making a first-class museum are discernible and will be carried out as time and money at my disposal will allow.

N. B. SANSON,
Curator.

Visitors to the Museum from July 1, 1907, to June 30, 1908, inclusive—

Canada	5,751
Yukon Territory	21
Newfoundland	3
United States	1,571
England	326
Scotland	116
Ireland	39
South Wales	4
Wales	4
Isle of Man	1
Channel Islands	1
Australia	66
New South Wales	10
New Zealand	49
South Africa	8
Zululand	1
Orange River Colony	1
Germany	21
The Hague	1
Holland	6
Belgium	4
China	18
Thibet	1
Italy	9
India	8
France	8
Bermuda, W.I.	7
Jamaica, W.I.	1
Manilla, Philippines	5
Norway	5
Samoan Islands	5
Austria	4
Japan	4
Sweden	4
Galicia	3
Russia	3
South America	2
Venezuela	1
Hawaiian Islands	2
Switzerland	2
Denmark	2
Upper Congo, Central Africa	1
Finland	1
Ceylon	1
Servia	1
Total	8,105

METEOROLOGICAL TABLES.

ROCKY MOUNTAINS PARK.

MAXIMUM and Minimum Temperatures and the General State of the Weather between July 1, 1907, and June 30, 1908.

Date.	Thermometer Readings.				Weather.
	Maximum.		Minimum.		
	6 a.m.	6 p.m.	6 a.m.	6 p.m.	
1907	°	°	°	°	
July 1...	58·2	65·6	43·6	46·2	Cloudy.
" 2....	60·4	69·6	46·4	48·6	Fair ; squally wind.
" 3....	66·3	69·1	40·1	40·8	Cloudy ; lightning.
" 4....	58·9	56·2	48·4	40·2	Cloudy ; thunderstorm ; squally wind.
" 5. ..	51·8	60·7	46·6	47·9	Cloudy.
" 6....	56·2	65·4	42·6	45·8	Fair.
" 7 ...	60·2	71·3	34·7	35·8	Fair ; *Epilobium angustifolium* out.
" 8 ..	67·2	72·4	38·9	39·1	Fair ; fine sunset ; perfect weather.
" 9....	66·0	76·4	42·6	43·7	Fair.
" 10....	67·0	78·5	41·6	41·7	Fair ; thunder ; rain but not much.
" 11....	63·5	75·4	46·2	46·2	Fair ; thunder and lightning ; very little rain.
" 12....	71·2	66·0	41·2	42·2	Cloudy.
" 13....	53·2	64·3	39·3	39·0	Cloudy ; very litle insect life about for days.
" 14....	58·8	65·6	41·4	42·9	Cloudy ; drizzle.
" 15....	57·0	61·8	43·9	43·8	Cloudy ; rain.
" 16 ...	53·2	68·3	36·9	37·2	Cloudy ; rain ; heavy dewfall.
" 17....	59·9	69·4	44·9	45·2	Fair.
" 18....	66·2	72·9	37·3	37·7	Fair ; thunder.
" 19....	59·9	77·5	37·4	38·2	Fair.
" 20.. .	74·2	64·5	43·3	44·8	Cloudy ; thunderstorm ; fog.
" 21....	51·0	70·3	43·9	44·2	Cloudy ; thunder ; heavy rain.
" 22....	64·0	70·2	49·8	50·9	Cloudy ; thunderstorm.
" 23....	53.5	72·9	38·3	38·2	Cloudy ; thunderstorm.
" 24....	57·6	63·9	42·2	41·9	Cloudy ; thunder.
" 25...'	62·0	74·0	38·7	38·3	Fair ; fine day.
" 26....	67·8	69·5	44·8	47·0	Cloudy ; rain ; thunder.
" 27....	66·8	76·5	40·7	41·0	Fair ; fine day.
" 28....	71.1	80·2	40·5	40·2	Fair ; asters flowering.
" 29....	73.6	77·7	42·4	43·7	Fair ; thunder and lightning but no rain ; fine sunset.
" 30....	69·5	81·0	50·8	50·2	Fair ; rain ; thunder.
" 31....	65·0	81·0	44·3	44·3	Fair ; thunderstorm but little rain.
Aug. 1....	70·2	77·0	48·1	47·8	Fair ; thunderstorm.
" 2....	60·2	79·5	42·2	42·3	Cloudy ; thunder.
" 3....	72·0	75·0	49·7	58·0	Cloudy ; thunder ; little rain.
" 4....	59·9	62·7	41·9	42·7	Cloudy ; rainbow.
" 5....	58·5	56.3	43·8	42·8	Cloudy ; rain.
" 6....	49·8	47.1	34·0	34·4	Cloudy ; rain.
" 7....	46·9	61·3	43·8	44·8	Cloudy.
" 8....	57·3	59·0	46·4	46·2	Cloudy ; rain.
" 9....	54·7	43·7	42·0	40·2	Cloudy ; rain ; fog.
" 10....	44·0	58·3	36·4	35·9	Cloudy.
" 11....	54·8	61·1	42·2	42·3	Cloudy ; rain.
" 12...	47·5	63·2	33·2	33·6	Fair.
" 13....	59·6	67·4	34·4	33·8	Fair.
" 14....	63·2	57·8	45·3	46·2	Cloudy ; rain.
" 15 ...	47·1	61·3	46·8	47·3	Cloudy ; rainbow.
" 16....	58·0	63·9	43·8	45·1	Cloudy.
" 17....	51·8	49·2	46·0	40·9	Cloudy ; rain.
" 18....	41·3	51·0	32·7	33·8	Cloudy.
" 19....	49·3	59·2	32·7	32·1	Fair.
" 20 ..	53·3	65·5	30·2	30·0	Fair.

MAXIMUM and Minimum Temperatures, &c.—*Continued.*

Date.	Thermometer Readings.				Weather.
	Maximum.		Minimum.		
	6 a.m.	6 p.m.	6 a.m.	6 p.m.	
1907.	°	°	°	°	
Aug. 21....	61·0	67·4	35·0	34·8	Fair.
" 22....	63·0	67·5	53·2	53·5	Cloudy.
" 23....	62·2	74·7	43·5	43·0	Fair; fine day.
" 24....	70·5	76·2	41·5	40·8	Fair; thunder and lightning; no rain.
" 25...	72·1	54·4	52·5	51·8	Cloudy; rain.
" 26....	54·3	50·1	47·5	46·1	Cloudy; rain.
" 27....	49·0	49·3	41·2	40·6	Cloudy; rain.
" 28....	45·9	59·0	34·4	34·7	Fair.
" 29....	53·3	58·9	50·2	44·4	Cloudy; rain; rainbow.
" 30....	44·3	56·1	36·4	36·2	Fair; aurora.
" 31....	53·8	66·0	30·5	30·2	Fair; fine day; rainbow.
Sept. 1....	62·2	74·3	31·9	31·7	Fair; rainbow; sheet lightning.
" 2....	66·2	71·1	39·9	40·1	Fair; thunder; fine day.
" 3....	59·5	44·8	42·8	41·6	Cloudy; heavy rain; thunder and lightning.
" 4....	44·8	64·4	35·4	34·8	Fair; fine day.
" 5...	60·2	63·5	34·0	34·6	Fair; sheet lightning.
" 6....	61·0	62·4	48·5	47·2	Cloudy; light rain.
" 7....	56·2	62·2	32·8	32·7	Fair.
" 8....	55·8	72·4	44·7	43·7	Fair.
" 9....	68·2	74·0	40·5	39·8	Fair.
" 10....	68·4	44·8	44·6	32·8	Cloudy; rain and snow; thunder and lightning.
" 11....	34·3	33·2	29·8	28·9	Cloudy; snow; 5 inches snow on ground.
" 12....	32·0	36·9	28·2	27·3	Cloudy; light snow and rain.
" 13....	36·0	46·6	24·0	23·2	Cloudy; no snow on ground.
" 14....	32·6	41·2	38·0	34·3	Cloudy; rain and snow.
" 15....	35·6	37·2	31·8	31·8	Cloudy; snow; about 1 foot of snow on mountains.
" 16....	35·8	52·8	32·3	32·2	Cloudy; snow and rain.
" 17....	42·8	50·4	37·8	38·2	Cloudy.
" 18....	46·0	49·8	29·3	29·2	Cloudy.
" 19....	44·8	54·7	38·3	38·8	Cloudy.
" 20....	49·8	57·0	43·3	44·1	Cloudy; fine sunset.
" 21....	51·3	58·8	30·0	30·2	Fair; fine sunrise.
" 22....	55·3	66·4	47·5	51·0	Fair; fine day.
" 23....	61·3	64·9	55·4	51·3	Fair; fine day
" 24....	54·3	63·4	30·4	30·2	Fair; fine sunrise; fine day.
" 25....	56·8	58·0	34·0	33·9	Fair; fine sunset; fine day.
" 26....	52·4	67·4	33·2	32·4	Fair; fine sunrise and sunset; fine day.
" 27....	57·0	47·8	33·7	35·1	Cloudy; rain.
" 28....	42·0	52·0	38·3	37·6	Cloudy; fine sunrise.
" 29....	47·3	57·3	32·0	31·3	Fair.
" 30....	54·0	60·3	44·2	45·7	Fair; fine sunrise.
Oct. 1....	56·0	45·1	44·8	35·8	Cloudy; rain and snow.
" 2....	36·0	46·8	32·6	32·2	Fair.
" 3....	44·4	51·0	33·7	37·8	Cloudy.
" 4....	50·0	60·3	46·3	45·2	Cloudy; fine sunrise.
" 5....	58·1	58·1	45·0	45·8	Cloudy; fine sunset.
" 6....	50·8	61·3	39·7	37·6	Fair; fine day.
" 7....	48·2	58·5	35·0	35·6	Fair; fine day.
" 8....	53·8	56·9	33·3	29·3	Fair; fine sunset; fine day.
" 9....	51·3	63·1	31·8	30·1	Fair; fine sunrise and sunset; fine day.
" 10....	55·8	63·4	28·6	28·3	Fair; fine day.
" 11....	57·1	67·8	26·9	25·9	Fair; fine day.
" 12....	51·0	65·6	29·5	28·8	Fair; parhelia; fine day.
" 13....	56·2	57·2	36·8	34·8	Fair.
" 14....	46·2	61·2	32·6	33·3	Fair; fine sunrise and sunset.
" 15....	56·7	60·2	51·3	48·3	Fair; very squally wind.
" 16....	56·2	57·3	49·3	41·6	Fair; fine sunset; very squally wind.
" 17....	41·7	53·8	22·4	20·7	Fair; fine sunset.
" 18....	41·2	60·3	30·4	31·4	Fair; fine sunrise and sunset.
" 19....	47·3	56·2	26·1	25·2	Fair; beautiful weather for several days past.
" 20....	42·0	61·0	29·2	29·7	Fair.
" 21....	57·2	62·5	47·8	42·9	Fair.

MAXIMUM and Minimum Temperatures, &c.—*Continued.*

Date.		Thermometer Readings.				Weather.
		Maximum.		Minimum.		
		6 a.m.	6 p.m.	6 a.m.	6 p.m.	
	1907.	°	°	°	°	
Oct.	22 ...	52·0	60·4	32·3	32·4	Fair.
"	23....	56·9	57·3	41·9	39·3	Fair; light rain.
"	24....	43·2	50·7	22·9	21·7	Fair.
"	25....	38·0	56·3	31·5	38·0	Cloudy.
"	26....	51·0	52·5	26·4	23·9	Fair.
"	27....	43·0	55·8	30·0	27·9	Fair; fine sunset; fine day.
"	28....	40·8	54·9	24·8	23·9	Fair; fine day.
"	29....	39·8	54·4	28·7	36·7	Cloudy; fine sunrise.
"	30....	46·1	39·0	36·9	34·1	Cloudy; rain.
"	31....	35·2	40·4	30·2	30·2	Cloudy; squally wind.
Nov.	1....	38·0	44·8	32·5	28·1	Fair; fine sunrise.
"	2....	41·1	38·7	33·2	31·2	Cloudy; rain and snow; squally wind.
"	3....	31·8	37·7	30·2	28·0	Cloudy; squally wind; snowbirds.
"	4....	38·9	44·2	37·2	38·2	Cloudy.
"	5....	43·3	47·7	37·9	41·3	Cloudy.
"	6....	45·0	44·8	43·4	29·9	Cloudy; rain and snow.
"	7....	30·2	37·8	23·0	24·7	Fair; thaw.
"	8....	34·2	43·8	30·2	30·8	Fair; thaw; fine sunset.
"	9....	37·0	37·0	26·3	25·9	Cloudy; fine sunset.
"	10....	34·2	38·3	23·8	21·3	Fair; fine sunset.
"	11....	30·0	43·2	19·7	18·2	Fair; fine sunset; fine day.
"	12....	31·2	35·7	20·1	17·5	Cloudy; light snow; skating.
"	13....	34·0	33·2	23·7	23·9	Cloudy.
"	14....	31·7	36·3	22·1	20·1	Fair; fine day.
"	15....	33·4	39·7	20·4	19·8	Fair; fine day.
"	16....	37·6	37·7	34·8	31·8	Cloudy.
"	17....	32·0	33·7	19·8	16·7	Fair; fine day; fine sunrise.
"	18....	30·2	35·0	18·7	18·7	Cloudy; fine sunset; squally wind.
"	19....	37·7	34·7	30·3	29·3	Cloudy.
"	20....	32·2	34·3	25·0	26·8	Cloudy.
"	21....	32·0	35·6	26·8	27·0	Cloudy; squally wind.
"	22...	35·1	36·6	32·8	27·2	Cloudy; snow.
"	23....	27·3	30·0	23·2	23·9	Cloudy; snow flurries.
"	24....	25·8	31·3	29·6	20·2	Cloudy.
"	25....	29·0	27·8	20·2	14·7	Cloudy; light snow.
"	26....	34·8	32·2	23·6	25·1	Cloudy; snow.
"	27....	26·0	22·7	13·8	8·0	Fair; river partly frozen over; fine day.
"	28....	22·2	20·7	18·1	21·8	Cloudy; light snow.
"	29....	37·2	41·4	27·1	35·2	Cloudy; light rain; thaw.
"	30....	40·2	42·2	37·0	33·2	Fair; thaw.
Dec.	1....	41·8	39·0	35·5	28·2	Fair; fine sunrise and sunset.
"	2....	35·2	38·1	27·9	27·2	Fair; fine sunset.
"	3....	35·0	40·4	24·0	29·1	Fair.
"	4....	38·7	45·2	31·3	30·8	Fair.
"	5....	43·2	37·7	35·0	29·9	Cloudy; very squally wind.
"	6....	30·3	32·1	27·8	27·6	Fair.
"	7....	29·2	29·2	15·8	14·9	Cloudy.
"	8....	27·2	18·8	6·2	— 1·3	Fair; fine day.
"	9....	21·2	29·3	7·2	21·0	Fair; fine sunset.
"	10....	27·2	28·3	23·0	17·4	Cloudy.
"	11....	28·2	33·4	17·0	19·5	Cloudy.
"	12....	32·0	33·4	29·2	25·8	Fair; thaw.
"	13....	26·2	24·8	15·8	18·0	Cloudy; snow; first sleighing.
"	14....	24·8	24·3	17·9	15·8	Cloudy; from 3 to 5 in. snow on ground.
"	15....	19·0	18·8	6·1	10·3	Cloudy.
"	16....	17·3	15·3	3·8	1·2	Fair; fine sunset; fine day.
"	17....	12·0	10·0	—4·1	0·6	Fair; very squally wind.
"	18....	8·0	10·8	—2·7	—3·0	Fair; fine sunset; squally wind.
"	19	10·2	10·6	—0·2	—2·7	Fair; squally wind.
"	20....	13·7	21·0	8·2	10·9	Fair; very squally wind.
"	21....	26·2	30·9	18·9	22·6	Cloudy.
"	22....	30·7	30·0	28·0	25·9	Cloudy; light snow; squally wind.

MAXIMUM and Minimum Temperatures, &c.—*Continued.*

Date.	Thermometer Readings.				Weather.
	Maximum.		Minimum.		
	6 a.m.	6 p.m.	6 a.m.	6 p.m.	
1907.	°	°	°	°	
Dec. 23....	31·3	30·0	27·5	24·7	Cloudy ; snow flurries.
" 24....	32·0	30·6	23·3	28·7	Cloudy ; very squally wind.
" 25....	29·0	25·6	23·2	20·9	Cloudy ; Lake Minnewanka frozen over.
" 26....	25·2	26·3	19·9	22·5	Cloudy ; light snow.
" 27....	23·8	27·4	6·9	15·9	Cloudy.
" 28....	25·0	20·9	15·9	9·4	Cloudy.
" 29....	12·8	14·4	—6·1	—7·4	Fair.
" 30....	9·8	10·3	—3·9	—7·0	Fair.
" 31....	1·0	10·8	—15·1	—15·2	Fair.
1908.					
Jan. 1....	11·2	26·8	3·0	8·3	Fair.
" 2....	25·3	30·7	19·2	18·7	Cloudy.
" 3....	29·0	29·3	16·8	16·2	Fair ; fine sunrise ; fine day.
" 4....	26·0	33·3	16·9	18·1	Cloudy ; squally wind.
" 5...	34·0	39·1	31·8	33·3	Cloudy ; thaw ; chinooking.
" 6....	35·2	31·3	25·8	23·2	Cloudy ; fine sunrise ; light snow
" 7....	29·0	28·0	26·2	23·7	Cloudy ; squally wind.
" 8 ...	27·0	29·2	16·8	20·1	Cloudy ; snow ; aurora.
" 9....	29·0	31·0	18·7	22·7	Cloudy.
" 10....	27·3	27·7	17·3	20·8	Cloudy ; snow ; fine sunrise.
" 11....	28·0	33·8	21·3	27·6	Fair ; fine sunset.
" 12....	29·0	24·3	9·8	5·3	Fair ; fine sunrise ; very fine day.
" 13....	20·2	25·2	13·0	10·0	Fair ; fine sunrise ; fine day.
" 14....	26·2	26·3	21·7	15·2	Fair.
" 15....	15·0	22·3	0·7	0·2	Fair.
" 16....	21·4	25·8	15·3	17·2	Cloudy.
" 17....	23·8	23·3	9·2	5·9	Fair ; very squally wind.
" 18....	21·0	29·2	15·7	16·3	Fair ; very squally wind.
" 19....	30·3	34·6	24·6	27·8	Cloudy.
" 20....	31·8	31·0	27·7	23·7	Cloudy ; light snow.
" 21. ..	24·5	24·3	16·8	18·3	Cloudy.
" 22...	20·0	20·0	—2·0	—4·0	Fair ; fine day.
" 23....	16·5	27·5	6·1	14·5	Fair ; very fine day ; squally wind.
" 24....	23·0	29·5	8·5	8·8	Cloudy ; very fine day.
" 25....	29·2	32·8	18·0	16·8	Fair ; very fine day ; river ice 19 inches.
" 26....	27·5	32·5	19·0	19·0	Fair ; fine day ; fine sunset.
" 27....	31·0	26·8	21·0	20·5	Cloudy ; snow.
" 28....	21·2	11·0	—7·3	—9·1	Fair ; fine day ; light snow.
" 29....	12·0	11·5	—1·8	—1·0	Cloudy.
" 30	9·5	9·8	—6·1	—11·2	Fair.
" 31....	—5·0	7·0	—26·7	—2·8	Fair.
Feb. 1....	6·0	12·0	—12·7	—3·2	Fair ; very squally wind.
" 2....	10·5	16·2	—1·2	—5·1	Cloudy ; fine day.
" 3....	15·0	20·8	4·5	4·8	Cloudy ; fine sunrise.
" 4....	16·0	9·5	3·0	2·0	Fair.
" 5....	3·2	13·2	— 5·9	— 1·2	Cloudy ; light snow.
" 6....	6·0	13·0	0·0	— 2·0	Cloudy ; snow.
" 7....	5·2	26·2	0·8	— 2·2	Fair.
" 8....	19·3	23·0	— 4·7	— 3·1	Fair.
" 9....	20·0	28·3	6·4	3·8	Cloudy.
" 10....	25·0	32·4	15·2	20·2	Cloudy ; fine sunset.
" 11....	25·0	26·7	— 3·8	— 0·8	Fair ; fine day.
" 12....	20·0	26·7	—10·4	—10·9	Fair ; fine sunrise and sunset ; fine day.
" 13...	22·6	28·8	2·3	3·7	Fair.
" 14....	27·2	33·3	20·2	20·8	Cloudy.
" 15....	31·0	33·8	25·4	20·1	Fair ; ice on river 2¾ in. ; rain.
" 16....	27·0	34·2	20·0	20·7	Cloudy.
" 17....	29·0	25·6	14·4	2·2	Fair ; very fine day.
" 18....	19·0	30·0	0·3	— 1·3	Fair.
" 19....	25·0	28·1	5·1	7·2	Fair.

MAXIMUM and Minimum Temperatures, &c.—*Continued.*

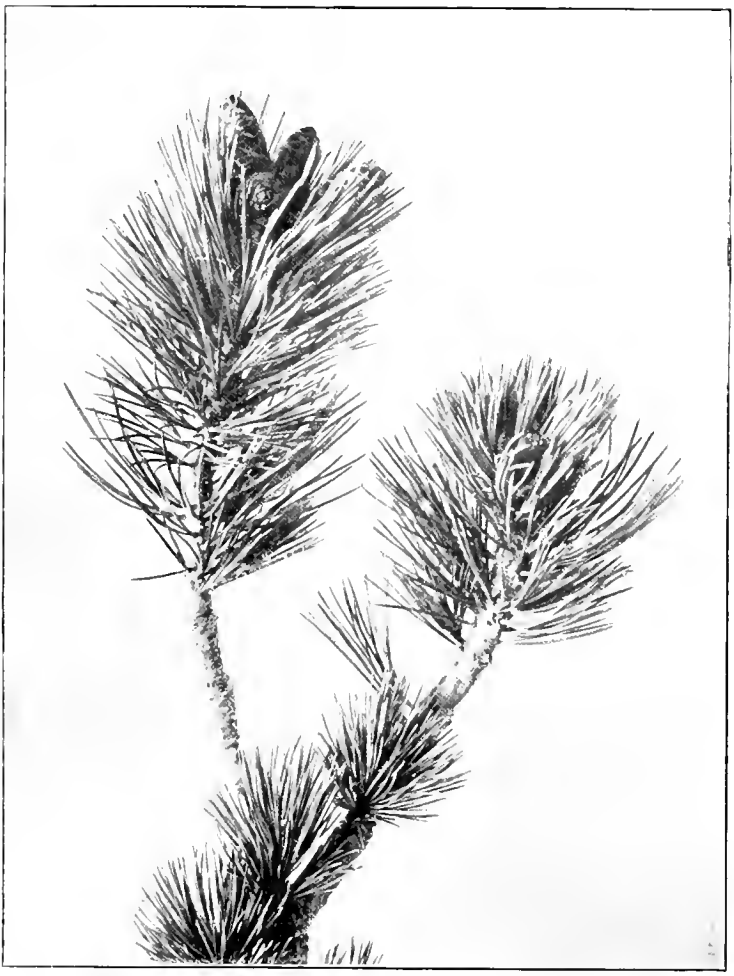
Date.	Thermometer Readings.				Weather.
	Maximum.		Minimum.		
	6 a.m.	6 p.m.	6 a.m.	6 p.m.	
1908.	°	°	°	°	
Feb. 20....	23·0	31·3	1 2	0 6	Fair; very fine day.
" 21....	29·2	40·3	12 9	12·9	Fair; very fine day; thaw.
" 22....	37·0	41·3	21·3	23·7	Fair; fine day; thaw.
" 23....	38·0	45·8	32·8	32·8	Cloudy; heavy thaw; chinook.
" 24....	41·0	33·2	30·8	30·0	Cloudy; sleighing good again.
" 25....	30·2	32·0	22·5	16·3	Cloudy.
" 26....	29·0	33·8	22·2	23·5	Cloudy; snow.
" 27....	33·0	32·0	20·1	19·9	Cloudy.
" 28....	20·5	19·9	6·2	5·2	Fair.
" 29....	14·8	21·8	— 3·7	2·4	Fair.
Mar. 1....	13·9	13·1	— 6·1	— 4·0	Cloudy; snow flurries.
" 2....	11·2	16·0	5·2	5·2	Cloudy; light snow.
" 3....	11·2	12·8	— 0·2	— 2·2	Fair.
" 4....	8·0	28·1	—15·3	—16·5	Fair; aurora; very fine day.
" 5....	21·0	32·0	—11·8	—13·4	Fair; very fine day.
" 6....	29·0	35·1	1 4	0·6	Fair.
" 7....	31·2	33·8	13·7	7·8	Fair.
" 8...	29·0	37·0	22·5	21·7	Cloudy; very squally wind.
" 9....	33·8	42·2	24·5	21·0	Cloudy; fine day; thaw.
" 10....	39·2	42·7	35·2	33·3	Cloudy; snow; very squally wind.
" 11....	35 0	39·3	32·5	32·5	Cloudy; snow.
" 12....	38·4	37·3	28·2	27·3	Cloudy; snow; Varied thrush.
" 13....	34·0	40·4	31·3	29·9	Cloudy; river opening in places.
" 14....	38·8	37·6	31 8	32·8	Cloudy; very squally wind; robin.
" 15 ...	33·0	22·8	18·9	11·0	Cloudy; snow.
" 16....	40·4	31·8	15·4	26·2	Fair.
" 17....	28·3	32·8	14·5	10 2	Cloudy.
" 18....	27·7	32·4	8·0	9·2	Fair; snow flurries; squally wind.
" 19. ..	28·0	32·9	8·4	9·2	Fair; sleighing bad; squally wind.
" 20...	30·5	33·8	22·2	25·8	Cloudy; squally wind.
" 21....	31·9	42·3	16·8	15·5	Fair; thaw; squally wind.
" 22....	38·2	38·2	35·2	34·2	Cloudy; very squally wind.
" 23....	35·0	36·2	27·7	26·8	Cloudy; ice on river 19 inches.
" 24....	33·0	29·2	19·3	18·7	Cloudy; snow.
" 25....	19·3	24·2	0·5	— 1·1	Fair; fine day.
" 26 ...	20·2	19·7	4·0	4 8	Cloudy; aurora.
" 27....	15·6	26·7	—10·4	— 9·5	Fair.
" 28....	24·2	31·7	— 6·4	— 6·0	Fair; fine day; aurora.
" 29....	29·0	34·7	24·4	25·3	Cloudy; squally wind.
" 30....	32·1	21·0	17 7	14·0	Cloudy; ice on Lake Minnewanka 28 inches.
" 31....	16·2	23·8	— 3 2	— 2 1	Fair.
April 1....	20 0	32·3	—12·9	— 13·3	Fair; Swainson's Leucosticte.
" 2....	30·3	45·3	20·3	18·8	Cloudy; thaw; sleighing bad.
" 3....	42 0	47·0	36·2	34·0	Cloudy; rain and thaw; squally wind.
" 4....	35·4	31·8	24·3	24·2	Cloudy; squally wind; ice on river about 21 inches.
" 5....	29 2	37·2	24·3	25·0	Cloudy; redpolls.
" 6....	29·5	32·3	19 0	19·2	Cloudy; light snow.
" 7....	27·7	42·2	9·0	11·2	Cloudy; arctic bluebirds.
" 8....	39·0	49·2	32·2	33·8	Fair; squally wind; no sleighing.
" 9....	45·0	40·8	33·3	33·2	Cloudy; light snow; river opening much.
" 10...	35·2	45·7	22·2	23·1	Cloudy; very squally wind; snow going very quickly.
" 11....	45·2	53·2	40·0	44·6	Cloudy; very squally wind.
" 12....	49·2	52·7	44·4	44·8	Cloudy; roads dry or mostly so.
" 13....	49·0	56·0	43·0	44·5	Cloudy; juncos.
" 14....	47·5	35·8	24·0	24·2	Cloudy; swallows.
" 15....	33·0	56·1	21·0	20·8	Fair; river open.
" 16....	52·0	52·7	34·8	38 8	Cloudy; no snow in valley; long-crested jay.
" 17....	44·2	44·0	37·0	38·7	Cloudy.
" 18...	39·2	50·4	33·0	34·1	Cloudy; anemones in flower.
" 19....	45·0	53 8	31·2	34·0	Cloudy; rain.
" 20....	51·8	54·9	36·8	42·3	Cloudy; white-crowned sparrows; solitaire.
" 21....	45·2	58·7	32·0	37·0	Fair; frogs piping; warbler.

MAXIMUM and Minimum Temperatures, &c.—*Continued.*

Date.	Thermometer Readings.				Weather.
	Maximum.		Minimum.		
	6 a.m.	6 p.m.	6 a.m.	6 p.m.	
1908.	°	°	°	°	
April 22...	54·0	58.9	32·6	32·6	Cloudy ; partridge drumming.
" 23. ..	51·2	50·2	35·7	35·3	Cloudy ; rain ; petasites in flower.
" 24. .	37·7	43·5	29·6	29·1	Cloudy ; rain and snow ; juncos building.
" 25....	37·0	45·2	31·2	31.2	Cloudy ; kingfishers ; ruby crowned kinglet.
" 26	44·2	53·1	23·4	23·1	Fair ; fine day ; Audubon's warbler.
" 27....	49·0	43·0	31·2	30·9	Cloudy ; snow rain.
" 28 ...	33·5	48·8	29·8	29·8	Cloudy ; snow ; rain ; bufflehead duck and goose.
" 29....	46·2	49·8	25·1	25·4	Fair ; swallows numerous.
" 30....	47·0	58·9	22·2	21·8	Fair ; very fine day ; lutescent warbler ; Vanessa antiopa and milberti and grapta.
May 1....	55·8	64·5	26·0	25·9	Fair ; very fine day.
" 2....	61·2	53·4	35·1	34·9	Cloudy ; northern chipmunks out.
" 3....	45 3	53·3	36·5	35 6	Cloudy ; rain.
" 4	48·3	57·2	31·3	31 0	Fair ; cowbird ; Shepherdia Canadensis in flower.
" 5....	51·0	63·8	45·3	44·8	Fair ; Lycaena and copper butterflies ; chipping sparrow; ruddy duck.
" 6....	60·6	71·0	29·0	29 0	Fair ; very fine day ; *genetriflorum.*
" 7....	67·2	72·0	30·8	31·8	Fair ; insects about ; lake partly open ; flicker.
" 8....	56·3	45·0	35·9	36·1	Cloudy ; rain ; meadow lark.
" 9 ..	43·0	53·7	35·7	35·8	Cloudy ; nut hatch.
" 10....	51·2	50·2	37·2	37·1	Cloudy ; rain.
" 11....	51·0	56·2	35·6	35·4	Cloudy ; rain ; Calypso borealis.
" 12....	45·8	49·9	37·1	37·6	Cloudy ; rain ; primula Mistassinica.
" 13....	48·8	46·3	38·9	39·7	Cloudy ; rain ; gull ; violets ; bearberry ; strawberry in flower.
" 14.. .	43·0	48·2	37·8	37·8	Cloudy ; little rain.
" 15....	46·3	51·3	37·3	38·0	Cloudy.
" 16....	49·8	45·2	38·2	35·8	Cloudy ; rain.
" 17....	40·0	53·1	36·8	35.6	Cloudy.
" 18....	47·6	47·4	32·1	32·6	Cloudy ; rain.
" 19....	45·2	45.8	37·0	36·8	Cloudy ; rain.
" 20....	43·2	53·1	36·2	36·8	Cloudy ; Dodecatheon Meadia ; San Dego redwing.
" 21....	51·0	58·1	29·2	30·2	Fair ; Tennessee warblers.
" 22....	51·3	59·4	33·2	33·9	Cloudy.
" 23....	53·5	61·3	30·8	31·7	Fair.
" 24	59·0	61·4	45·7	46·5	Cloudy ; olive backed flycatcher.
" 25....	56·1	48·7	38·8	38·8	Cloudy ; rain.
" 26....	46·0	49·7	38·0	38·2	Cloudy ; light rain.
" 27....	48·2	54·8	38·8	38·9	Cloudy ;-aurora.
" 28....	54·0	64·6	30·0	29 9	Fair ; grasshoppers, &c. ; very fine day.
" 29....	58·2	57·9	45·2	44·9	Cloudy.
" 30....	55·0	44·1	35·2	36·8	Cloudy ; rain.
" 31....	39·3	51·2	33·9	34·3	Cloudy ; rain.
June 1....	51·2	46·3	43·9	42·7	Cloudy ; river high ; rain.
" 2.. .	43·0	56 1	38·3	38·2	Cloudy ; light rain.
" 3....	50·3	57·5	40·3	41·2	Cloudy ; light rain.
" 4....	52·1	53·9	43·7	44·3	Cloudy ; light rain.
" 5....	52·2	59·0	45·8	47·2	Cloudy.
" 6....	59 0	57·3	45 6	45·7	Cloudy ; light rain.
" 7....	57·2	63·5	42·8	42·9	Fair.
" 8	61·0	72·5	34·8	35·1	Fair.
" 9....	66·4	74·4	37·8	37·8	Fair ; very fine day.
" 10....	67·2	72·9	38·2	38·0	Fair.
" 11....	65·3	57·1	46·1	45 1	Cloudy ; rain and hail.
" 12....	49·0	61·0	35·8	35·4	Fair.
" 13....	54·7	66·1	37·2	39·2	Cloudy ; rainbow; papilio tremens.
" 14....	63·3	73·2	35·8	35·3	Fair ; very fine day.
" 15....	69·3	70·0	37·7	38·7	Cloudy ; thunder and lightning.
" 16....	62·0	63·3	46·0	48·8	Fair ; fine sunset ; river high.
" 17....	57·0	61·0	36·8	37·8	Fair.
" 18....	59·1	63·6	34·3	34·9	Cloudy.
" 19....	56·0	57·3	42·1	42·4	Cloudy ; light rain ; thunder.

MAXIMUM and Minimum Temperatures, &c.—*Concluded.*

Date.	Thermometer Readings.				Weather.
	Maximum.		Minimum.		
	6 a.m.	6 p.m.	6 a.m.	6 p.m.	
1908.	°	°	°	°	
June 20....	55·5	50·0	38·6	43·2	Cloudy; rain.
" 21....	44·0	46·8	36·8	37·0	Cloudy; rain.
" 22....	45·2	60·3	39·1	43·0	Cloudy.
" 23....	58·0	66·0	42·3	42·2	Cloudy.
" 24....	63·3	76·2	36·0	37·0	Fair; very fine day.
" 25....	71·6	74·6	47·4	49·7	Fair; rain; very fine day.
" 26....	69·0	51·1	48·8	42·4	Cloudy; rain.
" 27....	45·2	47·0	38·8	39·8	Cloudy; rain.
" 28....	47·1	59·4	36·9	38·8	Cloudy.
" 29....	54·0	63·2	47·6	48·3	Cloudy.
" 30....	60·6	64·9	43·6	43·9	Fair.



1.—Pinus Albicaulis.—Grows in profusion at Banff and well up on the mountains sides.

2.—Corralhoriza innata virescens.—A most exquisite orchid, and fungoid in its characteristics. Found indamp pine woods during July and August. Though growing in other sections of the Rockies, the beautiful coral-like roots seem to develop best in the forests around Banff.

3.—Cypripedium.—This orchid is found from Banff to Field.

4.—Larix Lyallii.—This beautiful tree is found from 7,000 feet upwards. From the first of June the botanist may look for the flowers, which are of a deep crimson, and very profuse.

5.—The Anemone of the higher altitudes, blooming as the snows disappear at 8,000 feet and upwards.

11.—Systopteris fragilis.

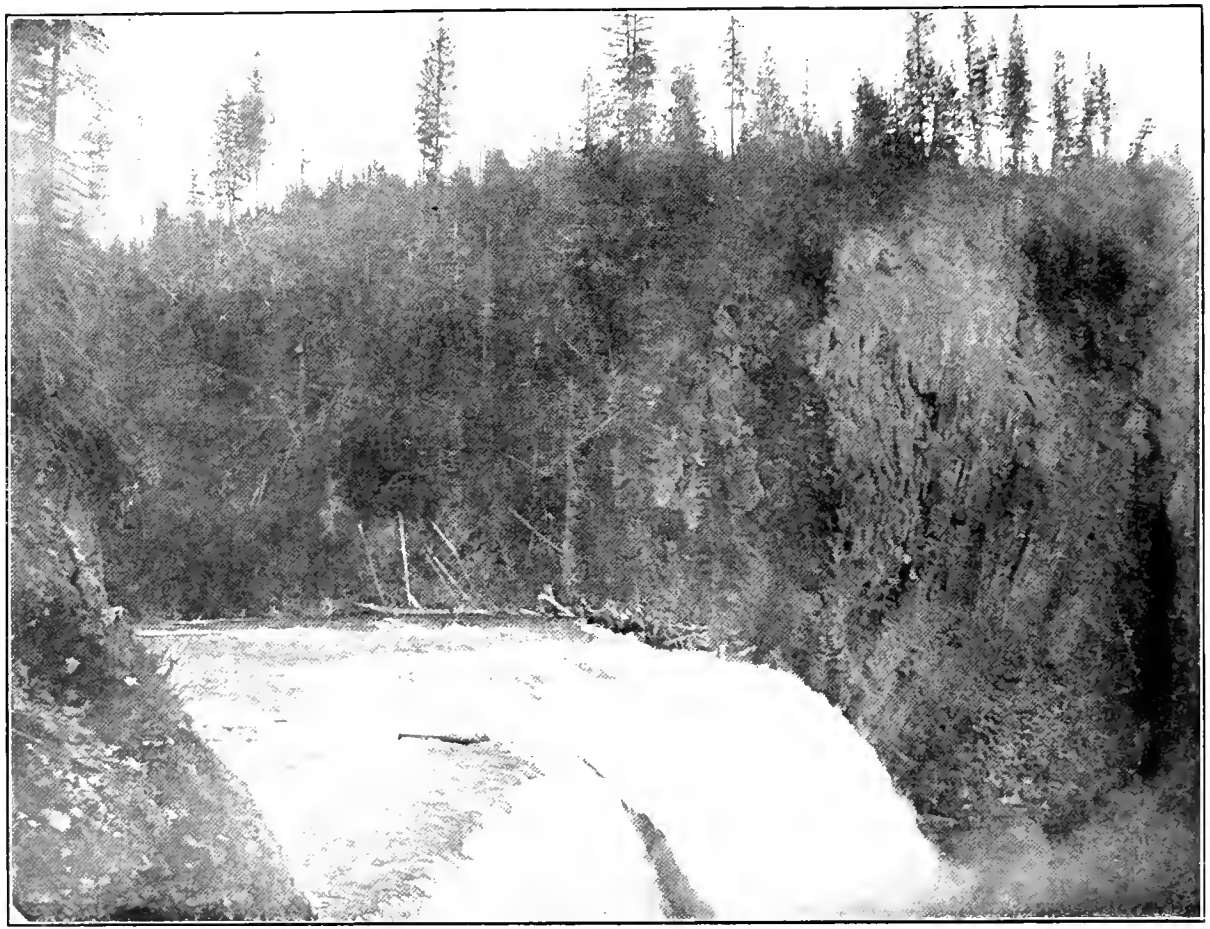
12.—The pink primula found in abundance in moist ground at Banff and Field in early June.

13.—Drias octopetala, found generally throughout the Rockies during July and August.

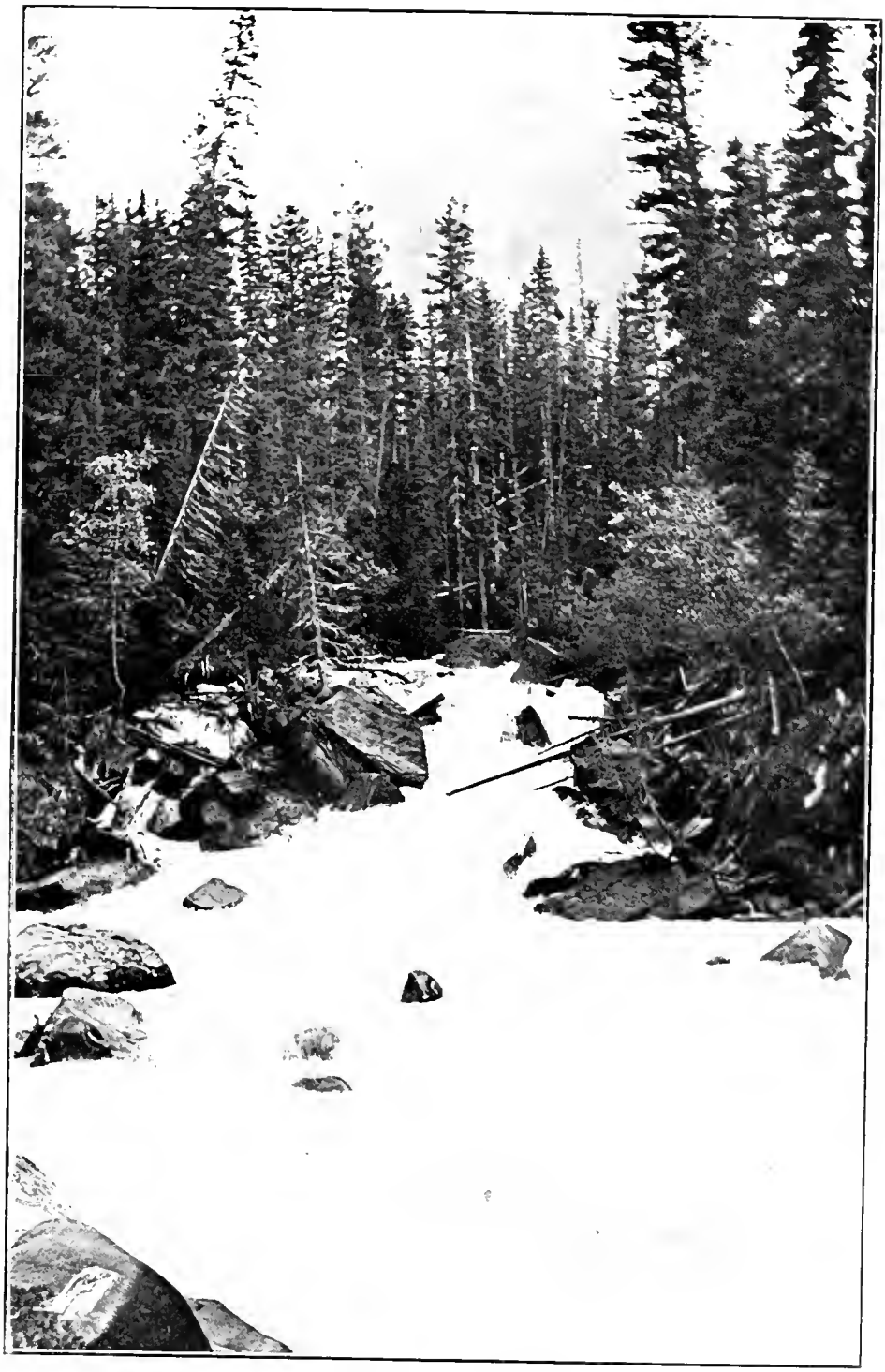
14.—Calypso bulbosa.—This orchid, the most beautiful of all orchids in the Rockies, is found in densely grown forests. Blooming early in June, it is seldom seen in perfection by botanists or tourists. With its deep crimson and yellow splotched pouch and magenta wings it is easily found by lovers of flowers in the soft, green, mossy beds beneath the pines.

Head gates Banff Waterworks.

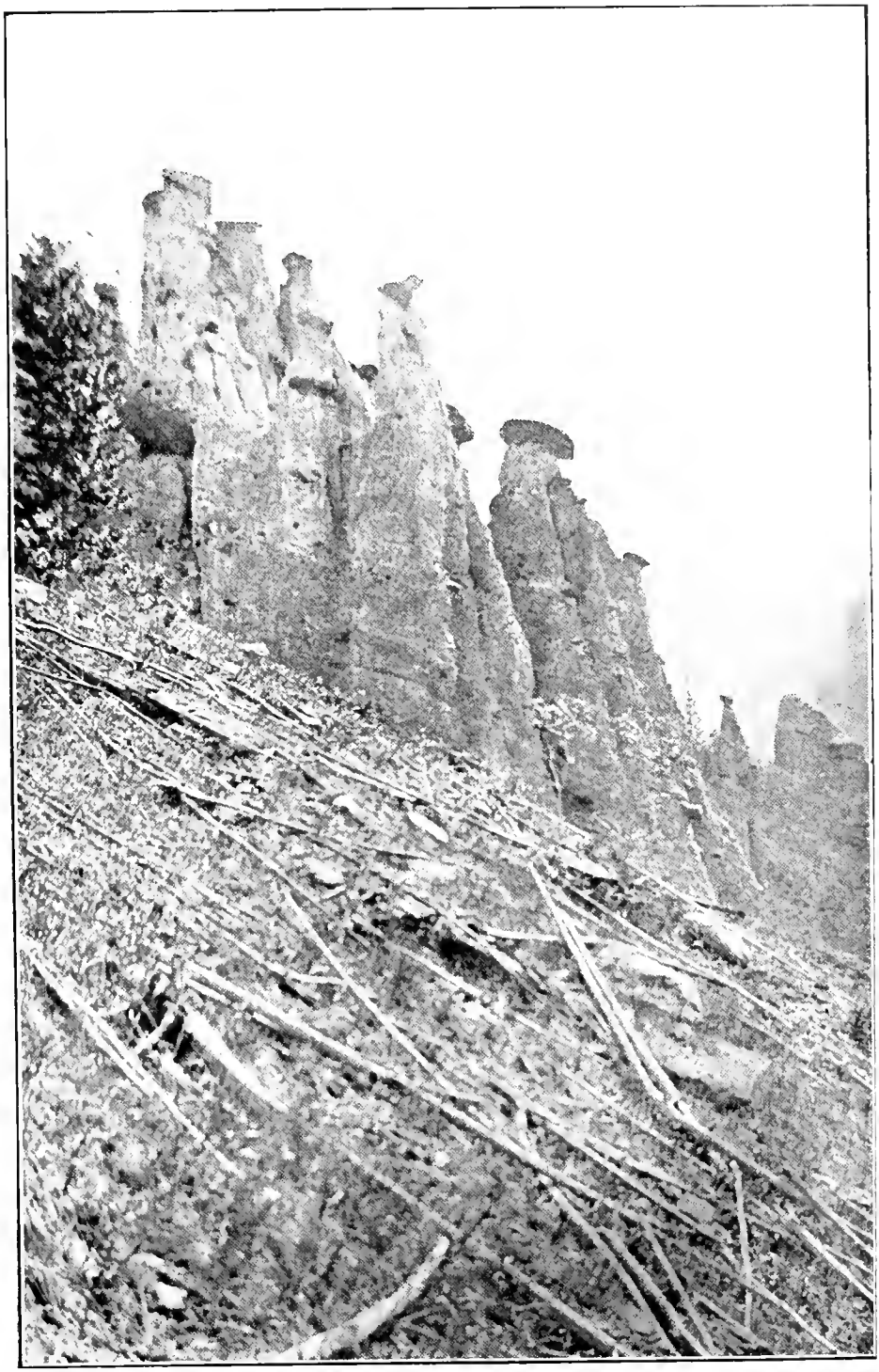
Yoho Canyon.



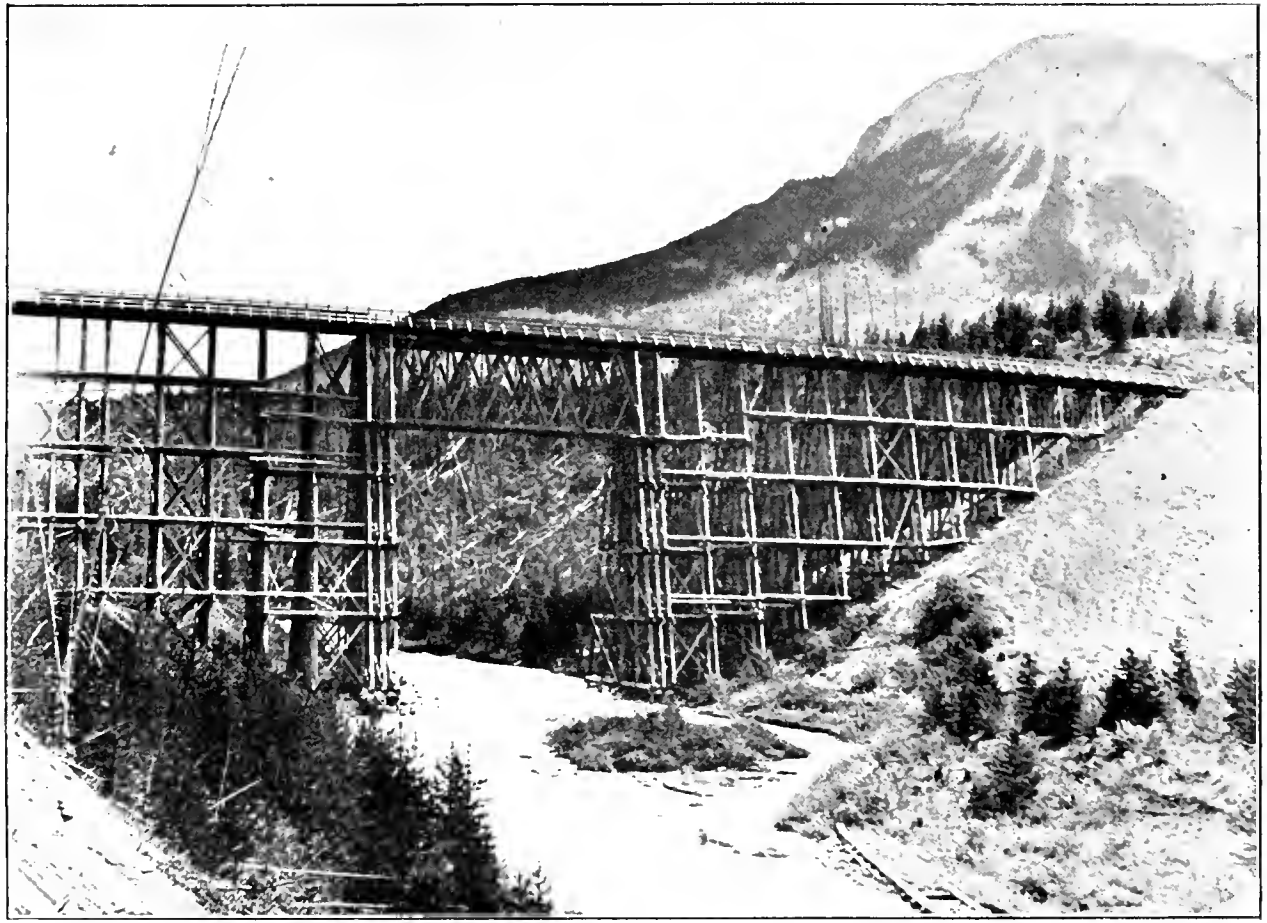
Bow River Falls at Banff



Yoho Falls into Kicking Horse.

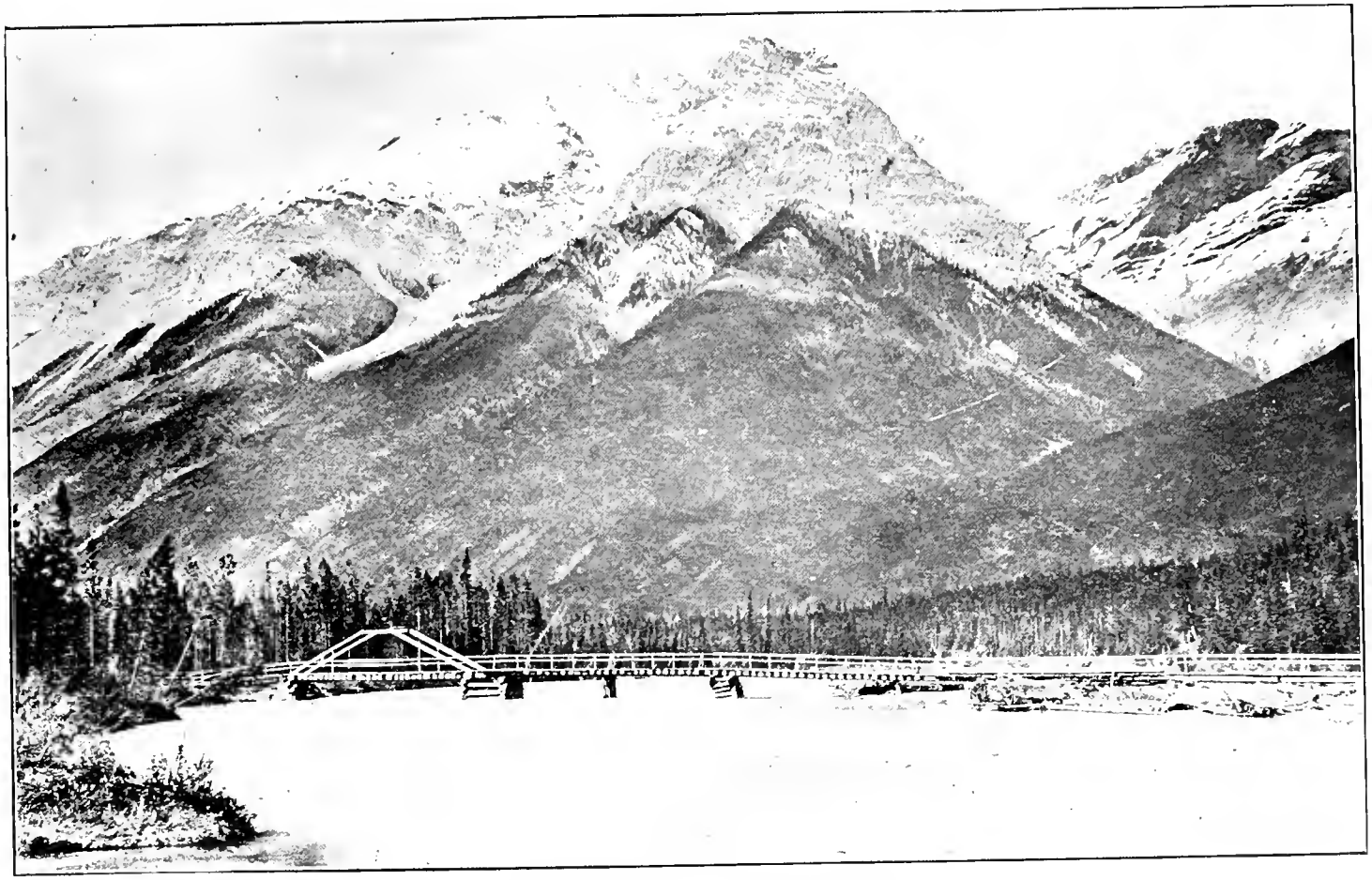


The Hoodoos three miles from Leanchoil.



Canyon and Carriage Road.

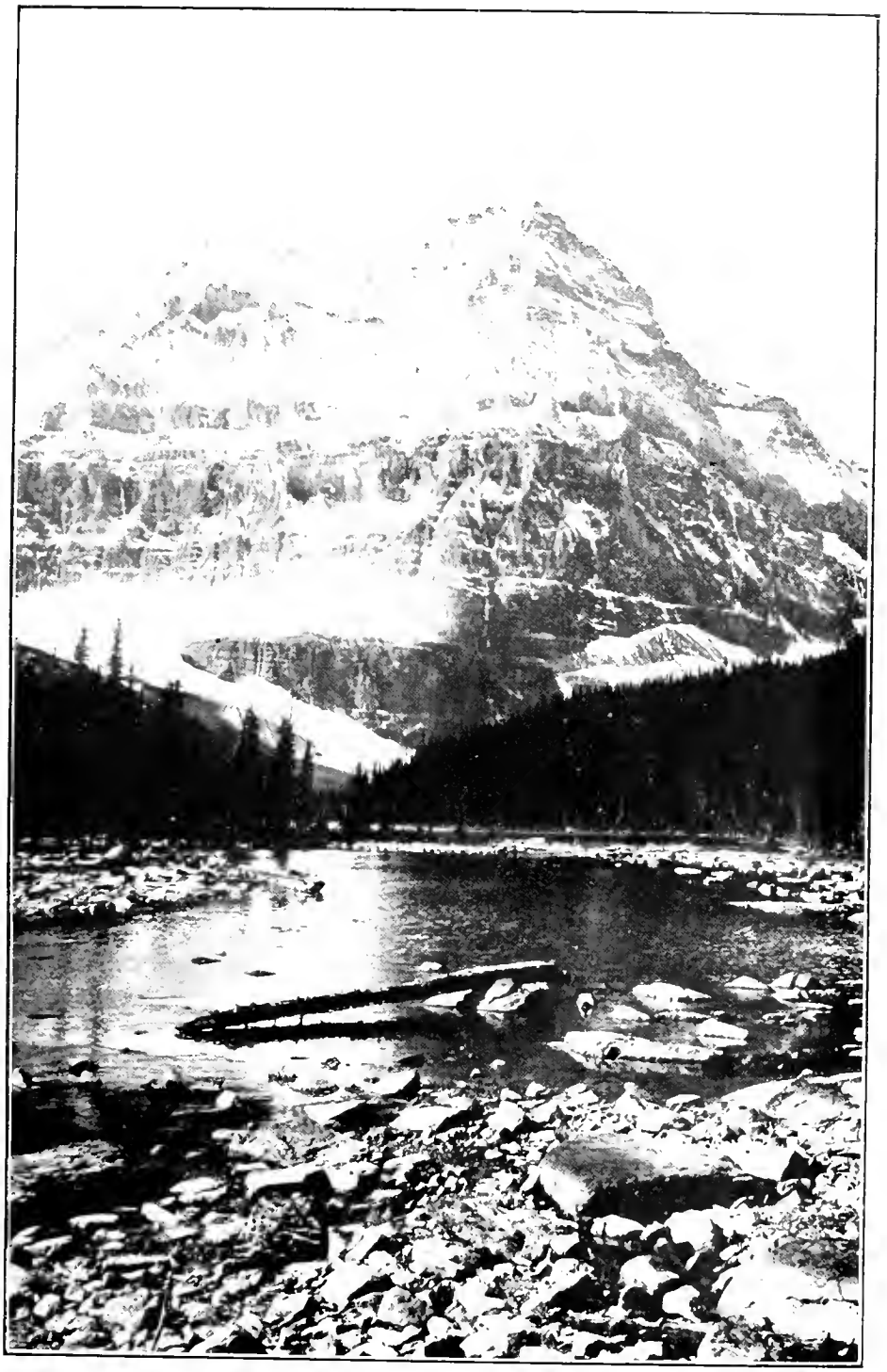
Point-Look-Out, Selkirk Caves.



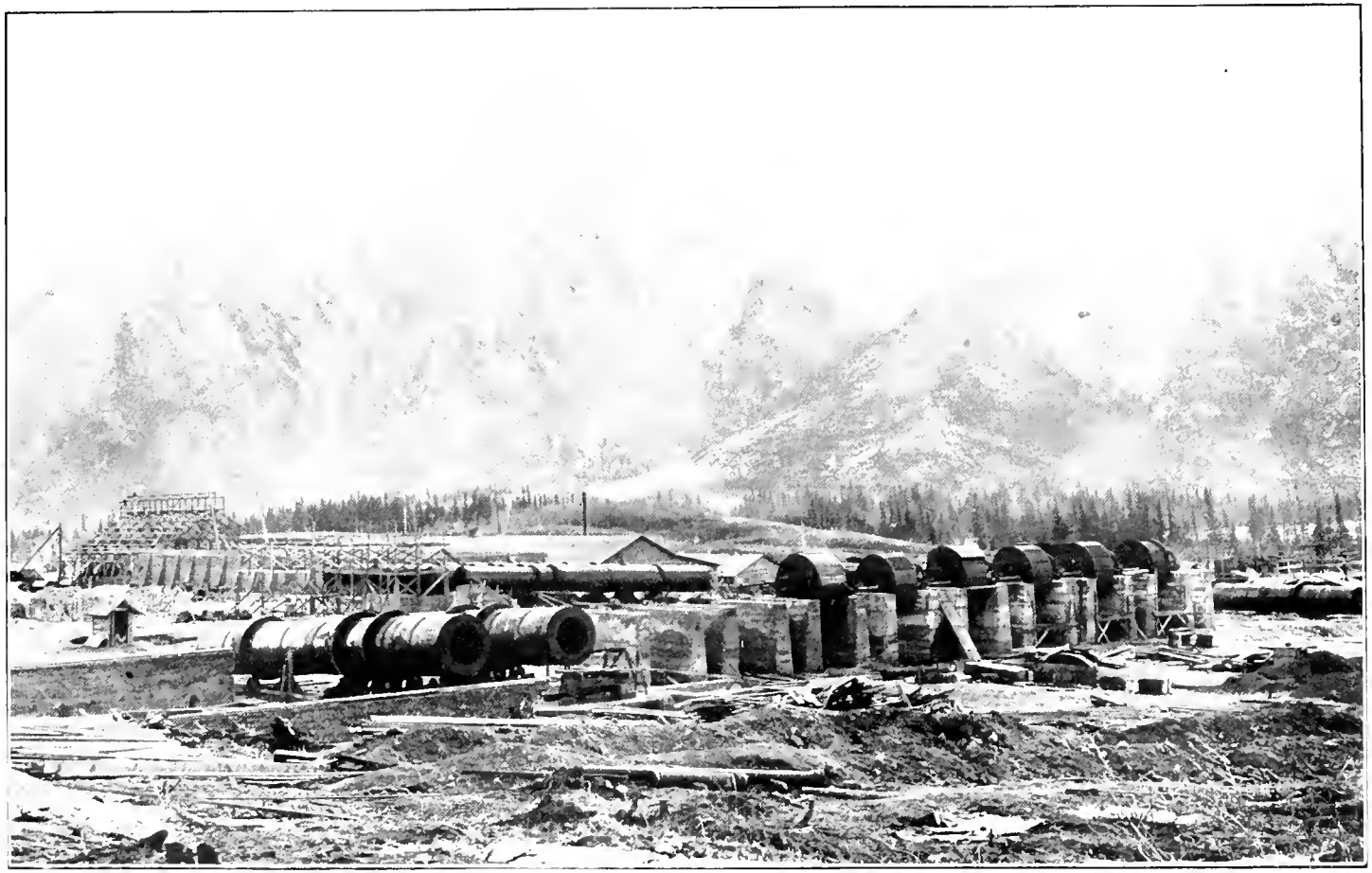
The Bridge, Mount Vaux and Hoodoo Gulch.

Twin Peaks Canyon, Yoho Valley.

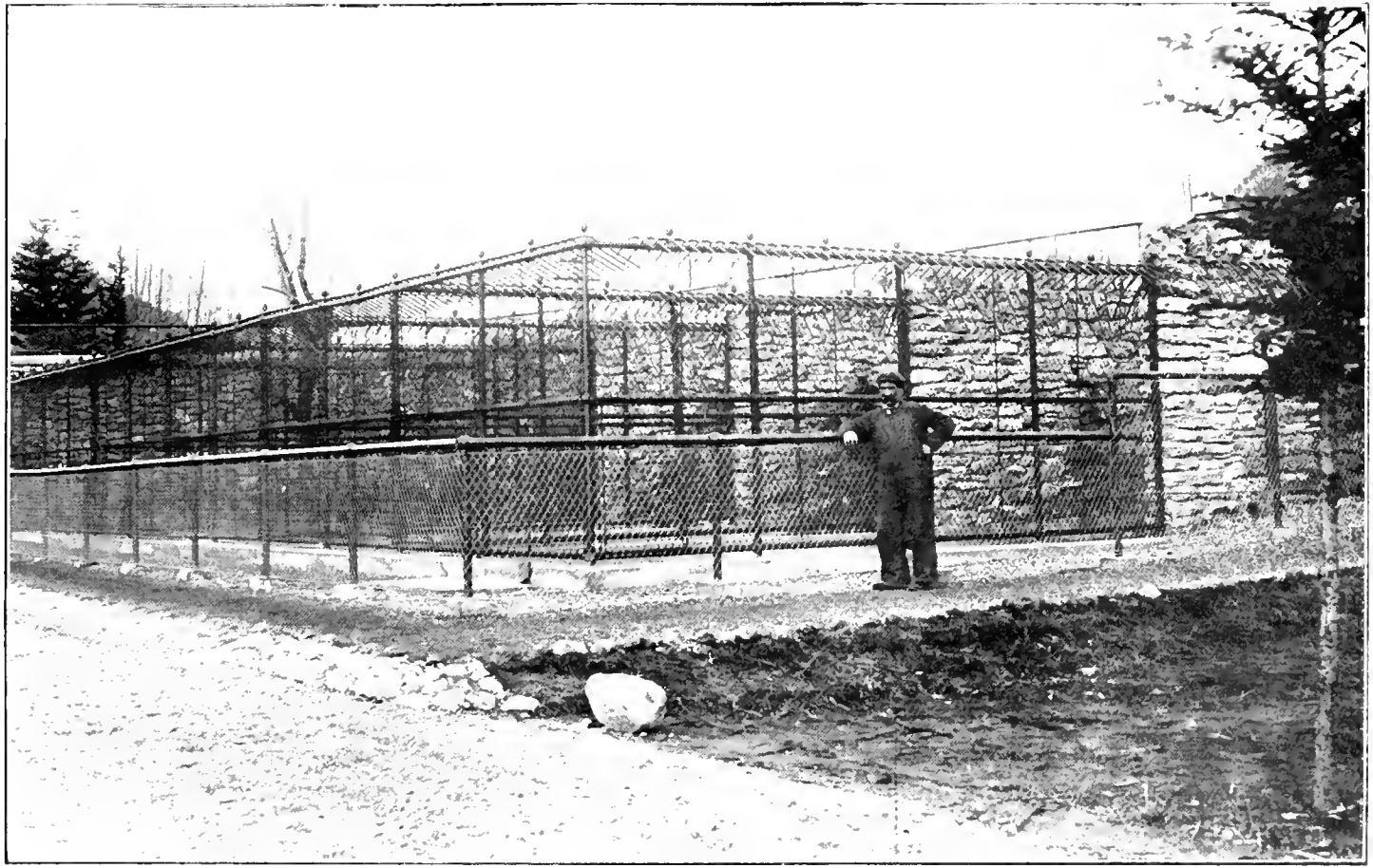
Pair of 10 Months' Old Moose.



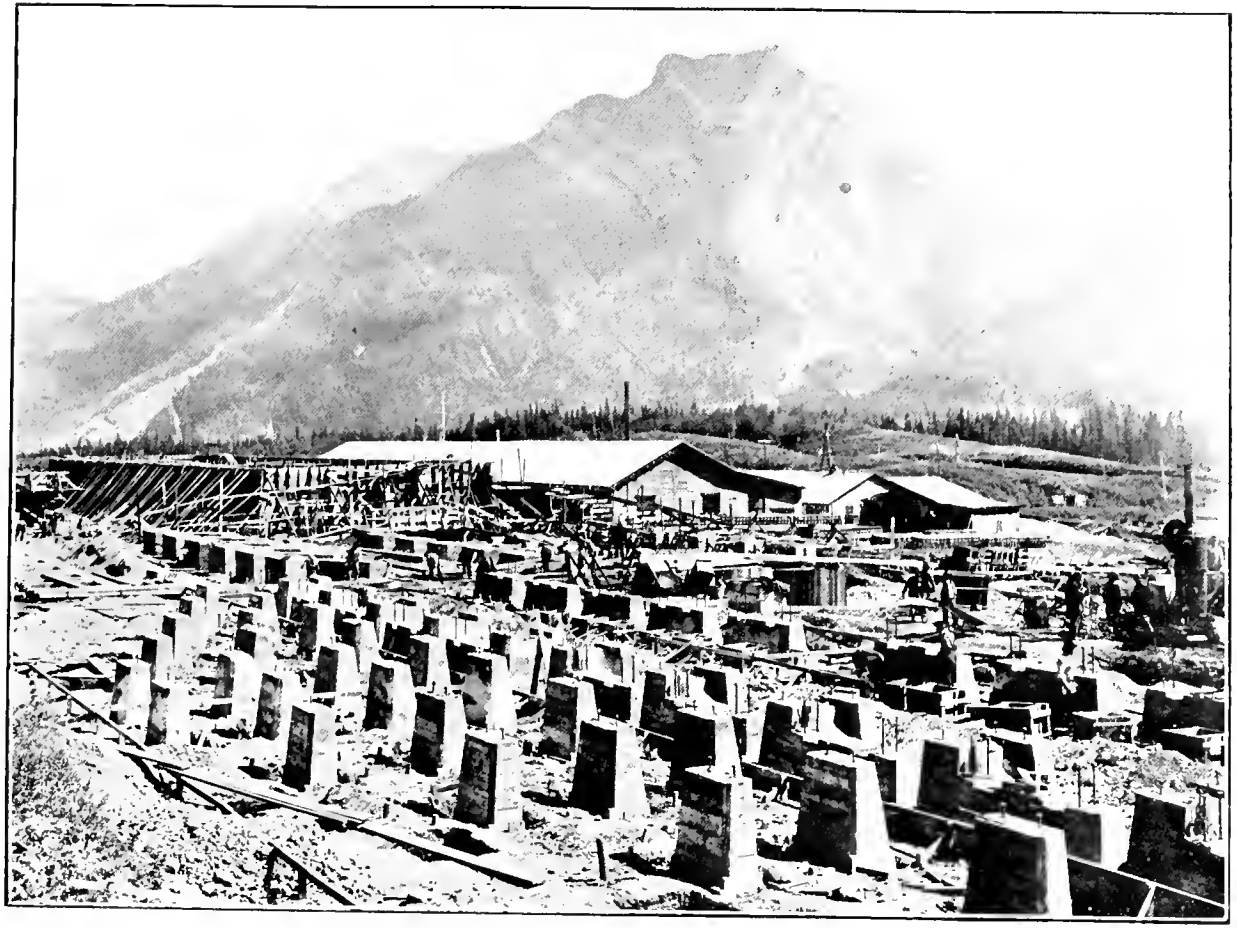
Mount Ball, near Banff. (Altitude 10,900 ft.)



Western Canada Cement and Coal Co., near Banff, under construction. The largest plant in the Dominion. Capacity 2,000 bbls. per day.



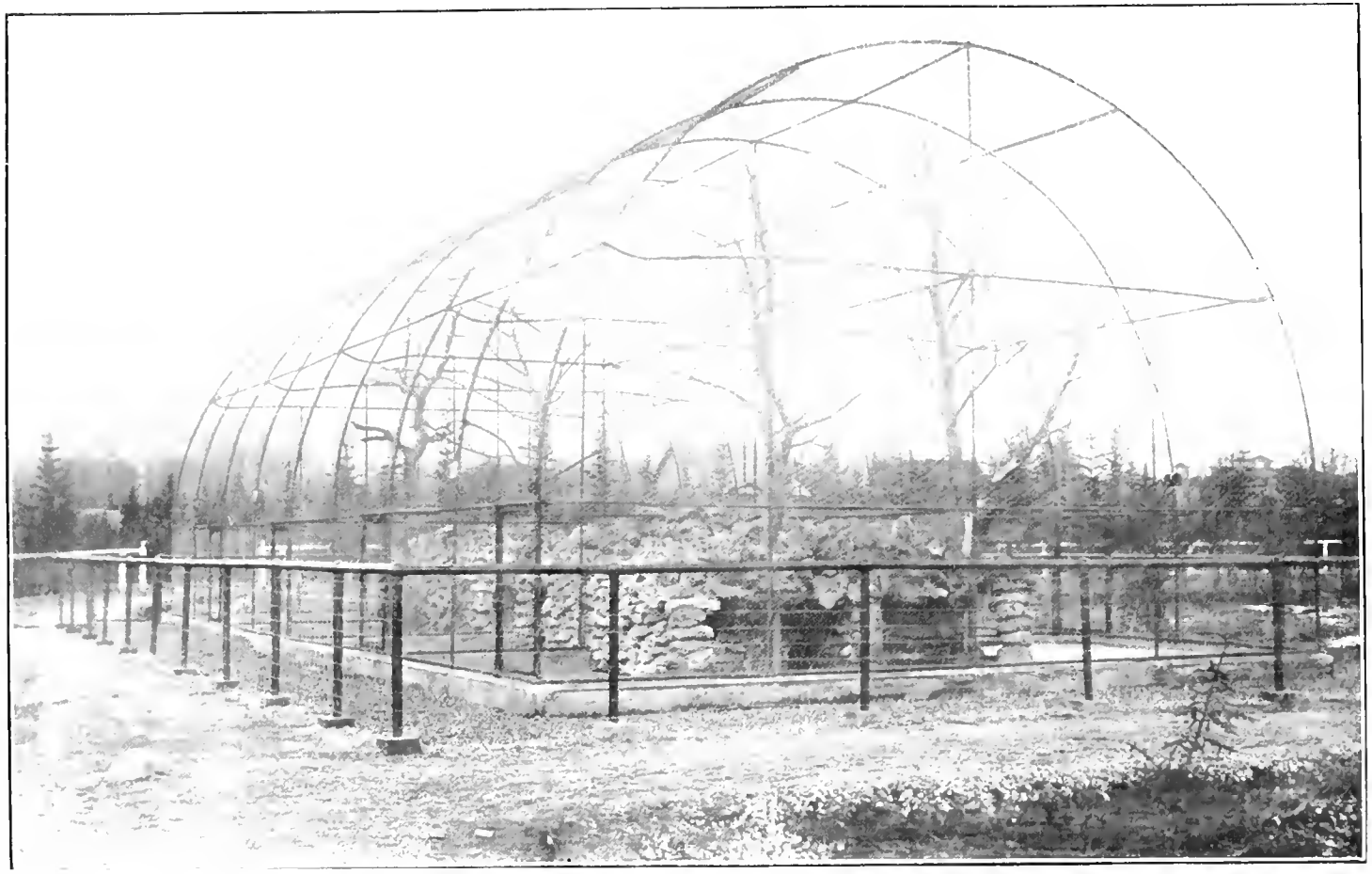
New Animal Cages, Banff.



Western Canada Cement and Coal Co., near Banff. The largest plant in the Dominion under construction. Capacity 2,000 bbls. per day.

Aspen Avenue, Banff.

Elk in the Park at Banff.



New Animal Cages, Banff.

Members of the Canadian Alpine Club returning from a successful climb of Mount Rogers.

PART VI

YUKON TERRITORY

YUKON TERRITORY

COMMISSIONER'S OFFICE,
YUKON TERRITORY,
DAWSON, Y.T., April 15, 1908.

The Hon. FRANK OLIVER,
Minister of the Interior,
Ottawa.

SIR,—I have the honour to submit the report of the Yukon Territory for the fiscal year ending March 31, 1908.

GOLD PRODUCTION.

The gold production in the Territory, as taken from the returns in the comptroller's office for the year ending March 31, 1908, was 189,011·86 ounces, which, at $15 per ounce—which is the valuation for royalty purposes—would amount to $2,820,161.60. This is the lowest output in the history of the Territory, since 1898, and is due mainly to the fact that a considerable number of the claims on Hunker, Bonanza and Eldorado creeks were not worked during the year, having been acquired by the Yukon Gold Company for dredging and hydraulicking purposes.

DREDGING.

The Yukon Gold Company has installed three large dredges on Lower Bonanza, one on No. 90 below and two on No. 104-A below Discovery, which were worked during the greater part of the season of 1907, but owing to encountering frozen ground the work was not as extensive as was anticipated in the early part of the season. Another dredge has been constructed on No. 90 below Discovery on Bonanza creek, and will be operated as soon as the season opens. This company is also constructing three dredges on Hunker creek, which it is expected will be working this season.

In connection with the construction of ditches and flumes by this company, 17 miles of ditching have been completed and about 4 miles of flume; the remainder of the flume is ready to be put in as soon as the weather permits, the foundations being already prepared. There is also 12½ miles of piping on the ground ready to be put together. The syphon, which will be used to convey the water across the Klondike valley, is all in position to be assembled, and has a capacity of 5,000 inches, being 49 inches inside diameter and 15,760 feet long.

The hydraulic electric transmission plant on the Twelvemile river is completed, and power will be supplied to all the gold-bearing creeks within the Dawson mining district for the company's several works, such as dredges, electric lifts, &c. Three electric lifts have been constructed by this company on Bonanza creek, and will be used this summer. The dam, which has been under construction at No. 57 above Discovery on Bonanza creek, is now completed, and will store 350,000,000 gallons of water; this water is to be used for hydraulicking the bench gravels on Bonanza creek, enabling the ground to be worked during the dry season, usually the months of June, July and August. There are two ditches, each of 1,000 inches capacity, conducting the water from this dam down Bonanza creek, which will supply two large hydraulic plants; it will also be used in connection with the electric lifts in the creek bottoms.

This company expects to have all its works completed and to be in a position to undertake active operations during the season of 1909.

The Canadian Klondike Mining Company is still operating in the Klondike River valley at a point near the mouth of Bear creek. This dredge has an average capacity of 2,800 cubic yards per day of 24 hours, and during the season of 1907 was in operation for 167 days.

The dredge belonging to the Bonanza Basin Gold Dredging Company was entirly remodelled last year, the motive power having been changed from steam to electric power.

The Lewes River Dredging Company operated on Discovery claim on Bonanza creek, but has since been removed to No. 6 below Discovery, and will continue there during the present season.

The dredge which has been operated in the submerged bed of the Klondike river has been removed to Indian river, and is being operated there by the Indian River Gold Mining and Development Company, Limited.

The Fortymile Dredging Company operated a dredge last season in the submerged bed of that river, and material to remodel this dredge is now being freighted there. Another dredge has been ordered by this company from San Francisco, and is expected to be delivered during the summer of 1908.

The submerged leaseholds owned by Wm. Ogilvie and others on the Stewart river have not been worked for several seasons, but a new company has been formed, viz.: The Yukon Basin Gold Dredging Company, capitalized at $20,000,000. A dredge is now being constructed at Whitehorse and will be taken down the Yukon river to these leaseholds as soon as completed. The company contemplates constructing during the present season another dredge to operate on the Stewart river.

INDIVIDUAL MINING.

Individual mining operations have been carried on at Granville on Lower Dominion, and on Sulphur, Quartz and Eureka creeks, with, it is understood, good results. New discoveries were made on Blackhills creek, and on Little Blanche, a tributary of Quartz. Blackhills is a tributary of the Stewart river, and is situated in the Dawson mining district. Two hundred and fifty-two creek and 100 hillside claims have been staked, and about fifty claims on its tributaries. There are about fifty individual plants operating on this creek, and the prospects for a good clean-up in the spring are excellent.

Quite a considerable amount of work was done in placer mining in the Salmon River district, principally on Livingstone creek. There are about 125 men working in that district.

There has been increased activity in the southern end of the Territory in copper and quartz. Last season's development work has disclosed greater ore bodies than even the most sanguine operators anticipated. The White Pass Railway Company contemplates building a spur line to some properties near Whitehorse, and has also erected ore bunkers at Skagway to facilitate the handling of ore.

YUKON COUNCIL.

The Yukon Council met on August 8, 1907, and prorogued on August 30, 1907. Fourteen ordinances were passed in connection with the local administration, and other necessary business transacted. A committee on mining was appointed by the Council and instructed to make such representations as to amendments to the Yukon Placer Mining Act and the Quartz Regulations as were deemed advisable. These recommendations have been forwarded to you, and it is satisfactory to note that a Bill embodying many of the proposed amendments has been presented to parliament. One

of the most important amendments to the local ordinance was the repeal of the section licensing music halls. The passing of this amendment has led to the abolition of dance-halls in the Territory.

The revenue of the Territory for the nine months ending March 31 was $332,-846.72, and the expenditure $338,755.10.

SCHOOLS.

The schools have been maintained during the past year in a very high state of efficiency, and the results obtained have given the highest satisfaction to the people of the Territory.

ADMINISTRATION OF JUSTICE.

The Territory during the past year has been remarkably free from crime of a serious nature. This condition I have no doubt is due to a large extent to the law-abiding spirit pervading the people of this Territory, but I do not wish to detract in this regard from the great credit due to the highly satisfactory administration of justice and the activity and devotion to duty of the Royal Northwest Mounted Police under the able supervision of the Assistant Commissioner, Major Wood.

GENERAL.

The people of this Territory have been hopefully looking forward to the probability of railway connection with the other parts of this Dominion, and any proposal to secure connection either by an extension of the Klondike Mines Railway, which extension is now contemplated, or some other satisfactory connection, would be eagerly welcomed. It is confidently believed that such railway connection would open up vast areas of agricultural, coal and mineral lands and afford opportunities to a large population.

The same spirit of optimism which has hitherto prevailed, still exists among the people of this Territory.

I have to bear testimony to the efficient service rendered by all the officials of the different departments of government in the Territory.

Reports from the Comptroller, Gold Commissioner, Crown Timber and Land Agent, Director of Surveys, Government Mining Engineer, are herewith inclosed.

I have the honour to be, sir,

Your obedient servant,

ALEXANDER HENDERSON,
Commissioner.

No. 1.

REPORT OF THE ACTING COMPTROLLER.

DEPARTMENT OF THE INTERIOR,
COMPTROLLER'S OFFICE.
DAWSON, Y.T., April 10, 1908.

The Hon. ALEXANDER HENDERSON,
Commissioner of Yukon Territory,
Dawson.

SIR,—I have the honour to submit my annual report for the year ending March 31, 1908.

The expenditure under the vote 'Administration of the Yukon,' through the Department of the Interior, disbursed through my office, was $145,912.56; statements with vouchers being forwarded to the department at the end of each month.

The expenditure on account of Department of the Interior 'subsidy to river' steamers,' being amounts paid to steamers for making trips on rivers not usually travelled, to assist prospectors and miners in getting in their supplies, amounted to $6,061.75.

The local revenues and expenditures of the Yukon Territory from July 1, the beginning of its fiscal year, to March 31, 1908, were: revenue, $332,846.72; expenditure, $338,755.10, administered through my office; quarterly statements with vouchers being sent to the Auditor General as required by order in council. I attach a copy of the balance sheet on March 31, 1908.

The disbursement on account of the Department of Justice was $25,822.60, for services in connection with this Territory; monthly statements being forwarded, with vouchers.

The expenditure on account of the Department of Indian Affairs for the relief of sick and destitute Indians, &c., was $7,400.19.

The expenditure on account of the Department of Public Works 'buildings,' has been managed through the Superintendent of Public Works and the Comptroller; the expenditure was $69,935.33.

The expenditure on account of the Department of Public Works 'river improvements vote,' amounted to $6,768.09.

The royalty collected in the Territory amounted to $70,511.20; collected at Dawson, $69,011.30; Whitehorse, $1,495.10, and Fortymile, 75 cents.

The receipts from free certificates issued to exporters of gold from Alaska were $156.50.

Revenue from both these sources was forwarded to the credit of the Receiver General, drafts being sent to the department weekly and statements at the end of each month.

The revenue from the sale of Yukon Territorial Court law stamps was $3,750.95; from Mining Court stamps to January 31, 1908, $272.25; drafts and statements being sent to the Department of Inland Revenue. As the Gold Commissioner's Court was abolished, the Mining Court stamps on hand were returned to the Department of Inland Revenue on February 24, 1908.

Monthly statements of the revenue received in the office of the Gold Commissioner and Crown Timber and Land Agent have been checked each month as formerly, and the returns forwarded to the department. The suspense account in the Gold Commissioner's office has been checked and the cheques countersigned in payment of the vouchers.

SESSIONAL PAPER No. 25

As the management of the city of Dawson was transferred to the government of the Yukon Territory, the revenue and expenditure on that account have been put through the local revenues of the Yukon Territory instead of being kept separately as formerly, and vouchers for the city of Dawson have been sent to the Auditor General's department in the same way as the other services of the Yukon Territory.

In the balance sheet inclosed there are two groups: group one representing the revenue and expenditure of the Yukon Territory, and group two representing the revenue and expenditure of the city of Dawson.

I have the honour to be, sir,

Your obedient servant,

G. I. McLEAN,
Acting Comptroller.

TRIAL BALANCE, GOVERNMENT YUKON TERRITORY, MARCH 31, 1908.

Appropriation.		Dr.	Expenditure.	
$ cts.			$ cts.	
4,000 00	Group One.	Indemnity and travelling expenses Yukon Council	3,660 00	
8,050 00		Town of Whitehorse	7,365 98	
23,900 00		Salaries and travelling expenses	17,176 60	
1,750 00		Preventive Service	946 60	
5,000 00		Printing and Stationery	3,781 86	
900 00		Whitehorse Library	600 00	
56,515 00		Schools	36,283 45	
34,000 00		Hospitals, Charities and Quarantine	23,722 97	
5,000 00		Contingencies	2,603 38	
4,300 00		Dawson Free Library (Territory)	3,325 00	
143,785 00		Roads, Bridges and Public Works	152,146 66	
7,000 00		Miscellaneous Expenditure	5,127 01	
1,800 00		Law Library	1,184 45	
10,000 00		Bonus to Mining and Maintenance Assay Office	5,997 36	
.....	Group Two.	Indebtedness of City of Dawson	20,954 80	
50,126 00		Dawson Fire Department	35,314 80	
10,000 00		Maintenance Streets and Sidewalks	8,527 17	
2,500 00		Street Lighting	2,542 50	
1,000 00		Printing and Stationery (City)	374 86	
2,000 00		Maintenance of Dog Pound	1,351 50	
1,500 00		Contingencies (City)	653 20	
2,100 00		Dawson Free Library (City)	1,575 00	
4,760 00		Salaries (City)	3,539 95	
		Balance on hand	7,777 32	
				346,532 42

Estimated Revenue.		Cr.	Revenue Received.	
	Group One.	Balance from 1906-07	13,685 70	
45,000 00		Liquor Licenses (Less 24,000 City)	44,938 58	
45,000 00		Liquor Permits	48,155 37	
100,000 00		Dom. Govt. Grant (Roads, Bridges, etc)	75,000 00	
125,000 00		Dom. Govt. Grant (Local purposes)	93,750 00	
15,000 00		Local taxation (Territory)	16,624 70	
24,000 00	Group Two.	Proportion Liquor Licenses (City)	.....	
50,000 00		Taxation (City)	53,048 57	
5,000 00		City Licenses and Sundry Revenue	1,329 50	
				346,532 42

No. 2.

REPORT OF THE ACTING GOLD COMMISSIONER.

OFFICE OF THE GOLD COMMISSIONER OF THE YUKON TERRITORY.

DAWSON, Y.T., April 13, 1908.

The Hon. ALEXANDER HENDERSON,
Commissioner of the Yukon Territory,
Dawson, Y.T.

SIR,—I have the honour to submit herewith the annual report of the Gold Commissioner's office for the fiscal year ending March 31, 1908.

The financial statement hereto attached, in addition to showing the receipts from the different branches of the office, gives a statement comparing the receipts of the fiscal year in question with the previous year.

The total receipts amount to $121,246.

As you will notice by the comparative statement, this is an increase of revenue over the previous fiscal year of $16,197.70. In making the comparison it must be remembered that the previous fiscal year was only nine months in length of time; however, I find that the revenue for the present year in question is $682.74 more than the fiscal year ending June 30, 1906.

It will be noted in the comparative statement that there is a large decrease of revenue this year in the issue of free miners' certificates, owing to the fact that free miners' certificates were done away with when the Placer Mining Act came into force.

In the face of this source of revenue being cut off, the total revenue for the year should be considered satisfactory.

Hereto attached will be found a statement compiled by the Mining Recorder, giving the number of locations and relocations on each creek in the Dawson district, showing what portions of each are creek, hill, bench, river or bar claims. During the year 1,397 new locations were recorded and 587 relocations of claims that had expired.

Hereto attached will also be found a statement compiled by the Mining Engineer, in which will be found a list of creeks upon which active mining operations are being carried on; the number of claims on each creek in which mining operations are being carried on; a general statement as to the mining operations in the territory; as to new discoveries; as to the influence of new mining methods; as to coal and as to wood. These statements are carefully compiled and are accurate.

Individual mining operations by what is known as the ordinary mining methods are now confined almost altogether to lower Dominion creek, in the vicinity of Granville, and to Quartz creek, and as time goes on will diminish, as the pay gravel that can be worked profitably in this way is coming to an end.

I am of the opinion that in the near future mining operations will be confined practically altogether to hydraulicking and dredging.

When the Yukon Gold Company have completed their ditch from Twelvemile, and when this company, with the other companies that contemplate bringing dredges into the country have installed their plants, there is every reason to believe that there will be a considerable increase in the annual output of gold in this Territory.

I have the honour to be, sir,

Your obedient servant,

E. C. SENKLER,
Acting Gold Commissioner.

SESSIONAL PAPER No. 25

FINANCIAL STATEMENT of the Gold Commissioner's Office from April 1, 1907, to March 31, 1908.

RECEIPTS.

To free miners' certificates		$ 71 25
Placer—		
To grants	$ 13,980 00	
Renewals	68,319 00	
Relocations	5,870 00	
Registered documents	12,356 00	
Abstracts	59 00	
		100,584 00
Quartz—		
To records	$ 2,590 00	
Certificates of work	747 50	
Certificates of partnerships	65 00	
Registered documents	660 00	
Lieu of assessment	200 00	
Certificate of improvements	27 50	
Acreage	459 60	
Abstracts	2 50	
		4,752 10
Sundry Accounts—		
To water grants	$ 1,225 00	
Advance deposit	1,907 98	
Hydraulics	3,464 67	
		6,597 65
Duncan—		
To placer grants	$ 1,150 00	
Renewals	3,606 00	
Relocations	1,070 00	
Registered documents	745 00	
Quartz grants	5 00	
Quartz certificates of partnership	2 00	
Quartz registered documents	5 00	
Water grants	25 00	
		6,608 00
Sixtymile—		
To placer grants	$ 50 00	
Renewals	2,010 00	
Relocations	220 00	
Registered documents	343 00	
Quartz records	10 00	
		2,633 00
Total		$121,246 00

DISBURSEMENTS.

By Receiver General	$ 119,140 52	
Gold Commissioner's suspense account	197 50	
Balance account	1,907 98	
		$121,246 00

COMPARATIVE STATEMENTS.

Returns Gold Commissioner's Office.

	Year ending March 31, 1907.	Year ending March 31, 1908.	Increase 1908.	Decrease 1908.
	$ cts.	$ cts.	$ cts.	$ cts.
Free Miners' Certificates	10,999 25	71 25		10,928 00
Placer Grants	19,630 00	15,180 00		4,450 00
Renewals	44,115 00	73,935 00	29,820 00	
Relocations	10,200 00	7,160 00		3,040 00
Registered Documents (Placer)	9,891 50	13,444 00	3,552 50	
Certificate of Partnership	310 00			310 00
Certificate of Work	1,556 00			1,556 00
Abstracts	74 75	59 00		15,75
Amended Applications	30 00			30 00
Water Grants	1,140 00	1,250 00	110 00	
Hydraulics	1,764 50	3,464 67	1,700 17	
Quartz Records	1,125 00	2,605 00	1,480 00	
Quartz Registered Documents	387 50	665 00	277 50	
Quartz Certificate of Work	467 50	747 50	280 00	
Quartz Certificate of Partnership	35 00	67 00	32 00	
Quartz Lieu of Assessment	100 00	200 00	100 00	
Quartz Certificate of Improvements	60 00	27 50		32 50
Quartz Acreage	1,254 32	459 60		794 72
Quartz Abstracts		2 50	2 50	
Advance Deposits	1,907 98	1,907 98		
	105,048 30	121,246 00	37,354 67	21,156 97
Net Increase			16,197 70	

RECAPITULATION.

FINANCIAL Statement Gold Commissioner's Office, Year ending March 31, 1908.

	Free Miners' Certificate Receipts.	Placer Grants.	Renewals.	Relocations.	Registered Documents.	Abstracts.	Water Grants.	Hydraulics.	Quartz Records.	Quartz Registered Documents.	Quartz Certificate of Work.	Quartz Certificate of Partnership.	Quartz Lieu of Assessment.	Quartz Certificate of Improvem'ts.	Quartz Abstract.	Quartz Acreage.	Advance Deposit.
	$ cts.	$	$	$	$	$	$	$ cts.	$	$	$ cts.	$	$	$ cts.	$ cts.	$ cts.	$ cts.
Dawson	71 25	13,980	68,319	5,870	12,356	59	1,225	3,464 67	2,590	660	747 50	65	200	27 50	2 50	459 60	
Duncan	.....	1,150	3,606	1,070	745	.....	25	.....	5	5	.....	2	.....	.....	.....	.....	.....
Sixtymile	.....	50	2,010	220	343	.....	.....	.....	10	.....	.....	.....	.....	.....	.....	.....	.....
Advance Deposit	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1,907 98
	71 25	15,180	73,935	7,160	13,444	59	1,250	3,464 67	2,605	665	747 50	67	200	27 50	2 50	459 60	1,907 98

LOCATIONS DAWSON DISTRICT YEAR ENDING MARCH 31, 1908.

Name of Creek.	Locations.				Relocations.			
	Creeks.	Hills and Benches.	Rivere.	Bare.	Creeks.	Hills and Benches.	Rivers.	Bars.
"Clear Creek," Stewart River	13	15			13			
Yukon River		27	27	16			11	
Yukon River, small tributaries	46	22			16			
Indian River			308					
Indian Creek	55							
Forty-mile River			16				3	
Small tributaries, 40-Mile River	30				4			
Moose Creek, 40-Mile River	77				13			
Fall Creek, 40-Mile River	99							
Herbert Creek, 40-Mile River	23							
Dominion Creek	29	40			25	52		
All Gold		2			2			
Klondike River		42	42		1		6	
Small tributaries, Klondike River	40				1			
Thistle Creek	10				28			
Black Hills Creek	195	36			44			
Quartz Creek and tributaries	63	22			98	24		
Barker Creek	5				13			
Hunker Creek	11	17			42	39		
Sulphur Creek	11				26	1		
Gold Run Creek	1	2			11	12		
Stewart River			8				4	
Twelvemile River			9					
Bonanza Creek	13	16			33	32		
Eldorado	2				19	13		
Selwyn Creek	6				1			
White River				1				
	729	241	410	17	390	173	24	

1,397 Locations. Among these were many so-called discoveries, but in reality are only first locations on abandoned creeks. Also, 587 Relocations during the year.

No. 3.

REPORT OF THE MINING ENGINEER ON MINING OPERATIONS IN THE YUKON TERRITORY FOR THE YEAR 1907-1908.

During the last year much grouping has been done whereby a large number of placer mining claims are being operated with one plant. Although the number of operations has decreased the scale of the work has materially increased. You will notice, in another part of this report, that there are 22 separate operations conducted on the hills of Bonanza creek. This does not mean that there are only 22 claims in operation, but that each operation is a plant of large magnitude operating on a group of placer claims ranging from 10 to 100 in number.

This arrangement has been found necessary to work the many claims already worked by the placer mining methods at a profit; this practice has been general on all the large gold-bearing streams situated within the Dawson mining district.

The hydraulicking and dredging methods are the two large scale methods of mining in vogue in this Territory. The former is applicable to hillside diggings, while the latter is confined to valleys and creek bottoms. As either of these large methods requires large areas of ground to justify the installation of a large plant, it is obvious that its application is only feasible when a large number of placer mining claims can be grouped together.

The individual mining operations are confined to the lower parts of Dominion and Sulphur creeks; the whole of Quartz and Black Hills creeks. The individual mining operations on Bonanza, Eldorado and Hunker creeks are nearly at an end, the whole being rapidly absorbed into groups of claims upon which large plants are being installed.

According to the regulations the work done on a claim outside its boundaries, with intent to work said claim, is deemed work on that claim. This privilege caused the largest portion of the principal gold-bearing creeks to remain idle until the large installations which are now in progress are completed. From the present outlook it appears to me that the same condition will prevail for one more year, after which an increase of output can be expected.

NEW DISCOVERIES.

Two new discoveries were made during the last year, viz.: one on Little Blanche creek and the other on Black Hills creek.

It was not surprising to find pay on the benches of Little Blanche creek, as pay had already been found in the immediate vicinity; the chief importance lies in the fact that it was situated within the limits of an hydraulic concession which was lately cancelled by the Department of the Interior for non-representation, and had it not been opened to the public it is possible that this pay would not have been found for a long time to come.

The other discovery, on Black Hills creek, is by far the more important, as it opens up a part of the Stewart river district which has lain dormant for the last seven years.

This stream, a distance of 60 miles from Dawson, is a tributary of the Stewart river, entering it at a point, on its right limit, 35 miles above its mouth.

All supplies are freighted over the snow at a cost of four cents per pound; any freight needed during the summer months will go by steamer as far as the mouth of the stream. There is at present stage connection twice a week.

There are 252 creek and 100 hillside claims located on this stream and about 50 other claims located on some of the tributaries.

The work going on is still in its initial stage and not more than prospecting is being done. Some winter dumps are being taken out, but no output of any great importance can be expected this year; the results at the spring clean-ups will determine to a material degree the importance of this stream as a gold producer.

At present there are about 50 separate individual plants in actual operation; some are taking out dumps, while the others are merely prospecting their claims.

THE INFLUENCE OF NEW MINING METHODS.

Where the mining conditions are inimical to dredging, such as hard bed rock and frost, and to hydraulicking, where there is not sufficient grade for the disposal of the tailings, a method has been devised by the engineers of the Yukon Gold Company whereby shallow creek gravels can be operated on a scale to compare favourably with that of the dredge. The main object of the method is to provide grade for the removal of the tailings collected into a sump-hole in the creek bottom, which are produced from hydraulicking. This mechanical device is an endless chain of buckets which elevate the material from the sump-hole into sluices.

This method was once introduced on Eldorado creek, but on account of the lack of water under pressure and the prohibitive cost of fuel for power, it was abandoned. As, in this instance, water is plenty and power is cheap, therefore, we should look for success, and if so, the largest and most important parts of Bonanza and Eldorado creeks will be operated in that way. As the method develops itself it is probable that many of the claims which cannot be worked by dredging will be operated in the future, provided they are situated within the radius of hydro-electric transmission and in the vicinity of water under pressure.

This method should be classified as an 'open-cut' method of mining, which is applicable to operate shallow creek diggings where water under pressure and cheap power are both available.

There are three of such already installed on Bonanza creek, and I may say that the operations, which will be conducted this year for the first time, will be watched closely.

COAL.

All the coal produced in the Territory comes from two mines, viz., the Sourdough and Tantalus coal mines.

There has been no demand for coal on the creeks; so far the production has been used for domestic purposes, the Dawson Electric Light and Power Company and some of the White Pass and Yukon Transportation Company's steamers.

Sourdough Coal Mines.

These mines are situated on the Yukon river, about 50 miles below Dawson. They are controlled by the Dawson Electric Light and Power Company.

The output of the mines for the last year was 5,200 tons; the price charged in Dawson per ton for domestic purposes was from $12 to $15, delivered at the residences.

The Tantalus Coal Mines.

These mines are situated on the Yukon river a few miles from Carmack's post, or a distance of 215 miles from Dawson.

These mines are controlled by the White Pass people, who use the total production for their steamers, operating on the Yukon river, and for domestic purposes in Dawson.

The output for the last year was 7,233 tons; the price charged in Dawson for domestic purposes ranges from $15 to $18 per ton, delivered at the residences.

WOOD.

Wood is still the chief fuel for mining purposes, but its need is growing less on account of large installations being erected whereby no fuel is needed. Its chief use in the Dawson mining district is for thawing. The cost of wood per cord varies with the locality in which it is used, also depending on the distance it has to be hauled. On the creeks the cost of wood per cord delivered on the claims is as follows :—

Bonanza creek, lower part	$10 00		
Bonanza creek, upper part	12 00		
Eldorado creek	12 00	to	$17 00
Hunker creek, per cord	7 50	to	11 00
Sulphur creek	8 00	to	11 00
Dominion creek, upper part	12 00	to	13 00
Dominion creek, lower part	7 00	to	8 00
Gold Run creek	8 00		

You will find herewith attached a statement showing the number of claims, and their location, in operation during the summer months. Only a small percentage of them are operated during the winter months.

The Mining Operations in the Yukon Territory during the Year 1907-1908.

Name of District and Stream.	Name of Company.	Description of Claims.	Method.	Remarks.
Dawson Mining District.				
Klondike River	Yukon Gold Company	Benches and hillside claims	Hydraulicking	There are three individual plants in operation on the left limit of the Klondike river. These outfits work by ground-sluicing and hydraulicking. The other claims in this locality are owned by the Yukon Gold Company and will be idle for another year.
	Bonanza Basin G. D. Co.	River valley	Dredging	
	C. K. Mining Company	River valley near Bear creek	"	
	Grotschier Concession	Bench gravels	Hydraulicking	
Bonanza Creek	Yukon Gold Company	Creek claims from No. 104-A to No. 85 below Discovery.	Dredging	This company has installed four dredges on these claims, and they can be counted as producers. The creek claims, from No. 85 to 30 below Discovery, are now idle and will be for another year.
	Yukon Gold Company	Benches and hillside claims bordering on the right and the left limit of the creek.	Hydraulicking	This company has acquired, with few exceptions, all the hillside and bench claims and is operating groups of claims of from 10 to 100 in number, as follows:—King Solomon Hill, Orofino Hill, American Hill, Magnet Hill, Monte Christo Hill and Bunker Hill. All the claims situated on Gold Hill and Cheechacho Hill were idle during the last year but will be operated next year.
	Yukon Gold Company	Creek claims from No. 30 to No. 10 below Discovery and from No. 3 to No. 6 above Discovery were idle, but will be worked next year.	Electric lift	Although none of these claims have produced the last year a very large amount of work was done on them in the way of preparing the ground for the method to be employed. There were a few individual claim owners who operated, which will be mentioned later.
	Lewis River Company	Discovery and two other claims	Dredging	This company operated on Discovery, No. 1 above and No. 1 below, during the first part of the year, after which it moved the dredge to No. 6 below Discovery and operated for the balance of the season.
	Cook, *et al.*	Hill and bench gravels	Hydraulicking	A group of claims on Boulder Hill.
	Bonanza Creek Gold Mining Co.	Hills and benches	"	A group of claims on Adams Hill.
	Individual operators	Creek and hill claims	Placer mining	There were fifteen creek operators and eleven hillside operators who operated the whole season.
Lovett Gulch	Yukon Gold Company	Creek, hill and bench claims	Hydraulicking	The majority of creek, hill and bench claims on this stream are owned by this company. These claims were idle during the year and will remain so until the big ditch is finished.
	Canadian H. and D. Company	Bench claims	"	A group of claims which were once worked by the placer mining method.
	Individual operators	"	Hydraulic-placer	There are four individual outfits operating on a small scale.
Trail Gulch	Yukon Gold Company	Creek, hill and beach claims	Placer mining	This company controls all the placer mining claims on this stream with two exceptions. These were idle last year and will be for another.
	Individual operators	Creek and bench claims	"	Two outfits were operating on a small scale.
Adams Creek	Bonanza Creek G. M. Company	Hydraulicking, hill e aims	Hydraulicking	All the hill claims bordering on the left limit of the stream are worked by this company.

Skookum Gulch	Individual operators	Creek claims	Placer mining	Three plants were operating on the creek.
	Yukon Gold Company	Creek and hill claims	Hydraulicking	A group of claims. They were idle last year.
	Individual operators	Creek claims	Placer mining	Three outfits were operating last year.
Eldorado Creek	Yukon Gold Company	"	"	All the claims owned by the company were idle.
	Individual operators	"	"	There were twelve producing outfits on the creek.
French Gulch	Otto Brener	Hill and bench claims	Hydraulicking	A group of claims on French Hill.
	Individual operators	Creek claims	Placer mining	Three individual outfits.
Gay Gulch	"	"	"	Two outfits operating about twelve claims.
Victoria Gulch	"	"	"	Three outfits operating ten claims.
Homestake Gulch	"	"	"	Two outfits operating four claims.
Magnet Gulch, American Gulch, Monte Christo Gulch and Fox Gulch.	Yukon Gold Company	"	Hydraulicking	All the creek claims situated in these gulches are being worked by three hydraulic plants, which operate bench claims in the vicinity.
Hunker Creek	"	"	Dredging	This company has three dredges, one at the mouth of the creek, one on the Anderson concession and one at No. 37 below Discovery.
	Yukon Gold Company	Bench claims	Hydraulicking	A group of claims situated on Paradise Hill.
	Otto Brener	Hill and bench gravels	"	Williams' hydraulic concession.
	DeBlegier and Company	Creek, hill and bench claims	"	A group of claims on Temperance Hill.
	Delhie and Company	Hill and benches	"	A group of claims on Delhie Hill.
	A. Larson, individual	Hill and bench claims	"	A group of claims on Temperance Hill.
	Mr. Elliott, individual	"	"	A group of claims on Paradise Hill.
	Mr. Kirkpatrick, individual	Creek claims	Placer mining	Two groups of claims below and above Discovery.
	Yukon Gold Company	"	Preparatory work	A large number of creek claims were idle last year and will be until the water system is completed.
	Individual operators	Creek and bench claims	Hydraulic and placer	There were twenty-six individual mining plants in operation in the creek bed and nine operating hills and benches. Each plant represents a number of claims formed into groups, each group being kept in good standing by the work of the plant. In each instance only one claim is worked at a time.
Last Chance Creek	Eilbeck and Collins	Hill and bench claims	Hydraulicking	A group of claims situated opposite No. 10 A. B.
	Dolan, *et al*	"	"	A group of claims opposite No. 15 A. B. Dis.
	Mahon and Abraham	Creek, hill and bench claims	Hydraulic and placer	A group of claims over seventy-five in number.
	J. S. Day	Hill and bench claims	Hydraulicking	A large group of claims near mouth of creek.
	Individual operators	Creek, hill and bench claims	Placer mining	Three outfits are operating in the creek and five are operating on the hillsides.
Gold Bottom Creek	"	Creek claims	"	Three outfits are drifting.
80 Pup	"	Creek, hill and bench claims	Drifting, hydraulic	Many of these claims are owned by operators on Last Chance creek who work the whole as a group.
Mint Gulch	"	Creek claims	Placer mining	Operating by the primitive method of drifting.
Dominion Creek	"	"	"	Five outfits are operating above Upper Discovery; eight outfits below Upper Discovery; twenty-one outfits below Lower Discovery. These are situated on the creek.
	"	Hill and bench claims	Hydraulicking	Seven plants are operating hill claims.
Caribou Creek	"	Creek claims	Ground sluicing	Only one outfit is working.
Gold Run Creek	Crueger Gold Run Company	"	Placer mining	Eight claims belonging to this company are being operated and three individual outfits.
Sulphur Creek	Individual operators	"	"	There are about twenty-five outfits working and producing and as many prospecting. There are no large companies on this creek.
Quartz Creek	"	"	"	There were eleven outfits drifting.
	"	Hills and benches	"	There were thirty outfits operating on these hills and benches. The most of the work done on this is done on bench gravels. Population, about 300.

The Mining Operations in the Yukon Territory during the Year 1907-1908.—*Continued.*

Name of District and Stream.	Name of Company.	Description of Claims.	Method.	Remarks.
Dawson Mining District.				
Indian River Valley	Indian River Devel. and D. Co.	River claims	Dredging	A dredge was put on this property last year.
Stewart River District.				
Duncan Creek	Individual operators	Creek claims	Placer mining	About twelve outfits were operating. Many of the owners are waiting for the results of the pumps.
Hiatt Creek	"	Creek and hill claims	"	About ten outfits were working during the year.
Clear Creek	"	Creek, hill and bench claims	Placer, ground-sluicing.	One outfit will be hydraulicking soon; three have been ground-sluicing and two are drifting.
Black Hills Creek	"	" "	Placer mining	About fifty outfits are operating and prospecting. The population on the stream is about 100.
Henderson Creek	"	Creek claims	"	Seven outfits are operating at present.
McQuesten River	"	Hill claims	"	Only two outfits are working at present.
Haggart Creek	"	Creek claims	Ground-sluicing	One outfit is ground-sluicing ten claims.
Barker Creek	"	Creek and hill claims	Placer mining	Six outfits drifting.
Ledge Creek and Steep Creek	"	Creek claims	"	Only a few people on these streams.
Ballarat Creek	Ballarat Hydraulic Company	"	Hydraulicking	An hydraulic concession.
Thistle Creek	Individual operators	Creek and hill claims	Placer mining	There are about thirty operators on the creek.
The Salmon District.				
Livingston Creek	"	Creek claims	"	There are about fifteen outfits operating on this stream and its tributaries. Population, about 125.
The Sixtymile District.				
Miller Creek	Miller Creek concession	"	Hydraulicking	Operated very little during the last year; they are preparing the ground for dredging.
Glacier Creek	Individual operators	"	Placer mining	There are about sixty operators on this stream.
10-Mile Creek	Syndicat Lyonnais	Bench gravels	Hydraulicking	An hydraulic concession.

No. 4.

REPORT OF THE ACTING CROWN TIMBER AND LAND AGENT.

OFFICE OF THE CROWN TIMBER AND LAND AGENT
OF THE YUKON TERRITORY,
DAWSON, Y.T., April 2, 1908.

The Hon. ALEXANDER HENDERSON,
Commissioner of the Yukon Territory,
Dawson, Y.T.

SIR,—I have the honour to submit my report for the twelve months ending March 31, 1908, accompanied by the following:—

Statement of revenue in the timber branch.
Statement of revenue in the lands branch.
Statement of timber and hay permits issued.

The revenue in the timber branch amounted to..	$17,712 60
The revenue in the lands branch amounted to..	8,505 00
Total for twelve months to March 31, 1908.. ..	$26,217 60

The total revenue for nine months to March 31, 1907, was $21,422.46.

It will be noticed that the revenue in both branches is keeping up pretty well. The past winter was extremely mild throughout and considerably less wood was consumed for fuel. It is likely a large quantity of wood brought to market this winter will go over to next year.

Of the $8,505 Dominion lands revenue, $5,003.40 was for purchase price of coal lands and interest, and $400 for survey fees for coal lands.

Coal is coming to the front rapidly. Royalty was paid on 15,433 tons, about triple the amount of last year; 7,233¾ tons of this was mined at Tantalus, the balance at Coal creek. The greater portion of the Tantalus coal is used by the White Pass boats plying between Dawson and Whitehorse, and the Klondike Mines Railway; and the greater portion of the Coal Creek coal by the electric light plant in Dawson, which is owned by the holders of the Coal Creek coal mine. The price of coal for domestic purposes in Dawson is $16 per ton.

Considerable coal land has been taken up on Indian river, 6 miles below Quartz creek, which has not been proven to any extent yet. A short distance above, the McKinnon brothers have been tunneling for several years through hard rock, in a hopeful search for coal of better quality than that heretofore discovered.

Mr. C. E. Miller, the greatest discoverer and promoter of the coal industry in the Yukon, will commence operations in May at his latest discovery on Tantalus butte, directly across the river from his previous discovery at Tantalus. Great things are expected of this coal, which Mr. Miller claims to be of the best quality yet discovered.

Operations were carried on all last summer at the Five Finger coal mine, the owners of which are confident that by tunneling through the hard rock they will yet strike coal of the best quality.

The Tantalus coal mine will operate this summer on as large, if not a larger scale than last year. Theirs is the best coal mined so far. The output of coal is increasing rapidly each year.

The Coal Creek people were driven out by water last season and their future movements are uncertain.

Wood is more difficult to get each season. That marketed in Dawson the past winter was very small and dirty. It may be said that in the vicinity of Dawson and for 75 miles up the Klondike the available timber is confined to the timber berths. Along the Yukon the nearest wood available outside of timber berths is two miles from the river. The average price for wood from Whitehorse to Dawson, where it is mostly all used for steamboats is $4.50 to $6.50 per cord, and from Dawson to Eagle, Alaska, $8. Wood delivered in 16-foot lengths from the raft at Dawson, goes at $8.50 to $10, and that hauled from the woods in winter sells at $10 per cord. The average price in Dawson for wood cut into stove lengths is $16.

The sales of the three mills in Dawson during the year amounted to 3,488,360 feet b.m. of lumber, and 547¾ cords of wood. Reports and payment of royalty on a portion of this are still outstanding, awaiting the return of officers of two of the mills this month.

The price for lumber has lately been $45 to $50 per thousand, but as the Northern Lumber Company has gone out of business and the Yukon Saw Mill Company is preparing to take over the Klondike Mill Company this summer the average price will be about $60. Of course for large contracts to the big mining companies, and they utilize 75 per cent of the lumber sold, the price would be lower. Owing to the activity of these mining companies a great deal of lumber is being used.

The Yukon Gold Company erected a mill at Twelvemile, below Dawson, to cut flume lumber in connection with the construction of the Acklen ditch. From March 26, 1906, to October 28, 1907, 7,192,894 feet b.m. was manufactured, 4,009,496 feet of which was on hand at the latter date. No revenue is derived from this whatever.

It is impossible to state how many timber berths are in operation, as some of the licensees leave here in the fall and are not seen again until spring, when possibly they land in Dawson with a raft. Probably five parties are operating on the Klondike, and about three or four on the Yukon.

The farmers were mostly pleased with their crops last season. All vegetables thrived splendidly and a great improvement was shown in the quality of potatoes, those grown at some points excelling the imported. Five homesteads were granted, and an additional dozen or more applied for. Most of the applications are from wood cutters, who find time to raise crops in the summer at the same places where they cut their wood in the winter.

The work of the office will be simplified considerably by doing away with two inspection trips each summer from Whitehorse to Dawson. Mr. Povah has worked out a new system of checking the wood consumed by steamboats in the Territory, which will save the time he is taken away from the office to make the inspections, as well as the expense of the trips. The system will be put into working order this summer and all the old business cleared up.

Rentals charged for waterfront at Dawson have been so materially reduced and so much of the frontage has been relinquished, that what used to be a great source of revenue has fallen off to next to nothing.

The office continues to be conducted in a most capable manner by Mr. W. F. Povah, with entire satisfaction to the public. Since taking charge of the office he has assumed the duties of former chief timber inspector D. A. McRae, of the accountant, clerks, in fact he does all the work previously done by a very large staff, creating, as stated by Mr. Gosselin, in the last annual report, 'a saving of over $1,000 per month.'

Mr. Charles Sylvestre is a good and conscientious timber inspector and does his work well. He keeps a check on all the wood brought to Dawson.

Respectfully submitted,

E. C. SENKLER,
Acting Crown Timber and Land Agent.

Crown Timber Branch.

——	Royalty.	Timber Permits.	Seizures.	Hay Permits.	Coal Royalty.	Total.
1907.	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.
April	1,226 99	2,369 50	575 00	.....	.....	4,171 49
May	1,731 16	413 25	127 50	29 00	40 00	2,340 91
June	951 14	182 32	91 00	8 00	10 00	1,242 46
July	441 61	921 37	45 50	70 00	39 05	1,517 53
August	178 63	315 46	12 00	27 00	275 48	808 57
September	208 05	431 50	15 00	.....	1,006 90	1,661 45
October	1,210 44	1,083 00	61 00	.....	126 90	2,481 34
November	686 72	415 35	8 00	.....	41 45	1,151 52
December	141 28	610 00	10 00	.....	3 60	764 88
1908.						
January	167 64	377 75	.....	.....	.....	545 39
February	119 65	427 50	21 50	.....	.....	568 65
March	148 41	310 00	.....	.....	.....	458 41
	7,211 72	7,857 00	966 50	134 00	1,543 38	17,712 60

Dominion Lands Branch.

——	General Sales.	Rentals.	Registration Fees.	Survey Fees.	Homestead Fees.	Total.
1907.	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.
April	650 00	2,015 00	4 50	200 00	.....	2,869 50
May	12 89	13 63	2 00	.....	.....	28 52
June	125 00	.....	.....	.....	.....	125 00
July	488 72	365 30	.....	100 00	.....	954 02
August	3,624 97	.....	17 00	100 00	.....	3,741 97
September	.....	12 91	6 00	.....	30 00	48 91
October	.....	51 17	6 00	.....	.....	57 17
November	134 41	50 50	.....	.....	10 00	194 91
December	160 00	.....	.....	.....	.....	160 00
1908.						
January	15 00	5 00	.....	.....	10 00	30 00
February	5 00	.....	.....	.....	.....	5 00
March	290 00	.....	.....	.....	.....	290 00
	5,505 99	2,513 51	35 50	400 00	50 00	8,505 00

PERMITS issued at Dawson during the twelve months ending March 31, 1908.

No.	Logs—B.M.	House Logs.	Cordwood.	Hay.
	Feet.	Feet.	Cords.	Tons.
8	244,000			
2		8,250		
72			9,048	
15				102

No. 5.

REPORT OF THE DIRECTOR OF SURVEYS.

SURVEY OFFICE, YUKON TERRITORY,
DAWSON, Y.T., April 6, 1908.

The Hon. ALEXANDER HENDERSON,
Commissioner of the Yukon Territory,
Dawson, Y.T.

SIR,—I have the honour to submit the following report of the operations of the Survey Department for the year ending March 31.

Mr. Gibbon and myself have been the only members of the staff during the past year.

In June and July Mr. Gibbon established base lines on a portion of the Sixtymile river and on Miller and Glacier and Little Gold creeks in the Fortymile district. In August Mr. Gibbon was employed in the office and in making some small surveys for the Gold office. From the middle of September to April first he was away on leave of absence.

Returns for none of the surveys made by Mr. Gibbon since the spring of 1905 have as yet been completed, in consequence of which I asked to have Mr. Bennet transferred to this office, which was done on the first of this month. I hope now to have all the back work brought up to date.

Plans and returns of the following surveys were filed in this office during the past year:—

Group lots including quartz claim surveys	75
Advertised placer claims	17
Base lines and traverses	4

These include the surveys made by surveyors in private practice in the Territory.

I have the honour to be, sir,

Your obedient servant,

C. W. MACPHERSON,
Director of Surveys, Y.T.

No. 6.

REPORT OF THE ASSISTANT GOLD COMMISSIONER.

OFFICE OF THE ASSISTANT GOLD COMMISSIONER,
WHITEHORSE, Y.T., May 4, 1908

The Hon. ALEXANDER HENDERSON,
Commissioner of the Yukon Territory,
Dawson, Y.T.

SIR,—I beg to submit the following report respecting the conditions existing in the Southern Yukon during the fiscal year 1907-8, comprising the Whitehorse, Conrad and Kluane districts.

WHITEHORSE DISTRICT.

The promised development of a year ago of the extensive copper showing in this district was unfortunately greatly curtailed and in most instances shut off by the fall in the price of copper and the accompanying financial depression. As a consequence the shipment of ore, which was assuming fair proportions, had to be entirely discontinued, while development operations were reduced to a minimum. However, things are beginning to look up again, and the next few months may set operations moving briskly once more. The Copper King mine has been fitted with suitable boiler, hoist and compressor, and it is likely will start work at an early day. The general development of the belt may, however, be said to await the completion of the spur or branch of twelve miles in length now being put in by the White Pass Railway, and which when completed will closely serve nearly all the supposedly good claims on the range. The railway company are already actively at work on this spur and will likely have it practically completed early in the coming summer. It will then, it is hoped, be found profitable to ship ore even at the prevailing low price of copper. The Arctic Chief and War Eagle claims are already preparing for this by working their properties in a small way, and it is hoped they will be joined by the Copper King, Valerie, Pueblo and others, later.

The total shipments of copper ore from this belt, last season, were approximately as follows :—

	Tons.
Grafter	2,000
Arctic Chief	300
Copper King	300

For a time the Grafter was operated quite extensively and with very bright prospects by the owner, Mr. Robert Lowe. A large body of ore, averaging 6 per cent copper with steady gold and silver values of $2.50 per ton, was struck, but notwithstanding this the fall in the price of copper from 24 to 12 cents per pound was altogether too great to permit of operation being continued without serious loss. At the time the mine closed down the shaft had reached the 100-foot level, and the mine foreman, a practical and experienced miner, unhesitatingly declared that he had then over twelve thousand tons of good shipping ore in sight. Under the old prices of copper and with the railway spur completed, this alone would undoubtedly have paid for the mine outright.

It sems a pity that greater depth has not been reached on the claims on this belt. In almost every case where the work has gone down the ore has been found to well maintain its values and to materially increase in extent.

The placer diggings at Livingstone creek are in about the same position as last year, nothing very striking having occurred. The production was somewhat less than the previous season, partly accounted for by a washout on the working of the Livingstone creek syndicate, by which a loss of about three weeks in the best part of the season was entailed. The total production of this camp for the year was somewhat less than $60,000. However, the general outlook appears to be brightening. Good pay appears to exist on both Summit and Cottoneva creeks, but production is hampered and delayed by the presence of water in the gravels in large quantities, necessitating the use of powerful and costly machinery in order to reach bedrock anywhere. The average depth to bedrock is also very great. Mr. G. A. Singer, on behalf of certain Seattle capitalists, sunk a shaft on No. 11 below Livingstone creek to a depth of 140 feet, but was greatly hampered throughout by the volume of water, and finally had to abandon the work through that cause. It is expected that larger pumps will be put in and bedrock reached without fail. The gravel encountered in sinking was found to contain small values throughout. A water system from Mendocino creek, where the supply is large, is projected and it is hoped will enable promoters to demonstrate the value of the ground. The gold in this camp is very heavy, mostly nuggets, and is consequently nearly all deposited on bedrock.

WHITEHORSE TIMBER AND LANDS.

Nothing unusual has developed in connection with timber and Dominion lands during the year. Four homesteads have been applied for under the new homestead regulations. There are no saw-mills operating in this district.

I append a table, No. 1, showing the collections made from all sources in this district during the year. The total is $15,109.71, and includes collections from mining, timber, Dominion lands and gold royalty.

CONRAD DISTRICT.

Matters have been quiet in the Windy Arm section also. No operations of any kind have been in progress for several months past. However, the prospects are better for the future. The Conrad Consolidated Co. have purchased and are about to install a concentrating plant capable of handling 60 tons of ore per day, and as it appears there is already a large quantity of good ore on hand, no doubt the product from the new venture will quickly become very considerable. One shipment of 100 tons of sacked ore was made from the Venus claim last summer, which I am assured averaged fully $50 per ton.

The Wheaton and Watson valleys still maintain their hold on the prospectors, though operations have here also been greatly restricted through lack of funds. However, a good road has been built through the Watson valley, and it is hoped and expected that several of the best showings will be thoroughly tested at an early day.

A shipment of 18 tons of silver lead ore from the Tally-Ho group is now on the way to the smelter, but the result has not been ascertained up to this time. It is expected that it will net between $80 and $90 per ton. Mr. H. W. Vance, of the Conrad Consolidated Mines Co., has secured an option on three claims in the Big Bend group, and will likely try them out thoroughly. The values here are perhaps greater than have been found elsewhere in this section. One assay gave $296 to the ton, and the average, I am assured, may fairly be given as between $50 and $100. Unfortunately the extent of this valuable ore has not yet been definitely ascertained.

The best assays have shown principally gold values, though silver in considerable quantities is also present in every case. Col. W. S. Thomas, who has options on a number of what appear to be the best claims in this section, performed about 100 feet of rock work last year with encouraging results. He also ran several small tunnels on the Tiger group, situated about six miles south, and encountered several fair sized veins of valuable ore. On the whole I think that this is a most promising district.

The total collections for this district are $2,318. It is all on account of mining dues. I attach a table, No. 2, giving the monthly returns of this.

KLUANE DISTRICT.

The collections for this district for the year total $3,358, and it is all on account of mines. The prospects for placer mining have about maintained the old level, the main production being from Fourth of July, Bullion, Sheep, Burwash and Arch creeks. The season was both cold and short, and the production suffered in consequence. A couple of small hydraulic plants have been installed at a point six or seven miles up Sheep creek, and it is hoped will be operated successfully the coming summer. The ground is shallow, only two or three feet in some cases, and pay is said to be present over quite an area. All the other productive creeks are mainly worked by shovelling the gravel from the creek bed into boxes erected at the point of operation, the water for which is usually obtained from wing dams farther up. Good pay has been found at one or two points by this method on Fouth of July and Burwash creeks, but the work can only be carried on during the most favourable summer months. The process, too, is most laborious, and the quantity of gravel handled necessarily small.

The copper showings on Burwash creek appear to promise well and will, no doubt, yet be heard from. But of course nothing can be looked for from this source until better transportation facilities are secured. The Jacquot Brothers are about to bring out a couple of tons of the ore from their claims on Burwash, which will at least demonstrate its quality. The cost of this shipment will necessarily be heavy. It has to be transported by sleigh and wagon nearly 200 miles. Several prospectors have been in the White River country since my last report, but so far as I can learn have discovered nothing startling beyond what has been previously reported. Indeed, so far as copper is concerned, I cannot but conclude, as the result of inquiries made upon every available occasion, that nothing has been yet shown to exist on White River proper that will compare with the showings discovered by Jacquot Brothers on Burwash and Tatamagouche creeks, Kluane lake.

There has recently been much talk of a road being built from Dawson to the head of White river. I feel sure the construction of such a highway would be a mistake, both because nothing has yet been discovered that would warrant such an expenditure, and also because the natural route is from Whitehorse through the Kaskawulsh and Kluane valleys, three-fifths of which is already served by fairly good wagon road. I here also attach a table, No. 3, giving details of the collections made.

I have the honour to be, sir,

Your obedient servant,

R. C. MILLER,

Assistant Gold Commissioner, &c.

TABLE No. 1.—STATEMENT showing the Fees Collected in the Office

Month.	PLACER MINING.					QUARTZ.		
	Grants.	Relocations.	Renewals.	Registration of Documents.	Certificate of Partnership.	Grants.	Certificate of Work.	Certificate of Partnership.
1907.	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.
April	.....	.....	30 00	2 00	.....	670 00	10 00	2 50
May	.....	80 00	45 00	14 00	.....	330 00	62 50	7 50
June	10 00	30 00	15 00	14 00	.....	265 00	47 50	2 50
July	.....	10 00	75 00	31 00	.....	175 00	45 00	7 50
August	30 00	30 00	825 00	14 00	8 00	30 00	50 00	12 50
September	20 00	.....	120 00	18 00	.....	110 00	42 50	5 00
October	40 00	140 00	105 00	11 00	.....	35 00	45 00	.....
November	.....	.....	.....	.....	.....	60 00	60 00	.....
December	50 00	30 00	30 00	4 00	.....	90 00	42 50	5 00
1908.								
January	20 00	40 00	.....	6 00	.....	20 00	17 50	10 00
February	.....	.....	.....	16 00	.....	5 00	55 00	2 50
March	.....	90 00	30 00	42 00	.....	35 00	50 00	.....
Total	170 00	450 00	1275 00	172 00	8 00	1,825 00	527 50	55 00

of the Asst. Gold Commissioner, Whitehorse, for Fiscal Year 1907-08.

Mining.		Water.	Timber and Land.			Gold Royalty.		Total.
Registration of Documents.	Payment in lieu of assessment work.	Rights.	Dominion Lands Receipts.	Wood.	Homestead.	Royalty.	Free.	
$ cts.	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.
316 00	100 00	.....	2,970 38	.....	.....	.....	.....	4,100 88
25 50	.....	.....	512 50	55 00	.....	.....	.....	1,132 00
87 00	.....	.....	1,083 12	.....	.....	111 72	1 00	1,666 84
39 00	200 00	.....	267 83	30 00	.....	395 15	1 00	1,276 48
25 50	.....	.....	.....	.....	40 00	181 15	.....	1,246 15
20 00	.....	.....	613 74	140 00	.....	62 95	.....	1,152 19
23 00	.....	.....	512 38	205 00	.....	670 13	4 00	1,790 51
136 00	.....	.....	.....	185 00	.....	68 50	.....	509 50
40 00	.....	.....	156 60	160 00	.....	.....	.....	608 10
10 00	.....	.....	17 31	75 00	.....	.....	.....	215 81
36 50	.....	.....	80 00	360 00	.....	3 00	.....	558 00
5 00	.....	.....	288 75	310 00	.....	2 50	.....	853 25
763 50	300 00	.....	6,502 61	1,520 00	40 00	1,495 10	6 00	15,109 71

TABLE No. 2.—STATEMENT of Fees Collected in the Mining Recorder's Office, Conrad, during the Fiscal Year, 1907-08.

Month.	Quartz Grants.	Quartz Certificate of Work.	Quartz Certificate of Partnership.	Quartz Registered Documents.	Payment in lieu of assessment work.	Total.
1907.	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.
April	25 00	5 00	.....	.....	.....	30 00
May	30 00	10 00	7 50	.....	.....	47 50
June	155 00	47 50	5 00	13 50	100 00	321 00
July	125 00	112 50	22 50	76 00	.....	336 00
August	300 00	337 50	12 50	34 50	200 00	884 50
September	155 00	92 50	5 00	2 50	.....	255 00
October	25 00	12 50	.....	17 50	.....	55 00
November	5 00	17 50	.....	19 00	.....	41 50
December	.....	.....	.....	18 00	.....	18 00
1908.						
January	.....	.....	.....	4 50	100 00	104 50
February	.....	20 00	2 50	.....	.....	22 50
March	.....	2 50	.....	.....	200 00	202 50
Total	820 00	657 50	55 00	185 50	600 00	2,318 00

TABLE No. 3.—STATEMENT of Fees Collected in the Kluane Office during the Fiscal Year 1907-08.

MONTH.	PLACER.					QUARTZ.				Total.
	Grants.	Renewals.	Relocations.	Registration of Documents.	Certificate of Work.	Grants.	Certificate of Work.	Registration of Documents.	Certificate of Partnership.	
1907.	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.
April	.....	720 00	10 00	28 00	.....	60 00	.....	10 00	.....	828 00
May	.....	30 00	30 00	.....	.....	20 00	.....	.....	.....	80 00
June	10 00	690 00	40 00	8 00	2 00	340 00	.....	24 50	.....	1,114 50
July	.....	30 00	.....	.....	.....	70 00	.....	.....	.....	100 00
August	.....	105 00	20 00	70 00	.....	70 00	.....	2 50	12 50	280 00
September	.....	330 00	20 00	.....	.....	40 00	.....	.....	2 50	392 50
October	.....	60 00	20 00	4 00	.....	35 00	.....	5 00	.....	124 00
November	.....	75 00	10 00	14 00	.....	25 00	70 00	5 00	2 50	201 50
December	.....	75 00	.....	.....	.....	.....	.....	.....	2 50	77 50
1908.										
January	.....	.....	.....	.....	.....	.....	2 50	.....	.....	2 50
February	.....	45 00	10 00	6 00	.....	20 00	.....	.....	.....	81 00
March	.....	30 00	40 00	7 00	.....	.....	.....	.....	.....	77 00
Total	10 00	2,190 00	200 00	137 00	2 00	680 00	72 50	47 00	20 00	3,358 50

PART VII

FORESTRY

FORESTRY

REPORT OF THE SUPERINTENDENT OF FORESTRY.

DEPARTMENT OF THE INTERIOR, FORESTRY BRANCH,
OTTAWA, July 16, 1908.

W. W. CORY, Esq.,
Deputy Minister of the Interior,
Ottawa.

SIR,—I have the honour to submit the following report of the work under my charge for the year 1907-8.

With this also are submitted the reports from the officials in charge of the different divisions of the work of this branch.

STAFF.

Mr. A. H. D. Ross, who was in charge of the timber survey on the Riding Mountain forest reserve during the summer of 1907, resigned in the fall to accept a position as lecturer in forestry at the University of Toronto. Mr. Ross carried out the work of this survey in a thoroughly satisfactory manner and rendered valuable service to the department. Mr. Ross will assist the forestry branch during the present year in collecting and compiling statistical information in regard to the forests and wood production of the Dominion.

Mr. A. Knechtel, formerly forester to the Forest, Fish and Game Commission of the state of New York, has been appointed inspector of forest reserves. Mr. Knechtel received his technical education as a forester at Cornell University, and previously had considerable practical experience in lumbering operations. The reforestation work done by the Commissioner in the state of New York, which is the most extensive work in that direction yet done in America, was carried out under his management, and he has also visited Europe and studied the systems of forestry carried out in the different countries of that continent.

Mr. H. R. MacMillan, a graduate of Yale School of Forestry, and Mr. J. R. Dickson, a graduate of the School of Forestry at Ann Arbor in connection with the University of Michigan, have also been appointed to the staff. They have both assisted in the work of this branch during the summer months, and have proved capable and reliable.

Mr. Archibald Mitchell, of Edmonton, has also been appointed permanent assistant in the tree planting division with headquarters at Indian Head. Mr. Mitchell received a training in forestry in Scotland and has been living in the province of Alberta for some years and is thoroughly acquainted with western conditions. He was formerly employed temporarily as a tree planting inspector under this branch.

Mr. E. F. Drake was transferred from the Mounted Police Department and placed in charge of irrigation records.

TIMBER.

During the past year 85 timber berths, comprising an area of 460·53 square miles, were sold, for which the sum of $246,931.55 was received as bonus.

TIMBER REGULATIONS.

In my report submitted a year ago I suggested that it was advisable to make such changes in the timber regulations as would provide for the survey and examination of any tract proposed to be disposed of so that the department would have knowledge of the timber of which it was disposing and could determine its value. In the line of this suggestion, after thorough consideration had been given to the question during the year, new regulations were adopted by Order in Council of December 19, 1907, a copy of which accompanies this report.

These regulations provide that timber berths shall be sold by public auction at the office of the timber agent for the district and that, before being offered for sale, each berth shall be surveyed and shall be examined by a competent timber cruiser. The timber cruisers will submit a sworn report as to the quantity and value of the timber, and on this report an upset price will be fixed by the Minister of the Interior, below which the berth cannot be sold. This method of disposal will give full opportunity to any person who desires to acquire timber to compete for it freely, and will at the same time protect the public interest in the timber.

No sales have yet been carried out under these regulations.

FOREST RESERVES.

During the past summer I visited as many as possible of the forest reserves with a view to ascertain their conditions, to become acquainted with the staff and to ascertain what further organization was required.

RIDING MOUNTAIN FOREST RESERVE.

The most important group of reserves in the province of Manitoba are the Riding Mountain, Duck Mountain and Porcupine reserves, in the western and northern part of the province. These reserves bore a forest of spruce, tamarack, jackpine, birch, poplar and other less important species and have been the scene of lumbering operations for many years past. They form the dominant watershed in the province of Manitoba, being the source of a number of the larger tributaries of the Assiniboine river such as the Rolling river, Little Saskatchewan and others, and of the rivers flowing into Lakes Dauphin and Winnipegosis. The effect of these reserves in regulating the flow of these streams is not the least of their useful services. The necessity of a water supply for successful agriculture is one that has impressed itself on public attention, but with the rapid development of the western provinces and the growth of cities and towns requiring water for domestic and industrial purposes and for municipal power and lighting plants, the question will become more and more acute and the advancement of some districts will be wholly dependent on whether or not they can obtain an adequate water supply.

The land included in the reserves is high and broken by ravines and sloughs and is generally but poorly adapted to agricultural purposes. Most of the Riding Mountain reserve has been cut over and has suffered severely from preceding and subsequent fires. The exact condition in this respect will not be known until the forest survey now being carried on is completed, but sufficient has been ascertained to demonstrate that this reserve will require careful treatment to place it in good productive condition. The Duck Mountain and Porcupine reserves are in better condition and comprise considerable areas of good spruce timber.

The protective service on these reserves has been organized on a permanent basis by the appointment of a chief forest ranger, Mr. W. A. Davis, and assistant rangers. Three rangers have been assigned districts in the Riding Mountain reserve, two in the Duck Mountain reserve, and one in the Porcupine reserve. Their districts will comprise about fifty miles of the boundary of the reserve and an area of about 600 square miles, the total area of the reserves being 3,668 square miles. It will there-

fore be seen that the area to be guarded by each ranger will be large and that these reserves are still undermanned.

The details of administration and organization will require further working out to perfect the system, but the results so far are satisfactory.

TIMBER SURVEY.

The timber survey of the Riding Mountain reserve was continued during the past season in the eastern part of the reserve and the following sections were completed: In range 16, the upper tier of sections of township 18, all of 19 and 20, and nearly all of 21; in range 17, the northern half of township 18, all of 19 and 20, and the south-east quarter of 21; in range 18, the eastern half of township 20, all west of the 1st meridian. It is found that the mature poplar timber in this part of the reserve has suffered from the attacks of fungi, probably consequent on ground fires injuring the trunks at the root. Timber of this character should be removed as soon as possible, as it is deteriorating instead of improving by lapse of time.

It is expected that the survey of this reserve will be practically completed during the coming year, and plans for the management of the timber on this reserve will then be prepared by a qualified forester and placed under his supervision to carry out.

WATER SUPPLY.

An application was received from the Minnedosa Power Company to be permitted to erect a dam on Clear lake so as to control the waters of the Little Saskatchewan river in connection with the proposed development of power for the supply of electricity to the town of Minnedosa. As this project was in furtherance of one of the purposes for which the reserve was set apart, namely, the preservation of the water supply, this application was approved.

PROTECTION OF GAME.

This branch has been considering the question of the protection of game in the forest reserves, and this question was specially brought to the attention of the department in connection with the Riding Mountain forest reserve by the Game Protective Association of the province of Manitoba. The association asked that the shooting or taking of game should be prohibited in a defined tract in the central part of the reserve. Careful inquiry is being made into the matter and steps will be taken towards placing the department in a position to deal effectively with the preservation of the game on the reserves.

TURTLE MOUNTAIN FOREST RESERVE.

This reserve is located in the southern part of Manitoba, and lies along the international boundary. It is a broken tract of land interspersed with small lakes, and is particularly adapted for a forest reserve. Practically the whole of the reserve has, however, suffered from fire. It has been well guarded for the last few years, and the damage from fire has decreased, but, lying as it does along the international boundary, it is a particularly difficult district to protect. The timber on this reserve consists of poplar, birch, ash and oak. No coniferous trees are at present growing on it. The protective service on this reserve has been strengthened and steps are being taken to clearly define its boundaries on the ground.

A number of squatters had located without authority within this reserve, but most of them have removed therefrom, and it is expected that all will have left the reserve in the early summer.

A small plantation of conifers was made in this reserve, and is succeeding well. During the present year some further tracts will be seeded with various coniferous trees.

SPRUCE WOODS FOREST RESERVE.

The tract comprised in this reserve, which is located about ten miles east of Brandon, is light, sandy soil, with the exception of a low-lying portion, which is covered by a tamarack swamp. The high land bears a scattered growth of spruce, and the natural reproduction is only slowly restocking the area. In consequence of this and because the reserve is easy of access by the Canadian Pacific Railway, more planting has been done on this reserve than on any other, the stock for this purpose being brought from the nursery station at Indian Head.

The method of planting followed was to run a furrow with a plough and plant the seedlings in the furrow in such a way as to shelter them as much as possible from the sun. The plantation was of an experimental nature, and now covers about twenty-five acres.

MOOSE MOUNTAIN FOREST RESERVE.

Near the eastern boundary of the province of Saskatchewan and south of the main line of the Canadian Pacific railway is located the Moose Mountain forest reserve. It is an elevated tract of hills and lakes and beautiful scenery. No one passing through the country on the railway would guess the existence of such a beautiful wooded tract, but any one who has visited it cannot but be impressed by its peculiar value as a forest reserve in a prairie district such as that in which it is located.

The shores of Fish lake, the most important sheet of water in the reserve, are frequented as a summer resort by the people of the district. The lands used for camping grounds are private property, having been disposed of some years ago. Larger numbers are, however, resorting to this lake every year, and it will be necessary in a short time to make some provision by lease or otherwise for their occupation of the land in that vicinity.

The timber on this reserve is poplar, birch and ash. Most of it has been cut over and a large part of it has suffered from fire so that there is little of a mature stand. There is, however, a vigorous young forest growth springing up all over the reserve and it furnishes a supply of wood for people throughout the district for many miles round. During recent years the protection from fire has been thorough and no loss has been occasioned in this reserve from that cause. As the natural reproduction is good and the protection from fire sufficient, no artificial means have been taken in this reserve to provide for reforestation.

I was unable to visit the Beaver Hills forest reserve, which is north of the Canadian Pacific railway and is of the same general character as the Moose Mountain reserve.

PINES FOREST RESERVE.

The Pines Forest reserve is situated south of the Saskatchewan river and west of Prince Albert and comprises a tract of 145 square miles of light, sandy land covered with a growth of jackpine. A swampy area runs diagonally across this reserve, in which tamarack and spruce are the most important trees. This tract has furnished a large number of ties for railway construction and is the chief source of fuel and timber supply for a large section. It is peculiarly suited for a forest reserve as the soil is of such a poor character that it cannot be successfully cultivated. As the question of the timber supply is of pressing importance, not only to the farming community but to the towns and villages, and there is some conflict as to what demands the reserve can supply, it is proposed to have a timber survey of this reserve made without delay so as to determine this question.

PRINCE ALBERT FOREST RESERVE.

A small reserve of the same general character as the Pines reserve, namely, light, sandy land covered with jackpine, was set apart some years ago by order of the

Minister of the Interior, to the north of the Saskatchewan river across from Prince Albert, but this reserve was not included in those established by the Dominion Forest Reserves Act. I examined this tract in company with the Crown Timber agent and the forest ranger, and after eliminating all lands that could be in any way classed as agricultural it was decided to recommend that a permanent reserve be established comprising the following lands :—Sections 16, 17, 18, 19, 20 and 21, township 49, range 26, west of the 2nd meridian ; sections 5, 6, 7, 8, 9, 10, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23 and 24, township 49, range 27, west of the 2nd meridian ; sections 34, 35 and 36, township 48, range 28, west of the 2nd meridian.

This reserve, if properly protected, will provide a fuel and timber supply for Prince Albert and the vicinity. The jackpine reproduces quickly and naturally and but little artificial assistance would be necessary to keep this tract in good forest condition. If it is bared of its forest covering it will become nothing but a waste of land, valueless for any purpose and a menace to the good land surrounding it.

COOKING LAKE FOREST RESERVE.

This reserve occupies a ridge lying to the east of Edmonton about forty miles. The location is well suited for a forest reserve as the land generally is of poor character and it occupies a tract of high land which forms the watershed of the district. The northern part is comprised in Elk Park and is a hilly country broken by valleys and lakes. In the central part the land is not so broken and the soil is of better quality, but in the southern part it assumes the same general character as in the north. Unfortunately the greater part of this reserve has suffered seriously from fire, and if it were not that the soil is generally poor and that it controls a watershed it would be hardly advisable to continue it as a reserve as it will take many years of careful protection and management to get it into good forested condition again. The fact that the Transcontinental railway passes through the southern portion of it has made a present demand for land even of poor quality.

There are several lakes at the southern end of the reserve which will form an important source of water supply. This is already recognized, as is shown by the fact that an application has been made on behalf of the city of Edmonton for water from these lakes to provide the city supply.

I did not have an opportunity of inspecting the Cypress Hills and Kootenay Lake reserves or the reserves in the province of British Columbia, but hope to make such an inspection during next year.

SQUATTERS.

Steps have been taken during the past year to induce the persons who have squatted on the forest reserves unlawfully to remove therefrom. Every reasonable facility has been offered them for this purpose, and good progress has so far been made.

FIRE RANGING.

During the past year 47 fire rangers were employed patrolling the forested districts, and fortunately their efforts resulted in preventing any serious damage to timber. The season was a favourable one, as it was generally wet, but destructive fires were prevented in several instances only by the strenuous efforts of the rangers.

The railway belt in the province of British Columbia was patrolled by 21 rangers, and but few fires assumed proportions sufficient to make necessary the calling out of additional assistance. A fire on the Stave river resulted from the clearing operations of the Stave Lake Power Company, crossed the river and would probably have destroyed valuable timber if it had not been promptly dealt with by the fire ranger, who called out the men employed by the power company and a lumber company in the vinicity. Another fire in the coast district required a fight of some weeks before it was finally subdued, but it was so kept in check that no timber belonging to the

Dominion was destroyed. The patrol in the railway belt has, since it was established, been thoroughly effective, and has prevented the destruction of much valuable timber.

Seven rangers patrolled the eastern slope of the Rocky mountains from the international boundary north to the Saskatchewan river. Few fires occurred, as the season was wet. The clearing of land was the chief cause given for the fires which took place.

In the Edmonton district there were five rangers employed and seven in the Prince Albert district.

These comprise the fairly accessible districts and the fire ranging patrol was not extended beyond them until last year. During last year a patrol was established along the line of construction of the Canadian Northern railway from Erwood to The Pas, being the first section of the line proposed to be constructed to Hudson bay. Two rangers were also appointed to protect the district along the Athabaska river from Athabaska Landing to the lake of that name, and one ranger patrolled the Lesser Slave Lake district. This service was looked after by Mr. H. A. Conroy, inspector for the Department of Indian Affairs, and has been carried out effectively, as is attested by reports received from residents of the district. The patrol will be extended into the Peace River district during the coming season.

Owing to the construction of the Grand Trunk Pacific railway westward from Edmonton there was special danger to be apprehended in that district. I have therefore corresponded with that company urging the necessity for the greatest possible precautions during the work of construction and have received word that strict instructions have been given to the contractors to use every effort and every precaution to prevent the spread of fire, and the engineers of the company are devoting their best efforts to seeing that these instructions are carried out. The forest ranger also made an inspection of the manner in which the clearing of the right of way is being carried out, and reports that it is being cleared in a great many places to a width of 200 feet, and that all the debris is being burned upon the land, none of it going outside the right of way. He considers that the requirements of the department in this respect are being met.

The danger is probably greater, however, from the number of people preceding and following railway construction and from the clearing of land for settlement. During last year no fires occurred and early in the present year the forest ranger in charge of the district was given instructions to provide an adequate patrol along the line at the earliest moment in the spring when danger was to be apprehended. These instructions are being carried out thoroughly and the reports so far received show that the patrol is effective. Newspaper reports of extensive fires west of Edmonton are not confirmed by the official reports received. All fires which occurred were extinguished without doing much damage to the forest.

NORTHERN DISTRICTS.

It is impossible to represent too strongly the necessity for adequate protective measures for the northern forested district, stretching from Hudson bay to the Rocky mountains, and covering a belt of timber of greater or less density of fully four hundred miles in width, north of the North Saskatchewan river.

The needs of the rapidly populating prairie country to the south and the necessities of the settlement which is even now extending into the forested zone will imperatively require the timber of this northern district. It has already suffered heavily from fire and the danger is increasing with the advance of settlement, the increase of travel and the extension of the railway systems. Unless some comprehensive scheme of protection is organized and carried out in advance of the opening up of the country this last great forest area of the west will be found, when it becomes accessible and its reserves and shelter are required to meet the public demand, to have suffered the fate of so many other forested districts throughout the Dominion, and to present but a

blackened and almost barren waste instead of the forest which once clothed it and made the whole district rich and habitable.

TREE PLANTING.

While in the west I inspected the nursery at Indian Head, from which trees are being distributed to the farmers throughout the prairie provinces. The buildings at the nursery are comfortable and suitable and are kept in good order. The grounds have been much improved by the establishment of tree belts and hedges and the whole tract included in the station is being carefully managed and prepared so as to bring about the maximum of sustained production of trees, which will probably be about 3,000,000 trees per annum. The nursery station is itself an example of how a prairie farm can be improved and beautified, and its condition reflects a great deal of credit on Mr. Norman M. Ross, under whose management it has been developed.

That the results of the work accomplished by this division of the Forestry Branch are useful and helpful is sufficiently demonstrated by a visit to some of the farms on which trees distributed from the government nursery have been planted. The contrast between bare buildings on the unsheltered prairie and the comfortable, homelike farmsteads which result from the planting of shelter-belts of trees, can be appreciated only by those who have seen some of the beautiful homes surrounded by groves of trees, hedges and gardens, which are to be found scattered throughout the prairie provinces. There can be no question as to the value of the work of tree distribution carried on by the department. Over eleven million trees have so far been distributed by the department throughout the prairie provinces. The average distribution is now about two million trees per annum.

Last year was not a favourable one in the early part of the season and as a result the stock at the nursery did not make such a successful growth as usual, consequently the number available for distribution was not as large as was expected. The influence of seasons will have to be taken account of in connection with the growth of nursery stock the same as with any other crop, and fluctuations in the quantities of trees available for distribution from season to season may be expected from this cause.

Sample plots of various species of trees are being set out at the nursery station in order to demonstrate the possibilities of different varieties. In these plots will be grown, not only those trees which are now known to be successful, but other species will be tested so that reliable information may be obtained as to the hardiness and productiveness of as large a variety of trees as possible. A number of the coniferous trees will be tested in these plantations. Sample plots of tamarack or Canadian larch have given good results so far as experimented with. The growth is rapid and vigorous and this promises to be one of the most useful trees for planting.

In order to provide for the proper handling of seed from coniferous trees and its extraction from the cones it will be necessary to provide a small drying house. The cones must be dried carefully and the seed threshed out, and in order to take full advantage of the intermittent seed years that occur in connection with coniferous trees it will be necessary to have facilities for handling the crop. Such an equipment is necessary if any increase is to be made in the growth of native coniferous trees in the nursery.

Some better provision for a supply of water to the nursery station is required as the present supply is of poor quality and is threatened by the wearing down of a dam which formed a reservoir on the farm. As the supply pipe for the town of Indian Head passes within a short distance of the nursery station, arrangements could be made for a supply from that source.

Six tree-planting inspectors were employed last year to cover a list of 3,206 names, 1,414 of whom were new applicants. The reports of the inspectors show that the plantations are generally successful. The percentage of failures is small and can

generally be attributed to some circumstances which prevented proper care being taken of the trees by the receipient at the time when this was specially necessary. Unfavourable weather has also interfered with plantations in some localities and this was the case during last summer.

IRRIGATION.

The irrigation records at head office have been carefully indexed and the information contained in them is now much more readily available and the handling of the business has been much facilitated in consequence. The list of sales of land for irrigation purposes has been carefully revised and corrected and a careful check is now kept of the connection between applications to purchase and applications for water rights.

A table is appended showing the schemes dealt with under the Irrigation Act up to the present time. The total number of schemes recorded at the present time is 537, of which 331 are for irrigation purposes. Of the irrigation schemes 231 are for the irrigation of 320 acres or less, 71 are for 320 acres to 1,000 acres, and the remainder, including those of the Alberta Railway and Irrigation Company, the Canadian Pacific Railway Company and the Southern Alberta Land Company, are for larger areas. The total area to be irrigated outside of the large schemes mentioned and a few others in which a survey has not yet been made is 176,458 acres.

Lands have been sold for reclamation by irrigation in 139 cases. Of these there have been 120 sales covering one section or less and nineteen sales exceeding that area, making a total of 62,332 acres. This does not include the area of 470,000 acres to be sold to the Alberta Railway and Irrigation Company, or the area of 380,573 acres to be sold to the Southern Alberta Land Company.

During the past year 125 applications were received, the works in connection with 90 schemes were authorized and 46 water licenses were issued.

IRRIGATION CONVENTION.

On July 17 and 18, I attended the irrigation convention held at Calgary. This was the first irrigation convention held in Canada, but it brought together a large representative attendance from the provinces of Alberta, Saskatchewan and British Columbia. A number of interesting and instructive papers were read and questions vital to irrigation interests in the west were discussed. The conclusions of the convention were crystallized in a series of resolutions, some of which are hereafter particularly referred to. The report of this convention has, by permission of the minister, been published as an appendix to a special report prepared by the Commissioner of Irrigation.

The following resolution, which relates to matters coming under the administration of this department, was passed:—

'Whereas, the permanency of all irrigation development is dependent upon an accurate knowledge of the location and quantity of water supply available; and

'Whereas, the matter of the topographical surveys to determine the location and quantity of such water supply and the proper methods of conserving it must be undertaken by the governments administering the law relating to the use of such water;

'Therefore be it resolved, that this convention, while recognizing work already done, urges strongly upon the Dominion government and the government of British Columbia, the importance of making the necessary appropriations and providing the necessary staff to undertake in an intelligent and systematic manner the gauging of all streams of water supply and the location and survey of all sites suitable for reservoirs for the storage of water.'

At the inauguration of the irrigation service in connection with this department it was proposed to provide for a hydrographic survey to comprise the whole irrigation

district. Gauging stations were established on a number of larger streams, and measurements were taken in other places, but floods washed out most or all of the gauge posts and the measurements were not carried on continuously or with any relation to one another. As a result, the information available as to the flow of the streams is not complete and does not give reliable data from which general conclusions can be drawn.

More attention has been given to this question in the last two years, but the report of a visit made by a member of the staff of the irrigation office to some of the hydrographic stations in the western states during the past year showed that a decided improvement was required in the organization and equipment of the hydrographic survey in the irrigation district in the west if complete and reliable data are to be obtained.

The determination of the water supply is of the greatest importance, not only to irrigation interests, but for the municipal supply of the rapidly developing towns of the west, for the operation of railways and for the convenience of the growing population. As the administration of the water resources of this great district is under the control of the Dominion the responsibility for dealing with this subject rests upon the federal authorities, and the importance of the interests involved would justify the increased expenditure that may be necessary to place the hydrographic survey on an efficient basis.

The difficulties of the present situation are well illustrated by the report of Mr. R. J. Burley, who was inspecting in the Maple Creek district during the last year. Irrigation works in that district are developing and many inspections are required, and the report states that special work of this nature delayed the inspection for some three weeks just at a time when a close check should have been kept on the flow of water in the various streams. The flow of the streams in the irrigation district varies rapidly, and the hydrographer should be able to give his attention to the measurements at the proper time if sufficient and reliable data are to be obtained. An arrangement of hydrographic districts in the irrigation tract with a staff which will be able to give its attention specially to the hydrographic work will be necessary to put this service on a proper basis.

The survey of reservoir sites, also referred to in the resolution quoted, is deserving of consideration. As the normal flow of the streams becomes appropriated for various purposes it will be necessary to provide means for conserving the flood waters, which now to a large extent are wasted, so that they may be utilized for maintaining a steady flow. The rivers flowing from the eastern slope of the Rocky Mountains are subject to great fluctuations owing to sudden thaws in the mountains, often with destructive results, and an investigation such as that suggested would throw considerable light on the possibilities of controlling such floods. A special investigation of reservoir sites would therefore be of great usefulness.

Another resolution passed by the convention was as follows:—

'Whereas, the duty of water, or the amount required for the irrigation of a defined area, has a most important bearing on irrigation development; and

'Whereas, the information upon this important question available in any of the provinces of Saskatchewan, Alberta or British Columbia, is vague and incomplete;

'Therefore be it resolved, that the attention of the governments interested should be directed to this important matter, and they should be urgd to take the necessary action to provide for carrying on a thorough system of investigation to determine the duty of water in the different provinces, so that such duty may then be fixed by law.'

The duty of water is a question that is vital to irrigation and is one that is affected by so many conditions of soil, climate, varieties of crop, &c., that it is necessary to have a thorough scientific investigation to arrive at any assured conclusions. At present the irrigation regulations fix the duty of water at 150 acres per cubic foot per second, that duty having been fixed on the recommendation of Mr. G. G. Anderson, an eminent authority. Objection has at times been taken to this duty, and it is the

subject of one of the clauses of a resolution submitted to the department by the Farmers' Association of Southern Alberta. No doubt the experimental farm conducted by the Department of Agriculture near Lethbridge will take steps to gather data on this question. Under an arrangement with the Canadian Pacific Railway the Commissioner of Irrigation is carrying on observations on the irrigation tract of the company to determine this question.

The irrigation convention also placed itself on record as favouring a forest reserve on the eastern slope of the Rocky Mountains on account of its effect on the flow of the streams issuing from the mountains which are the chief source of supply for irrigation purposes. I would recommend that during the present season a preliminary examination be made to determine the tract which should be included in this reserve, if such a policy is decided on, and to ascertain what special provisions should be made to accomplish the purpose of preservation of the timber and the water sources while at the same time permitting the development of the natural resources included in the district.

IRRIGATION ACT.

The Irrigation Act of the Dominion is generally admitted to be a very complete piece of legislation, but in the carrying out of its provisions questions are continually arising that make necessary a re-examination of the principles on which it is based and occasional amendment of its provisions. A petition received in the department from the Alberta Farmers' Association raises several important questions that may be given some mention.

The association asked that the right to the use of water should be made negotiable and transferable, arguing that a water right, once purchased, was personal property and should be freely transferable the same as any other property. The principle of the Irrigation Act is that a right to the use of water for irrigation purposes is granted in connection with a particular piece of land and is thereafter appurtenant to the land, and that the water cannot be transferred to or used upon any other piece of land. At the first glance it may seem a hardship that a man who has the right to the use of water in connection with a piece of land should not be permitted to use it on any other land or transfer it to some one else if he considers it advisable to do so, but a consideration of the principle on which the law is based and of the experience of other countries leads to the conclusion that the principle is a sound one, and any departure therefrom should be carefully safeguarded.

The principle of the law is that the water is public property and that any rights to the use of it do not convey any property in it but are granted for beneficial use in connection with a specific location. If any larger right were permitted to exist, a right to water might be held speculatively and not used beneficially. One person or company might get control of the water and have a monopoly which would place the owners of lands dependent on the stream at their mercy. The evidence of experience is against the unrestricted transfer of water rights and the proper policy seems to be to adhere in the main to the principle already established by the Act of making the right to the use of water appurtenant to the land.

The Farmers' Association asked that irrigation companies should be required to maintain and operate all laterals under their respective systems. This request related particularly to the Alberta Railway and Irrigation Company. The arrangement that this company should maintain and operate the main laterals, and not the subsidiary laterals supplying the respective parcels of land, was a matter of agreement between the company and the representatives of the persons who proposd to settle on the tract supplied from its canal, and when the form of agreement was submitted to the department for approval it was the embodiment of an arrangement which had been arrived at as mutually satisfactory to the parties interested, and on that ground it was approved. The department having already given its approval of the agreement and the works having been carried on and contracts entered into in

accordance therewith, the department would hardly now have authority to alter the terms of the agreement.

The practice usually followed is that the companies should build only the main laterals, but the Canadian Pacific Railway Company has made a departure from this practice by undertaking to construct ditches to carry the water to each quarter section.

Several amendments to the Irrigation Act were submitted to parliament and became law. The principal provisions are as follows :

Representations had been made by the union of municipalities that authority might be given under the Irrigation Act for the crossing of municipalities, including roads and public places, in such a way as to override the rights of municipalities. The Act was therefore amended to provide that such crossing should not be made without the consent of the municipality, but that an appeal might be made by either party to the Dominion Board of Railway Commissioners if mutually satisfactory terms could not be reached.

The Farmers' Association of Southern Alberta asked that irrigation companies should be required to construct and maintain bridges across their works at all travelled roads. An amendment was made to the IrrigationAct providing that where the Board of Railway Commissioners authorized the construction of a road across the works of an irrigation company at any road allowance established by the Dominion lands system of survey the bridges and approaches should be constructed and maintained by the company.

The Canadian Pacific Railway Company submitted for approval a form of agreement for the grant of water rights which they proposed to use in connection with their irrigation project. This agreement was, after alteration in some important respects, approved. As, however, it was found that apparently authority for approval or disapproval of the whole agreement did not rest with the minister an amendment was made to the Irrigation Act to provide that such forms should be wholly subject to the approval of the minister.

In order to facilitate dealing with drainage projects within the area covered by the scope of the Irrigation Act the Act was also amended to provide that, on application by the provincial authorities and a report from the Commissioner of Irrigation that the proposal would not interfere with any irrigation works or the future development of irrigation, any drainage scheme might be carried out under the provincial statute.

PARKS.

Toward the end of the fiscal year the Dominion parks were transferred to the charge of this branch of the department. They include the Rocky Mountains Park of Canada, Yoho Park, Glacier Park, Jasper Park, Elk Park and Buffalo Park.

The administration of these parks was organized by placing in general charge Mr. Howard Douglas, Superintendent of the Rocky Mountains Park, with the title of Commissioner of Dominion Parks. Mr. Geo. E. Hunter, assistant to Mr. Douglas, was promoted to the position of Superintendent of the Rocky Mountains Park. Mr. O. D. Hoar is continued as Superintendent of Yoho Park and Mr. W. C. Simmons in charge of Elk Park.

The fencing of Elk Park was completed and the herd of buffalo imported from Montana to the number of four hundred were placed therein and from reports received are doing well.

To provide for the whole herd properly a new reserve was set apart known as the Buffalo Park covering lands in townships 42, 43 and 44, ranges 6, 7, 8 and 9, west of the 4th meridian.

This tract is open rolling country with bluffs of poplar and is specially well suited as a run for the buffalo. As it is proposed to bring in the remainder of the herd of buffalo during the present year tenders were invited for the construction of a fence surrounding this park. The fence is to be of wire, similar to that constructed around Elk Park. The fence will be nine feet high to the top of the wire and the

wooden posts are to be fifteen feet long and to be firmly set not less than three and one-half feet in the ground. It is expected that this will make a strong and substantial fence well suited for the purpose for which it is erected.

Tenders for this fence were opened at Edmonton on April 10, 1908, by Mr. Douglas in the presence of Mr. John Stocks, Deputy Commissioner of Public Works for the province of Alberta, and of the agent of Dominion lands at Edmonton. Seventeen tenders for all or part of the work were received, the lowest being for $58,998.10 from the Ideal Fence Company, Limited, and John Breckenridge, and the contract was therefore awarded to them. The contract requires the completion of the fence by August 1, and it is proposed to bring in the remainder of the buffalo in September.

Respectfully submitted,

R. H. CAMPBELL.
Superintendent of Forestry.

SCHEMES dealt with under the Irrigation Act, 1894 to 1908.

—	Irrigation.	Domestic.	Industrial.	Other.	Total.
Schemes recorded	331	36	128	42	537
Water licenses granted	141	19	80	12	252
Works authorized	152	14	38	18	222
Applications	38	3	10	12	63
Cancelled or withdrawn	...	...	...	...	184
Total schemes recorded	...	...	...	...	721

Domestic.—Household and sanitary purposes, the watering of stock and the working of agricultural machinery by steam.

Industrial.—The working of railways and factories by steam.

Other.—Chiefly municipal water supply systems.

TIMBER REGULATIONS.

ESTABLISHED BY AN ORDER OF HIS EXCELLENCY THE GOVERNOR GENERAL IN COUNCIL, DATED THE 19TH DAY OF DECEMBER, 1907.

DISPOSAL OF LICENSES.

1. Licenses to cut timber on Dominion lands in the provinces of Manitoba, Saskatchewan and Alberta, the Northwest Territories, within twenty miles on either side of the main line of the Canadian Pacific railway in the province of British Columbia and in the tract of three and one-half million acres to be located by the government of the Dominion in the Peace River district in the province of British Columbia, lying east of the Rocky Mountains and adjoining the province of Alberta, shall be disposed of by public auction at the office of the Dominion timber agent for the district in which the berths are situated.

2. Before any parcel of timber is offered for sale it shall be surveyed by a duly qualified Dominion land surveyor into berths of an area not exceeding twenty-five square miles, and each of such berths shall then be thoroughly cruised by a duly qualified timber cruiser in the employ of the Dominion government, who shall make as exact an estimate as possible of the quantity of timber on the berth, ascertain its

general condition, its accessibility, and any other matters that may be necessary to determine the value of the timber and to enable the Minister of the Interior to fix an upset price, and shall furnish a report thereon under oath to the minister. The minister shall then fix an upset price at which the berth shall be disposed of and no berth shall be sold at less than the price so fixed.

3. No license shall be disposed of until notice of the sale has been given for a period of not less than sixty days in a newspaper published in the district in which the berth is located and also in a newspaper having a general circulation in the province.

4. There shall be kept in the Department of the Interior at Ottawa a list of persons to whom notice of all sales of timber shall be sent. Any person making application in writing shall be entitled to have his name placed on the said list and no name shall be removed therefrom until after the expiration of sixty days from the date of a notice to be given in writing to the person so named and sent by mail to his last known address.

5. The notice of sale shall give the distinguishing number, the description and area of the berth, the upset price, the place and the day and hour at which such sale is to be held.

6. Purchases to the amount of one thousand dollars or under shall be paid in cash at the time of sale. Purchases over one thousand dollars and not exceeding five thousand dollars, shall be paid one-half in cash at the time of sale and a note or notes shall be given for the remaining half of the purchase price payable in three months with interest at the rate of five per centum per annum. Purchases over five thousand dollars and not exceeding ten thousand dollars shall be paid one-third in cash at the time of sale and notes shall be given for the remaining two-thirds of the purchase price payable in three and six months with interest at the rate of five per centum per annum. Purchases exceeding ten thousand dollars shall be paid one-fourth in cash at the time of sale and notes shall be given for the remaining three-fourths of the purchase price, payable in three, six and nine months with interest at the rate of five per centum per annum. Notes given as herein provided shall be made payable at a bank in the city or town in which the sale is held, or at a bank in the city of Ottawa. Cash payments must be made at the time of sale in legal tender or by an accepted cheque on a chartered bank, or by a draft issued by a chartered bank payable to the order of the Deputy Minister of the Interior. If default is made in any payment required by this section the sale shall be forfeited and void.

(*b*) The purchaser must also pay the cost or the estimated cost of the survey of the berth before a license is issued.

7. Persons to whom berths are awarded at a sale shall sign a contract agreeing to carry out and complete the purchase on the terms and conditions of sale, according to the following form :—

District of , Berth No. I of , having bid for the berth above named the sum of $ dollars, and said bid having been accepted, do hereby promise and agree to carry out and complete the same forthwith in accordance with the terms and conditions of sale as set forth in the notice of sale dated at the day of and in the regulations for the disposal of timber under license established by His Excellency the Governor General in Council.

Witness,

LICENSES.

8. No license for any timber berth shall be issued until the full amount of the purchase price, the cost or estimated cost of survey, and the ground rent for the first year have been paid.

(*b*) The licensee shall be entitled to a refund of any amount overpaid on account of the survey of the berth and if the amount paid on this account at the date of sale

is not equal to the cost of survey as finally determined he shall pay such additional sum as may be necessary to make up the full cost of survey.

9. All timber licenses shall expire on the thirtieth day of April next after the date from which they are granted.

10. The license shall vest in the licensee, subject to the conditions mentioned in the license, all right of property whatsoever in all trees, timber, lumber and other products of timber which he is entitled by the license to cut and which have been cut within the berth during the continuance thereof whether such trees, timber, lumber or other products be cut by authority of the licensee or by any other person with or without his consent; and shall vest in the licensee, as against any person other than the Crown in the right of the Dominion, subject to the conditions mentioned in the license, all right of property whatsoever in all trees, timber, lumber and other products of lumber cut within the berth during the continuance thereof by any other person without his consent; and shall entitle the licensee to seize in replevin, revendication or otherwise, as his property, timber of any kind cut upon the berth, where the same is found in possession of any unauthorized person, and also to bring any action or suit at law or in equity against any person unlawfully in possession of any such timber, or of any lands within the berth, and to prosecute any person to conviction and punishment for any offence in connection with such timber or land, and all proceedings pending at the expiration of the license may be continued and completed as if the same had not expired.

11. A license shall be renewable from year to year while there is on the berth timber of the kind and dimensions described in the license in sufficient quantity to be commercially valuable, if the terms and conditions of the license and the provisions of the Dominion Lands Act and of the regulations affecting the same have been fulfilled:

Provided that such renewal shall be subject to the payment of such rental and dues and to such terms and conditions as are fixed by the regulations in force at the time renewal is made.

12. Whenever any portion of a timber berth has not upon it timber of the kind and dimensions described in the license in sufficient quantity to make it commercially valuable the Minister of the Interior may, after an inspection has been made, declare such portion fit for settlement and withdraw it from the berth and from the operations of the license covering it:

Provided that no withdrawal shall be made unless the licensee has had sixty days' notice thereof, and that the Minister of the Interior is satisfied that the same can be made without unduly interfering with the operations of the licensee on the berth, and that, upon such withdrawal, the ground rent shall be reduced in proportion to the area withdrawn.

13. If the Minister of the Interior ascertains, after an inspection has been made, that any land within a timber berth is fit for settlement and is required for that purpose, he may require the licensee to carry on the cutting of timber provided for by clause 32 of these regulations on the said land, and on the expiration of the time within which the timber which the licensee is entitled to cut should be removed therefrom, may withdraw such land from the berth and from the operations of the license covering it.

14. If the survey of any timber berth heretofore granted or which may be granted hereafter is not completed at the expiration of the period fixed in the advertisement of the sale of such berth or, in the absence of such provision in the advertisement, by the thirty-first day of December, 1907, such failure to complete the survey shall be deemed an infraction of these regulations and shall render the license liable to forfeiture as provided therein.

(*b*) Provided, however, that the Minister of the Interior may, instead of declaring a berth forfeited for failure to complete the survey thereof, require the licensee to pay to the Crown the sum of ten dollars for each day after a date to be fixed by the said minister by notice mailed to the licensee at his last known address during which

the survey shall remain uncompleted and such sum shall be payable whenever demand is made therefor by the proper officer of the Department of the Interior.

15. If, in consequence of any incorrectness in survey or other error or cause whatever, a timber berth is found to comprise lands included in another berth awarded at a prior date, or any lands sold, granted, leased or lawfully set apart for any other purpose under these regulations or the Dominion Lands Act, the latter berth shall be void in so far as it interferes with any previous sale, grant or setting apart.

16. Any right to a timber berth cannot be assigned or transferred without the consent of the Minister of the Interior. The fee for the registration of an assignment of a timber berth or of any interest therein shall be at the rate of one dollar for each square mile covered by the berth, but in no case shall such fee be less than two dollars.

17. The following is the form of license to be issued for timber berths :

Know all men by these presents, that by virtue of the authority vested in me by the Dominion Lands Act, and by an order of His Excellency the Governor General in Council of the day of , I, the Minister of the Interior of Canada, do hereby in consideration of the sum of , ground rent, now paid to me for the use of His Majesty King Edward the Seventh, and in consideration of the dues hereinafter mentioned give unto , hereinafter called the licensee, his executors and administrators, full right, power, and license, subject to the conditions hereafter mentioned and contained, and such other conditions and restrictions as are in that behalf contained in the Dominion Lands Act and the amendments thereto, and in the regulations respecting timber passed by the Governor General in Council, to cut timber on the following tract of land (hereinafter called the 'berth' or 'berths,') that is to say :

and to take and keep exclusive possession of the said lands, except as hereinafter mentioned for and during the period of one year from the first day of May, , to the thirtieth day of April, , and no longer.

This license shall vest in the licensee subject to the conditions mentioned in the license all right of property whatsoever in all trees, timber, lumber and other products of timber which he is entitled by the license to cut, and which have been cut within the berth during the continuance thereof, whether such trees, timber, lumber or other products be cut by authority of the licensee or by any other person with or without his consent ; and shall vest in the licensee as against any person other than the Crown in the right of the Dominion, subject to the conditions mentioned in the license, all right of property whatsoever in all trees, timber, lumber and other products of lumber cut within the berth during the continuance thereof by any other person without his consent ; and shall entitle the licensee to seize in replevin, revendication or otherwise, as his property, all timber of any kind cut upon the berth where the same is found in the possession of any unauthorized person, and also to bring any action or suit at law or in equity against any person unlawfully in possession of any such timber or of any lands within the berth and to prosecute any person to conviction and punishment for any offence in connection with such timber or land, and all proceedings pending at the expiration of the license may be continued and completed as if the same had not expired.

This license is subject to the following conditions and restrictions in addition to such of the conditions and restrictions as are in that behalf contained in the Dominion Lands Act and the amendments thereto and in the regulations respecting timber passed by order of His Excellency the Governor General in Council.

(*a*) That the licensee shall not have the right thereunder to cut timber of a less diameter than ten inches at the stump except such as may be actually necessary for the construction of roads and other works to facilitate the taking out of merchantable timber, and shall not have the right to cut any trees that may be designated by the proper officer of the Department of the Interior as required to provide a supply of seed for the reproduction of the forest.

(*b*) The licensee shall be entitled to a renewal of his license from year to year while there is on the berth timber of the kind and dimensions described in the license in sufficient quantity to be commercially valuable, if the terms and conditions of the license and the provisions of the Dominion Lands Act and of the regulations affecting the same have been fulfilled :

Provided that such renewal shall be subject to the payment of such rental and dues and to such terms and conditions as are fixed by the regulations in force at the time renewal is made.

(*c*) Whenever any portion of the berth hereby licensed has not upon it timber of the kind and dimensions described in the license in sufficient quantity to make it commercially valuable the Minister of the Interior may, after an inspection has been made, declare such portion fit for settlement and withdraw it from the berth and from the operations of the license covering it :

Provided that no withdrawal shall be made unless the licensee has had sixty days' notice thereof ; and that the Minister of the Interior is satisfied that the same can be made without unduly interfering with the operations of the licensee on the berth, and that, upon such withdrawal the ground rent shall be reduced in proportion to the area withdrawn.

(*d*) If the Minister of the Interior ascertains, after an inspection has been made that any land within the berth hereby licensed is fit for settlement and required for that purpose he may require the licensee to carry on the cutting of timber provided for by clause 32 of these regulations on the said land, and on the expiration of the time within which the timber which the licensee is entitled to cut should be removed therefrom, may withdraw such land from the berth and from the operations of the license covering it, and upon such withdrawal the ground rent shall be reduced in proportion to the area withdrawn.

(*e*) That the licensee shall take from every tree he cuts down all the timber fit for use and manufacture the same into sawn lumber or some such saleable product, and shall dispose of the tops and branches and other debris of lumbering operations in such a way as to prevent as far as possible the danger of fire in accordance with the directions of the proper officers of the Department of the Interior.

(*f*) That the licensee shall prevent all unnecessary destruction of growing timber on the part of his men and exercise strict and constant supervision to prevent the origin or spread of fires.

(*g*) That the licensee shall furnish to the Dominion Timber Agent having jurisdiction in the matter at such periods as may be required by the Minister of the Interior or by regulations under the Dominion Lands Act, returns sworn to by him or his agent or employee, cognizant of the facts, showing the quantities manufactured, sold or disposed of, of all sawn lumber, timber, or any other product of timber from the berth, with the exception of slabs and saw-dust, in whatever form the same may be sold or otherwise disposed of by him during such period, and the price or value thereof.

(*h*) In lieu of or in addition to the returns provided for by the preceding clause the Minister of the Interior may require that every licensee shall furnish during each year to the Dominion Timber Agent having jurisdiction in the matter at such periods as may be required by the Minister of the Interior, through himself, his scaler or foreman, or through all of them, a statement in writing in detail, under oath, setting forth the number of pieces of timber, saw-logs and other material cut, caused to be cut or taken under his license during such period, and the correct contents in board measure of the same, as shown by Scribner's log rule, if the timber has been cut in Manitoba, Saskatchewan, Alberta, or the Northwest Territories, and by the British Columbia log scale when cut within the railway belt of British Columbia.

(*i*) That the licensee shall pay, in addition to the said ground rent, dues in the manner prescribed in section 21 of the Timber Regulations, and also one-half of the cost incurred by the Crown in guarding the timber from fire, the government paying the other half. A statement will be furnished the licensee showing his share of the

cost incurred and payment thereof shall be made to the Crown within thirty days thereafter.

(*j*) That the licensee shall keep a 'lumber sales book,' in which shall be entered all sales of the products of the berth, both cash and credit sales, also a book accounting for the number of feet of sawn lumber manufactured each day at the mill, with the day and date; all books and memoranda kept at the logging-camps shall be carefully preserved and these and other books kept by the licensee in connection with his lumbering business he shall submit for the inspection of the Dominion Timber Agent or other officer of the Crown whenever required for the purpose of verifying his returns aforesaid.

(*k*) This license shall be subject to the right of the Crown to deal in accordance with the provisions of the said Act, and the regulations made under it by the Governor in Council with any and all stone, coal and other minerals found within the limits of the berth licensed; and the Crown shall have the right in dealing as above provided, with any stone, coal or other minerals in lands licensed as timber limits to authorize the persons to whom such stone, coal or other minerals are granted to take possession of and occupy such extent of the land so licensed as is necessary to work such stone, coal or other minerals, and to open necessary roads through any such timber berth, paying the licensee of the berth the value of any and all timber of a diameter of ten inches at the stump and upwards, necessarily cut in making such roads or in working the quarries or mines, such value in case of dispute to be fixed by the Minister of the Interior; and the provisions of this clause shall operate retrospectively, that is to say: they shall apply to all licenses of timber berths heretofore granted under any Act respecting Dominion lands, as if they had been contained in such Act when it was passed.

(*l*) This license shall be subject to forfeiture on the order of the minister for violation of any of the conditions to which it is subject or for any fraudulent returns:

Provided that in case the minister shall decide to exercise the power of forfeiture conferred by this section the licensee shall have the right within thirty days of formal notification to him in writing by the minister of his intention to declare such forfeiture, and which notification shall be deemed to be sufficient if addressed to the place last known to the minister as the address of the licensee, to appeal against such notification of forfeiture to the judge of any competent court of the district having jurisdiction in matters of contract. The licensee shall within thirty days of the notification to him by the minister notify the minister in writing of appeal taken and pending the report within reasonable delay from the judge on the question of appeal, no declaration of forfeiture shall be made by the minister. The judge to whom appeal is taken shall report to the minister his finding in the case and on receipt of such report the minister may proceed under this section in accordance with his finding and in case the finding be in favour of the minister the judge shall, when transmitting his report, issue a summons directed to the appellant calling upon him forthwith to vacate or abandon or to cease using the berth and if, upon the return of the summons it appears that he has not vacated or abandoned or ceased using the said berth, the judge shall make an order or warrant for his summary removal from the berth and the said order or warrant shall be executed by the sheriff, bailiff, constable or other person to whom it is delivered :

Provided that such report by the judge shall be appealable by either side in like manner as any other decision of the said court ;

And provided further that if the violation of the regulations refers merely to payment of money due under the license, the minister may waive the power of forfeiture on payment of double the amount found by the judge to be due, and costs, and may enforce payment in the manner provided for by the Dominion Lands Act and the timber regulations and take such action in regard to all other matters of forfeiture as may arise and be provided for by this section and the Dominion Lands Act.

(*m*) That should any railway company become entitled to a grant from His Majesty or his successors of any portion of the lands hereby demised whether as part of their land subsidy provided for by the statutes of Canada, or for the road-bed of the railway, or its branches, or for stations, station-grounds, work-shops, dock-yards and water frontage on navigable waters, building yards and other appurtenances required for the convenient and effectual construction and working of the railway and its branches, and if His Majesty or his successors grant the same, the land so granted, shall so soon as due notice thereof in writing has been served upon the licensee, or his legal representatives, be withdrawn from the operation of this license, but the licensee or his legal representatives shall be at librty to remove all timber then cut and all property belonging to him on the lands thereby withdrawn from the operation of this license, and the ground rent shall be reduced in proportion to the area withdrawn.

(*n*) This license cannot be assigned or transferred without the consent of the Minister of the Interior.

(*o*) The licensee shall have in operation within one year from a date when he is notified by the proper officer of the Department of the Interior that the Minister of the Interior regards such a step necessary or expedient in the public interest, and keep in operation for at least six months of each year of his holding, a saw-mill in connection with the berth herein described, capable of cutting in twenty-four hours a thousand feet board measure for every two and one-half square miles of the area licensed.

(*p*) Any notice, demand or other communication which His Majesty or the Minister of the Interior may require or desire to give or serve upon the licensee may be validly given and served by the Secretary or Assistant-Secretary of the Department of the Interior.

Dated at Ottawa, this day of , one thousand nine hundred and

Deputy of the Minister of the Interior.

I accept this license and agree to all the terms and conditions thereof.

Licensee.

RENTAL AND DUES.

18. The licensee shall pay an annual ground rent of five dollars per square mile except for lands situated to the west of Yale, in the province of British Columbia, in which case the yearly ground rent shall be five cents per acre.

19. Within thirty days after the date of awarding a timber berth the person in whose favour it is awarded shall pay rent for the year in advance and if not then paid the said rent shall bear interest at the rate of five per centum per annum from that date until the same is paid.

20. The lessee shall pay the following dues on timber cut on his berths : Sawn lumber, fifty cents per thousand feet board measure. Railway ties, eight feet long, one and one-half cents each; railway ties, nine feet long, one and three-quarter cents each. Shingle bolts, twenty-five cents per cord, and five per cent on the sale of all other products of the berth:

Provided, however, that the licensees will not be required to pay royalty dues on the sale of slabs or on saw-dust.

(*b*) Licensees of timber berths may be permitted under the supervision of an officer of the Department of the Interior to cut and remove burnt timber from their berths on payment of one-half the dues prescribed by the regulations.

21. One-half the cost incurred by the Crown for guarding the timber from fire shall be defrayed by the licensee thereof, the Crown defraying the other half.

22. All ground rents, royalties, or other dues on timber cut within the boundaries of any timber berths, which are not paid at the time when they become due, shall bear interest at the rate of five per centum per annum until paid, and shall be a lien on any timber cut within such limits or on other Dominion lands by the licensee or his agents; and in case of such non-payment whether in consequence thereof the license of the berth has or has not been cancelled the Dominion Timber Agent or other person authorized thereto may, with the sanction of the Minister of the Interior, seize so much of the timber cut on such berth or other Dominion lands by the licensee or his agents as will, in his opinion, be sufficient to secure the payment of such rent or royalty and all interest and expenses of seizure and sale, and may detain the same as security for the payment thereof; and if payment is not made within three months after such seizure, he may, with the sanction of the Minister of the Interior, sell such timber by public auction; and after deducting the sum due to the Crown, the interest thereon and expenses aforesaid, he shall pay over the balance if any, to the licensee, if the timber was in his possession at the time of seizure, or if it was not, to the person who had possession thereof at the time :

Provided that if no bid equal to the amount due the Crown is made at such public auction such timber may be disposed of at private sale.

23. All timber cut under license shall be liable for the payment of the Crown dues thereon, whenever and wherever the said timber or any part of it is found, whether it is or is not converted into deals, boards or any other manufacture of wood ; and all officers or agents employed in the collection of such dues may follow all such timber and may seize and detain it wherever it is found until the dues thereon are paid or secured, as provided in the next preceding section.

24. If the payment of the dues on any timber has been evaded by any licensee or other person, by the removal of such timber or products out of Canada, or otherwise, the amount of dues so evaded and any expense incurred by the Crown in enforcing payment of the said dues under the Dominion Lands Act may be added to the dues remaining to be collected on any other timber cut on any timber berth by the licensee or by his authority, and may be levied and collected or secured on such timber, together with such last-mentioned dues, in the manner hereinbefore provided; or the amount due to the Crown, of which payment has been evaded, may be recovered by action or suit in the name of the Minister of the Interior or his agent, in any court of competent jurisdiction.

25. The Minister of the Interior may take or authorize the taking of bonds or promissory notes for any money due to the Crown, as aforesaid, or, in his discretion, for double the amount of any dues, penalties and costs incurred or to be incurred, and may, if it is under seizure, then release any timber upon which the same would be leviable, but the taking of such bonds or notes shall not affect the right of the Crown to enforce payment of such money, and the debt shall be a lien on any timber cut on the same or on any other berth by the licensee or by his authority, if the sums for which such bonds or notes are given are not paid when due.

RETURNS OF MANUFACTURE.

26. The licensee shall in each year furnish to the Dominion Timber Agent having jurisdiction in the matter at such periods as may be required by the Minister of the Interior returns sworn to by him or his agent or employee, cognizant of the facts, showing the quantities manufactured, sold or disposed of, of all sawn lumber, timber, or any other product of timber from the berth, with the exception of slabs or saw-dust, in whatever from the same may be sold or otherwise disposed of by him during such period and the price or value thereof.

27. In lieu of or in addition to the returns provided for by the preceding section of these regulations, the Minister of the Interior may require that every licensee shall furnish during each year to the Dominion Timber Agent having jurisdiction in the matter at such periods as may be required by the Minister of the Interior, through himself, his scaler, or foreman, or through all of them, a statement in writing in

detail, under oath, setting forth the number of pieces of timber, saw-logs and other material cut, caused to be cut or taken under his license during such period, and the correct contents in board measure of the same, as shown by Scribner's log rule, if the timber has been cut in Manitoba, Saskatchewan, Alberta, or the Northwest Territories, and by the British Columbia log scale when cut within the railway belt of British Columbia.

28. It is required that all licensees, through themselves, their scalers and foremen, shall furnish proofs on oath on the first day of May of each year, or at such other time as the Minister of the Interior may direct, as to the exact locality, by a ground sketch, where all timber, saw-logs or other lumber cut by themselves and others, to their knowledge, upon the timber berth held or occupied by him or them, respectively, have been cut.

29. All timber before being put into any stream or lake to be floated to the mill must be marked with a stamp furnished by the licensee and approved by the Dominion Timber Agent, a copy of said stamp to be placed on record in the Dominion Timber Office.

30. On the arrival of any raft, or parcel of timber or saw-logs, cut or taken from Dominion lands, at the place where the same is to be manufactured or sold, and before the same becomes mixed with the timber or saw-logs, the owners or persons in charge thereof shall report the same to the Dominion Timber Agent having jurisdiction in the matter, making, if required, declaration upon oath as to where the said timber was cut, the number of pieces and the description of each kind of wood contained in such raft or parcel of timber and contents thereof in board measure, and should the Dominion Timber Agent not be satisfied with the correctness of such report, he shall cause a strict count and scale to be made of the timber on such raft; and on being satisfied of the correctness of such report or count, the Dominion Timber Agent may grant a clearance in due form for such raft, when the same may be at the disposal of the owner or person in charge of the same. Should the number of pieces given in the report of the owner or person in charge be found by the specification of measurement to contain a greater number of pieces or contain a greater number of feet in board measure than is given by the owner or agent's report, the surplus number of pieces or overplus if not satisfactorily explained, shall be held as having been cut on Dominion lands without authority and subject to payment of dues accordingly. This clause only to have force in case of a licensee making payment of dues on the quantity of lumber contained in the timber or saw-log by log scale.

MANUFACTURE.

31. All timber taken from berths acquired under the provisions of these regulations shall be manufactured within the Dominion of Canada and all timber taken from a berth in Manitoba, Saskatchewan, Alberta or the Northwest Territories must be manufactured at the saw-mill of the licensee to be operated in connection with the berth as prescribed by section 32 of these regulations unless permission otherwise is given by the Minister of the Interior as provided by the said section.

32. The licensee shall have in operation within one year from the date when he is notified by the proper officer of the Department of the Interior that the Minister of the Interior regards such a step necessary or expedient in the public interest, and keep in operation for at least six months of each year of his holding, a saw-mill in connection with his berth, capable of cutting in twenty-four hours one thousand feet board measure for every two and a half square miles of the area licensed, or shall establish such other manufactory of wood goods as the Minister of the Interior accepts as equivalent thereto.

(*b*) Provided, however, that, notwithstanding anything in these regulations, a licensee may in lieu of erecting a mill be permitted to have the timber cut from the berth or berths held by him manufactured at a mill which is not his own property, provided that he cuts from the said berth or berths at the rate of one hundred thousand feet annually for each square mile held by him under license.

CUTTING TIMBER WITHOUT AUTHORITY.

33. If any person without authority or in contravention of the timber regulations, cuts, or employs or induces any other person to cut or assist in cutting any timber of any kind on Dominion lands, or removes or carries away, or employs or induces or assists any other person to remove or carry away any timber of any kind so cut, he shall not acquire any right to such timber, or any claim for remuneration for cutting the same, preparing the same for market or conveying the same towards market; and when the timber has been removed out of the reach of the timber officers, or it is otherwise found impossible to seize it, he shall incur a penalty not exceeding three dollars for each tree which, or any part of which, he is proved to have cut or carried away, or assisted to cut or carry away; and such sum shall be recoverable with costs, at the suit and in the name of the Crown, in any court having jurisdiction in civil matters to the amount of the penalty; and in all cases the burden of proof of authority to cut and take the timber shall lie on the person charged; and the averment of the person seizing or prosecuting, that he is duly employed under the authority of the Dominion Lands Act, shall be sufficient proof thereof, unless the defendant proves the contrary.

34. Whenever any timber agent or officer receives satisfactory information, supported by affidavit or solemn declaration made before a justice of the peace or before any other competent officer or person, that any timber has been cut on Dominion lands without authority or in contravention of the timber regulations, or if any timber officer or agent, from other sources of information or his own knowledge, is aware that any timber has been cut without authority on any such lands, he may seize or cause to be seized, the timber so reported or known to be cut, wherever it is found, and place the same under proper custody, until the matter is decided by competent authority.

35. If the timber reported or known to have been cut without authority or in contravention of the timber regulations has been made up with other timber into a crib, dram or raft, or in any other manner has, at any mill or elsewhere, been so mixed up with other timber as to render it impossible or very difficult to distinguish the timber so cut without authority from the other timber, the whole shall be held to have been cut without authority, and shall be liable to seizure and forfeiture accordingly, unless the holder separates to the satisfaction of the timber agent, the timber cut without authority from the other.

36. Whenever any timber agent or other officer or agent is in doubt as to whether any timber has or has not been cut without authority or in contravention of the timber regulations, or is or is not liable to dues on the whole or any part thereof, he may inquire of the person or persons in possession or in charge of such timber, as to when and where the same was cut; and if no satisfactory explanation, on oath or otherwise, as he requires, is given to him, he may seize and detain such timber until proof is made to the satisfaction of the Minister of the Interior, or of such timber agent or officer, that such timber was not cut without authority, and is not liable, either in whole or in part, to dues of any kind; and if such proof is not made within thirty days after such seizure, such timber may be dealt with as timber cut without authority, or on which the dues have not been paid, according to the circumstances of the case; and the dues thereon may be recovered as hereinbefore provided.

37. If any timber, or any product thereof, is seized under the provisions of the Dominion Lands Act by any timber agent or officer, he may allow such timber or product thereof to be removed and disposed of, on receiving sufficient security, by bond or otherwise to his satisfaction, for the full value thereof, or in his discretion for payment of double the amount of all dues and the penalties and costs incurred or imposed thereon, as the case may be.

38. All timber seized under the Dominion Lands Act shall be deemed to be forfeited, unless the owner thereof or the person from whom it was seized, within one month from the day of the seizure, gives notice to the seizing officer or to the timber

agent or officer under whose authority the seizure was made, that he intends to contest the seizure; and if, within fifteen days thereafter the claimant has not instituted proceedings before a court of competent jurisdiction to contest the seizure, or if the decision of the court is against him or if the claimant fails duly to prosecute such proceedings in the opinion of the judge before whom such case is tried, who may for that cause dismiss the suit on the expiration of three months from the date on which it was instituted, the timber may be confiscated and may, after thirty days' notice posted up at the place where the same is confiscated, be sold by public auction, by order of the Minister of the Interior.

2. The Minister of the Interior may, if he sees cause for so doing, instead of confiscating timber cut on Dominion lands without authority or in contravention of the timber regulations, impose a penalty which, in addition to all costs incurred, shall be levied on such timber; and in default of payment of the whole on demand, he may, after a notice of fifteen days, sell such timber by public auction, and may, in his discretion, retain the whole proceeds of such sale, or the amount of the penalty and costs only.

3. In the event of there being no bid equal to the amount due the Crown for timber put up at public auction under this section the minister may dispose of the same by private sale.

39. Whenever any timber is seized for non-payment of dues, or for any cause of forfeiture, or any prosecution is instituted for any penalty or forfeiture under the Dominion Lands Act, and any question arises as to whether the said timber was cut on other than Dominion lands, the burden of proving payment, or of proving on what land the said timber was cut, shall lie on the owner or claimant of such timber.

40. Any officer or person seizing timber in the discharge of his duty under the Dominion Lands Act may, in the name of the Crown, call in any assistance necessary for securing and protecting the timber so seized.

APPENDIX No. 1.

REPORT OF NORMAN M. ROSS, DISTRICT SUPERINTENDENT OF FORESTRY.

FOREST NURSERY STATION,
INDIAN HEAD, SASKATCHEWAN, April 1, 1908.

R. H. CAMPBELL, Esq.,
Superintendent of Forestry,
Ottawa, Ont.

SIR,—I have the honour to submit herewith my eighth annual report of the work carried on under your instructions since April 3, 1907.

The growing season of 1907 was a most exceptional one in many ways and though favourable to tree-growth in the cases of older plantations, was not at all a satisfactory one for those set out in the spring or for the raising of general nursery crops. The winter of 1906-7 was an extremely severe one, the cold weather continuing until very late in the spring. We were unable to commence our distribution until May 16, nearly three weeks later than the average season. Distribution was completed on May 31, but even at this late date the young shoots had not started to sprout. The season all through was unusually cold and in some sections very dry, consequently growth in the new plantations was much less on the average than in past seasons. The seed sown in the preceding fall (1906) was very late in germinating and, although all the stock attained a fair size, it was not so large nor so well matured as in other years.

The reports sent in by the tree-planting inspectors continue, as usual, very favourable. They all report increasing interest in the work throughout the country generally and give most satisfactory account as to the progress of the older plantations. Some of the earlier plantings set out in 1901 and 1902 I have had an opportunity of seeing myself and find that these trees have now attained a height of from fifteen to eighteen feet, forming a splendid shelter to each other and to the buildings and garden plots which they surround. In very few cases have the plantations been neglected or are altogether unsuccessful. When, however, it is considered that several thousand separate plantations have been established all over the prairies one cannot be reasonably surprised at a small percentage of failures. It is not always easy for a settler just starting a new home on the prairie, to find time to give all the attention he might wish to the cultivation of trees. Occasionally sickness, unfavourable weather, loss of horses or any of numerous other troubles can easily upset all previous plans making it impossible for him to care for his plantation. As before stated the actual number of unsuccessful plantations is very small indeed. After this spring's distribution the total number of seedlings sent out since 1901 will be over 11,000,000. In addition to this a considerable quantity of seed has been distributed from time to time, thus enabling many farmers to grow their own seedlings. This spring (1908), we have sent out 310 lots of maple and ash seed of from three-quarters of a pound to three pounds each.

The tree-planting inspectors employed last season were as follows :—In Manitoba, Messrs. A. P. Stevens and F. W. H. Jacombe; in Saskatchewan and Alberta, Messrs. Angus MacIntosh, Walter Guiton, John Caldwell and John Kennedy. The greatest increase in the number of fresh applications is in Saskatchewan and Alberta where the construction of railroads is opening up much new territory for homesteaders, most of whom seem anxious to avail themselves of government assistance in setting out plantations around their new homes.

Three thousand two hundred and six names were on the inspector's lists to be visited during the summer. These were all visited with the exception of some 67 who were either absent from their places or lived too far away to be easily reached. These have been communicated with and the necessary information asked for. Of the above total, 1,414 were fresh applicants ; 365 of these had not sufficiently prepared their land and will therefore not receive any trees this spring. This spring (1908) trees will be sent to 1,424 applicants, 375 being men who have already set out plantations under our system of co-operation and wish to further extend them. According to provinces the applicants are distributed as follows :—Manitoba, 464 ; Saskatchewan, 659; Alberta, 301.

SCOTCH PINE PLANTING ON SPRUCE WOODS RESERVE.

Since 1904 planting of an experimental nature has been done each spring on the Spruce Woods Reserve near Sewell in Manitoba. The only variety used up to date is the Scotch pine, for the reason that we have not yet been able to work up a stock of white spruce or native pine seedlings. The main object of the present experiments is to see whether two year-old seedlings can be successfully set out in a rough and cheap manner. If the Scotch pine succeeds under these conditions there should be no difficulty in transplanting the seedlings of the more hardy native varieties. Though under favourable conditions it is known that Scotch pine will produce far more timber and of better quality than can ever be expected of the jackpines, still we do not know how far conditions in the west are suitable for it.

The largest trees we know of are not more than twenty-five years old and although these appear thrifty and in good condition, it would not do to take too much for granted. Samuel B. Green of the Minnesota Agricultural College, claims that, in the Western States, the Scotch pine deteriorates after the age of about twenty years and is not a valuable variety for prairie planting. Under the circumstances then it

seems advisable that in undertaking any extensive planting on this reserve a considerable proportion of the trees set out should be of native varieties of known hardiness.

We can, at the nursery here, produce two-year old pine seedlings at a very small cost per thousand as compared with transplanted stock. Labour in the west is very high and it has so far been impossible to procure day men who are at all familiar with such work as transplanting conifers. In consequence they work slowly and, owing to carelessness in planting, a comparatively large percentage of the young seedlings succumb. The hand labour required in the cultivation of the transplant beds, the cost of transplanting and the extra length of time the stock has to remain in the nursery, make an enormous difference between the cost of seedlings and transplanted stock. In fact this difference is so great that it is questionable whether, if transplanted stock had to be used, planting on a large scale, such as should be done on this reserve, would be a profitable undertaking.

Last spring we sent down from Indian Head to the reserve 29,000 two-year pines which were set out in the same manner as those planted in the preceding years, namely, in shallow furrows running east and west. The furrows are spaced about four feet apart and the seedlings planted at the rate of about 2,700 per acre. Since starting this work we have planted out here some 70,000 Scotch pines. The results are very encouraging. The planting of 1905 is commencing to show up above the grass and from now on should make good annual growth. The percentage of plants which have died is comparatively small ; from careful counts it is estimated at not over 18 per cent. This spring's planting was somewhat less successful than that of former seasons owing to the very late date at which it could be undertaken, namely, June 7, over twenty days later than last season. The first small planting of 1904 was, unfortunately, burnt up last spring by a prairie fire. A guard had been ploughed around the plantation but the wind was very high and the fire jumped it. Until some suitable system of fire-guards is established it would of course be unwise to do any extensive planting. It is hoped that either this or next season the matter will be attended to in a practical manner.

EXHIBITS.

An exhibit was, as usual, set up this summer at Brandon, during the annual fair. The character of this exhibit did not differ in any material respect from that made in previous years, a description of which has been made in my former reports.

NURSERY WORK.

We had last summer on our nursery station 37 acres under nursery crops. Eleven acres of this is in one year old ash which will not be large enough for distribution till the spring of 1909. The remaining area was made up of eleven acres of two-year ash, nine acres of Manitoba maple, three acres native elm two years, and three acres of conifer seedlings and transplants.

Owing to the backward spring and the unusually cold season, the growth of the seedlings was not quite up to the usual standard. The maple was from seed picked in North Dakota, as last year no seed of this variety could be picked in Saskatchewan or Manitoba. I am sorry to report that these maple seedlings did not mature up as well as they should have done as the fall was wet and growth kept up till the heavy frosts came.

We have heeled in, ready for distribution this spring, the following numbers and varieties :—

Maple, 1 year old	457,000
Ash, 2 years old	655,450
Elm, 2 years old	198,000
Cottonwood (imported)	400,000
Total	1,710,450

In the past season we had to depend altogether upon the unprotected plots of the nursery station for raising our stock. The land is new and not yet in the best condition for growing seedlings. In the course of a couple of years or so we hope to have very satisfactory shelter, but till the hedges grow up and the land is worked a little more we cannot hope to raise as many seedlings per acre as we did on the highly cultivated and well sheltered grounds which we had been allowed to use on the experimental farm up till last fall.

This season an additional twenty-five acres was prepared for sowing during the fall and following spring. The soil is in fairly good condition but the land is, of course, absolutely bare of shelter. Caragana seed was sown in rows at intervals over this new ground in order to start hedges which will in later years form good windbreaks. About sixteen acres of green ash and five acres of Manitoba maple were sown in the fall ; the greater part of our maple will be put in this spring.

COLLECTION OF SEED.

Elm.—I regret very much that we have no one-year elm seedlings, due to the fact that those who had arranged to collect seed for us last June failed to do so. This seed is gathered in the Qu'Appelle Valley some miles north of Indian Head. The trees last summer bore a good crop, and it appeared as if there would be no difficulty in getting plenty of the seed collected. Owing to the backward season, work on the nursery was so pressing that it was not possible to take our own men out to gather the seed as we did the year before. The man who agreed to get the seed picked for us has always proved reliable in past seasons in supplying maple and ash seed. He claimed, however, that the half-breeds who do the work for him found that picking elm seed was too tedious a job. Unfortunately we were not notified of this till it was too late to make other arrangements.

Green Ash.—The green ash seed crop last season was an extremely heavy one and we had no difficulty in getting a large supply. In fact the collectors gathered a considerable quantity more than we could accept. We had delivered 200 bushels or more of the rough seed.

Manitoba Maple.—The crop was fairly good but owing to the fact that the ash was more plentiful and more easily picked it was difficult to get the collectors, who are half-breeds and Indians, to gather maple. We were only able to secure about 82 bushels of rough seed. This is ample for our own sowing but will not allow of as much for distribution as we should wish.

White Birch.—A few pounds of this seed was collected by Mr. Arch. Mitchell at Edmonton, and sown in the beds last fall. We have had good success in propagating this variety which is very hardy. However, the seedlings require almost the same treatment as the conifers, it being necessary to sow in shaded beds and transplant to nursery rows at one or two years old. The expense in raising this variety in comparison with the other hardy broad leaf kinds is very much greater.

Jackpine (Pinus Divaricata).—A few bushels of cones were picked by the survey party in the Riding Mountains and shipped to the nursery last fall. The seed was extracted during the winter, producing about two pounds of clean seed.

Murryana Pine.—Cones of this variety were gathered in Cypress Hills, and four and a half pounds of clean seed were extracted at the nursery.

White Spruce.—Cones were collected by the survey party in the Riding Mountains. After drying nine pounds of clean seed were extracted.

Native Tamarack.—Cones collected by the survey party in the Riding Mountains, some seed was extracted in the fall and sown immediately, the remainder cleaned up later. Altogether about seven pounds were obtained. This is the first year that we have been able to get any of this seed and as it is evidently a most uncertain crop it is to be hoped that good results may be obtained from this lot.

As the work of progagating conifers at the nursery will undoubtedly be considerably extended it would seem necessary to have a suitable room or small building for drying out the cones. No difficulty is experienced in opening the white spruce cones. This is very easily accomplished under glass with a few hours' sunshine. The cones of the jackpines, however, require a very high temperature which must be sustained for several hours. A large quantity of cones can be treated to advantage only in a specially constructed room where the temperature can be properly regulated. The cones of tamarack open fairly readily though they seem to require considerably more heat than the spruce. We could not get the seed properly extracted without using artificial heat.

CONIFERS.

In the spring of 1907 a considerable number of tamarack seedlings were pulled from the swamp southeast of Sewell in Manitoba. In all about 17,000 were shipped for transplanting in the nursery here. These were lined out into rows and have done very well, 77·5 per cent having taken good root. When the greatly altered conditions from swamp land to ordinary upland prairie soil are considered this percentage is very favourable. When growing in the wet swamp moss the seedlings have an extremely poor root system, making it necessary to grow them in nursery rows for at least one season before planting in permanent plantation. These tamaracks are to be used for demonstration or test plantations to be set out on the nursery here. This variety has proved to be so promising and is of such economic value that it is thought advisable to test it as thoroughly as possible.

About 40,000 two-year seedlings of Scotch pine, murryana pine, Norway spruce and white spruce were transplanted last spring. They did well during the summer but have been very much exposed during the winter owing to lack of snow. At the present date, however, they appear to be in good condition. Conditions on the nursery are not just yet very favourable for raising young conifers owing to the want of suitably sheltered plots for the transplanting beds. When exposed as they are now, the young plants cannot be expected to make the same growth as they would in a well protected nursery. This difficulty will, however, be overcome in a few years when, it is hoped, a good stock of the hardy conifers may be worked up. We have now in nursery rows about 27,000 conifers four and five years old, which will be moved to permanent plantations this spring; the total number of plants in the transplanting beds being 161,275. There is also a considerable stock of one and two-year seedlings in the shaded beds. Most of the two-year-olds will be transplanted this spring.

A considerable length of fresh seed beds will be sown this spring, the principal varieties being Scotch pine, *pinus murryana, pinus divaricata,* native white spruce, Siberian larch and native larch or tamarack. Small quantities of other varieties such as *picea excelsa septentrionalis* (a hardy variety of Norway spruce), *picea ajanesis,* and others which may prove hardy but which have not yet been tested, will also be sown in an experimental way.

PERMANENT PLANTATIONS.

Last season no additions were made to the permanent plantations as we had no land suitably prepared which could be spared for this purpose.

Both the broad leaf and coniferous plantations are in splendid condition and during the season made very good growth. From measurements made in November the average new growth made by the different varieties is as follows :—

	Feet.	Inches.
Maple, planted in 1906, new growth	2	6
Ash, planted in 1906, new growth	1	2
Elm, planted in 1906, new growth	2	2
White birch, planted in 1906, new growth	2	3

	Feet.	Inches.
Cottonwood, planted in 1906, new growth	4	8
Russian poplar, planted in 1906, new growth	2	8
Scotch pine, planted in 1906, new growth	...	11·1
White spruce, planted in 1904, new growth	1	7
Tamarack, planted in 1904, new growth	2	5½

During the summer a considerable area of new land was prepared, by very deeply backsetting the virgin prairie, for further permanent plantations. It is proposed to set out the following this spring :

1 acre Acute leaf willow, planted 3 x 3.
1 acre Golden leaf willow, planted 3 x 3.
1 acre White leaf willow, planted 3 x 3.
3 acres Dakota cottonwood, planted 4 x 4.
2 acres American elm, planted 4 x 4.
1 acre Pinus murryana, planted 4 x 4.
2 acre Pinus murryana and ash, planted 4 x 4 in equal mixture.
2 acres Scotch pine and ash, planted 4 x 4.
2 acres Native tamarack, planted 4 x 4.
3 acres Native tamarack and ash, planted 4 x 4 in equal mixture.
2 acres Native tamarack and maple, planted 4 x 4 in equal mixture.
2 acres European larch and ash, planted 4 x 4 in equal mixture.

In all twenty-two acres, requiring 63,480 seedlings, transplants and cuttings.

It is also proposed to commence this spring a number of small exhibition plots of conifers principally, where all the hardy varieties can be planted side by side in a central part of the nursery. The plots will be 44 feet square and each one will contain 100 trees set four feet apart each way. The object of these plots is for the information of visitors, who will see, growing side by side, different hardy kinds as nearly under plantation conditions as possible, in such a manner that the merits of one can be readily compared with those of another. The reason that this is being done chiefly with the conifers is that very little is known by the general public regarding varieties suitable for prairie planting and it is thought that everything possible should be done to encourage their planting. In time it is hoped to have a collection of from twenty to thirty varieties which may be suitable for our western climate and conditions.

ORNAMENTAL GROUNDS AND SHRUBBERY.

All the hardy shrubs have done well during the past season. Many of the lilacs set out as small plants in 1905 bloomed for the first time. Spirea van Houtii, Spirea Arguta and Spirea Billardii, all came through the winter unprotected and bloomed profusely. The Japanese rose (rosa rugosa rubra) is especially worthy of planting in the west; it has a very long season of bloom and the large, bright red hips which follow the flowers remain on the bushes well on into the winter.

Around the new boarding house land has been got in shape for a small amount of additional ornamental planting and the making of a small grass lawn.

PLOUGHING AND FARM WORK.

Fifty acres of prairie were cleaned of scrub, broken and back-set ; twenty-five acres of this was ploughed a third time as deeply as possible and well cut up with the disc-harrows in order to put it into shape for permanent plantations. Twenty-five acres of oat stubble land was summer-fallowed and put into condition for nursery. Eighteen acres of nursery plots were also ploughed after the seedlings were dug, and cultivated for resowing.

About a thousand bushels of oats and fifteen tons of rye grass hay were raised to supply feed for the horses.

BUILDINGS.

The small packing shed which we had erected on the Experimental Farm, was cut in two and moved up to the nursery and an addition 40 x 24 feet built in. We now have two good packing sheds which should give us ample accommodation during the distribution season, also providing considerable room for drying and storing seed.

Your obedient servant,

NORMAN M. ROSS.

APPENDIX No. 2.

REPORT OF MR. F. W. H. JACOMBE, TECHNICAL ASSISTANT.

OTTAWA, April 2, 1908.

R. H. CAMPBELL, Esq.,
Superintendent of Forestry,
Ottawa.

SIR,—I beg to present the following report of work done during the year ending March 31, 1908.

At the conclusion of the work of making out the distribution lists for 1907 I commenced work on a card index of the applicants for trees from the inauguration of the scheme, and was occupied at this work for some weeks. For some time after this again, I was occupied in the work of making some necessary preparations for the forest survey party for the following summer.

On Thursday, June 13, I started for Winnipeg in company with Mr. Rognaas, who was to work as assistant with Mr. Ross' party. On Monday morning, June 17, I joined Mr. Ross' party at Dauphin, and for the next two weeks assisted Mr. Ross in organizing the work of the survey. On July 1, I left Dauphin for Winnipeg, and on July 3 met Mr. A. P. Stevenson at Morden and arranged with him as to our respective districts for tree planting inspection work during the summer. This division allotted to me the northern part of the province, including the following railway lines: (1) Canadian Pacific Railway main line, Winnipeg to Kirkella; (2) Rapid City and Miniota branch; (3) Varcoe and Lenore branches; (4) Minnedosa and Yorkton sections, Portage la Prairie to Millwood; (5) Souris section, Elm Creek to Souris, and (6) Arcola section, Souris to Sinclair. To these were subsequently added the Yorkton and Sheho sections as far as Sheho, Sask.

Along the main line I found the trees had suffered somewhat from the exceedingly dry weather of the spring. This had affected especially the cottonwoods; in some plantations twenty-five per cent or over of those planted in the spring of 1907 had died, owing, as far as I could find, to the very dry weather at the time of planting and subsequently. This was the case more especially along the main line between Portage la Prairie and Brandon. At the latter place conditions had been more favourable, and the trees were in good condition. On the railway lines further north conditions were very different, as there had been a plentiful supply of rain all season, and the trees had made a good growth. In one case, on the farm of Mr. E. A. Schwalm, near Russell, maple showed a growth up to four feet during the season, and ash up to three feet two inches; these trees had been planted the previous year.

Later in the season, when visiting the plantations along the Souris and Arcola and Moose Mountain sections, I found that the dry season had shown its effect, in the growth for that season being somewhat less than usual. In some cases trees had been badly damaged by hail; this was noticed only in the neighbourhood of Pipestone and Sinclair.

On the Yorkton branch in Saskatchewan there seemed to have been good growth during the season and great care had been taken of the trees.

Unusual numbers of caterpillars of the tussock moth were found toward the end of August and the beginning of September, especially around Rosser and Virden. During the last winter the trees suffered to some extent from the attacks of rabbits; in the northern part of the province it is the bush rabbit which is reported to be the worst depredator, and this variety prefer the cottonwood trees; in the southern part of the province, the jack-rabbits are the common ones and they prefer the ash trees. Along the Souris section also I found a number of cases of damage by mice during the previous winter. The vagabond gall (caused by the plant-louse, Pemphigus vagabondus), was fairly common again during the past summer, and in one plantation near Pipestone I found a couple of trees that had died, apparently through the repeated attacks of this insect.

On the whole, I think that, on account of the short season, the growth of the trees was somewhat less than usual. Owing to the rush and crowding of the work on the farms, due to the late spring and consequent rush of work, the care given the trees, in common with other crops, was not quite up to the usual standard; there were many exceptions to this, however, and in general the branch has little to complain of in regard to the care of the trees.

Since my return to Ottawa in November, 1907, I have been occupied in the office work connected with the distribution of trees this spring, work in connection with the library of the branch, the preparations of press bulletins, &c.

I have the honour to be, sir,

Your obedient servant,

F. W. H. JACOMBE.

APPENDIX No. 3.

REPORT OF MR. A. P. STEVENSON, TREE-PLANTING INSPECTOR.

NELSON, MANITOBA, April 1, 1908.

R. H. CAMPBELL, Esq.,
Superintendent of Forestry,
Ottawa.

SIR,—I have the honour to submit the following brief report on the work done by me under your instructions as tree-planting inspector in connection with the work carried on in this province by the Forestry Branch of the Department of the Interior.

On June 14 I commenced the work of inspection, and shortly after met Mr. F. W. H. Jacombe by appointment at Morden, when the list of applicants for trees in Manitoba was gone over and examined with the view of dividing up the work of inspection in Manitoba equally between us, Mr. Jacombe taking the northwestern part of the province, while the district covered by myself was the Red River valley west to the boundary of the province and along the main line of the Canadian Northern Railway from Winnipeg to Togo.

The past winter had been one of the longest and stormiest in our experience in the west, the snowfall being excessive. Some damage was done in a few of the young plantations by the settling of the deep snow drifts in spring, but where snowbreaks were planted no injury was noticed in the plantations.

This year's experience affords a good object lesson of the necessity of planting a snowbreak when planting out a windbreak, and it is satisfactory to notice that the farmers are devoting more time and attention to this subject. A snowbreak consists

of a single row of trees planted rather close together at a distance of forty or fifty yards from the plantation proper on the north and west sides; this clear space of forty yards between the single row and plantation affording a place for the snow banks to lodge.

The jack-rabbits were more troublesome than usual last winter, doing considerable damage, especially to the elm and ash. Cottonwood also suffered to some extent. On account of the deep snow they were able to get into the top branches of good sized trees and cut them up very badly. The shot-gun is the only sure remedy; close netting is of little use in a winter of deep snow, besides being rather expensive. Where there are only a few trees, such as fruit trees, an application of fish oil with a little sulphur and carbolic acid stirred in it, we have found to be an effective remedy.

The past summer was one of excessive drouth in southern Manitoba. In some localities practically no rain fell throughout the summer. On this account the young trees planted out this season have not averaged so well as in former years. My estimate is 75 per cent of trees growing that have been planted out this year, and it is only to the thorough preparation of the soil, which the Forestry Branch insists on before trees are planted or any one receives trees, I attribute this good showing during this dry year.

The small cottonwoods suffered most from the dry weather and the ash the least of any. After the first year the ash is a very popular tree with planters on account of its sturdy qualities and when mixed with other varieties it is a fairly quick grower.

The early groves planted out under the Forestry Branch co-operative scheme made very satisfactory growth. On account of the close planting the moisture from the melted snow evaporated very slowly so that the trees did not suffer on account of the drouth. It was also interesting to note that gardens, where partially surrounded with a shelter-belt gave a good crop of vegetables and small fruits, while those without any protection did not yield half a crop. The snow slowly melting in the plantation supplied sufficient moisture in the subsoil to ensure a crop.

The planting out of a wood lot on the farm for the purpose of growing fire wood and fence posts is becoming a very live practical question with the prairie farmers, and a number of wood plantations will be started this coming spring, more especially with men who have finished planting for a shelter-belt.

The Vagabond Gall had given considerable trouble among the cottonwood trees, and has been the cause of considerable anxiety to those having fine plantations of this variety. This trouble has been noticed in other years but only to a limited extent, and little harm has resulted. But this year the vitality of the trees appears to have been weakened and it is feared the trees so affected have suffered considerable injury. I am not aware of an effective remedy for this trouble. I have advised picking off the galls which is all right as far as it goes and with a few trees, but where there are hundreds it is impossible to do this. The dry season may have been the cause of the great increase in the number of galls affecting the trees this past season.

We notice the Russian willow where planted is giving very good satisfaction and is in very general demand on account of its quick growing qualities, adapting itself to almost any soil and location, holding its leaves quite green when every other deciduous tree in the grove is brown and bare.

The general condition of the trees in plantations set out under Forestry Branch supervision is very satisfactory, no injury from winter killing was noticed and the cultivation and care given the newly planted out trees were very satisfactory.

There is an ever-increasing number of the earlier planted groves in which cultivation has entirely ceased, the trees effectually shading the ground, choking out weeds and grass and thereby establishing forestry conditions, and proving to the planter the wisdom of the rule laid down by the Forestry Branch, that trees should be planted at the rate of 2,720 trees to an acre, or four feet by four feet apart each way.

The questions of the proper distance apart to plant trees in order to secure best results, of pruning and the proper time to do it, are matters on which a considerable number of new planters have rather peculiar views. The idea prevails that to plant

trees four by four feet apart is too close, that ten by ten feet is required in order to give sufficient room for cultivation with a team and plough between the rows of trees.

For an illustration of the desirability and benefit of close planting, the planter's attention is directed to groves set out four to six years ago under government supervision, and also to natural bluffs that may be growing in the neighbourhood. It can be seen that the tallest and best trees are in the centre of the grove, where the roots of the trees are entirely shaded from the sun and drying winds.

The inspector has also to point out the unnecessary labour and absurdity of pruning up to a single stem the young trees planted out for the purpose of a shelter-belt. If left without pruning the trees will more quickly and effectually shade the ground, and thereby shorten the labour of cultivation, and forestry conditions will more quickly be brought about. As the trees increase in height the lower limbs will die and can then be cut out and used on the farm as summer wood.

The Forestry Branch co-operative tree-planting scheme is one of the most popular with the people in the west, and as the years go by and the beautiful groves show up more and more prominently dotted over the prairie landscape, they become silent witnesses of the government's wisdom and forethought for the comfort and welfare of the dwellers on the plains of the west.

A. P. STEVENSON,
Tree-Planting Inspector.

APPENDIX No. 4.

REPORT OF ANGUS MacKINTOSH, TREE-PLANTING INSPECTOR.

HEADLANDS, SASKATCHEWAN, April 1, 1908.

R. H. CAMPBELL, Esq.,
Superintendent of Forestry,
Ottawa.

SIR,—I have the honour to submit to you a brief report on the tree-planting inspection work with which you entrusted me in 1907.

The territory allotted to me was that intersected by the Kirkella Railway from Elkhorn to Strassburg and up the east side of Last Mountain Lake; the Prince Albert branch from Lumsden to Rosthern, and the Canadian Northern from Quill Lake to Vermilion.

The applicants for trees are not all to be found in strips of country along those railways, but are widely scattered, many of them from forty to seventy miles, some even further, from any railway. In those outlying places there are a number of bachelor homesteaders amongst our applicants who put in only half their time on the homesteads, having from necessity to go out and earn money elsewhere; and the inspector sometimes finds nothing but vacant shacks and a few acres of prairie sod turned over at the end of a long journey. It is not, however, always so, for there are now many thriving small plantations in some of those remote places, and there is no lack of desire to have trees shown.

The plantations made in past years in settlements less remote are steadily increasing, are on the whole doing well, and many of them are now attractive features of the landscape. Most of them are as well kept as can be expected, for many of the owners have not yet got over the preliminary work of making for themselves comfortable homes. There are of course a few exceptions where the trees have not had the attention necessary to insure success, especially where farms have been sold, and the purchaser lacks the enthusiasm of the former tree-planting owner.

On account of the extraordinary lateness of the spring of 1907 planting operations were everywhere much delayed, and in many cases had to stand over until all the grain was sown. Yet on the whole the trees have done wonderfully well. I estimate the failures among them at ten per cent.

Although the previous winter was a severe one, I am glad to say that the plantations all over the territory that I inspected look well. There is very little damage or cutting back noticeable and the greater number of the trees injured in that way in past years have recovered and are now making a much hardier growth. The few cases of cutting back that I did see I attribute to the richness of the soil, coupled with heavy manuring. I have often to warn applicants for trees, and recipients of them, about the evil of putting too much manure on the land, and in that way causing the young trees to grow too fast and soft.

I am sorry that on account of the large number (over 700) of names on my list, and the kind of country over which they were scattered, I was unable to visit all the applicants. Those, however, on whom I did not call have been written to.

Your obedient servant,

ANGUS MacKINTOSH.

APPENDIX No. 5.

REPORT OF JOHN CALDWELL, TREE-PLANTING INSPECTOR.

VIRDEN, MANITOBA, April 1, 1908.

R. H. CAMPBELL, Esq.,
Superintendent of Forestry,
Ottawa.

SIR,—I herewith beg to submit to you my report for the season of 1907.

My territory was the Canadian Pacific Railway main line from the Manitoba boundary to Regina and back to Manitoba along the Areola line and all the intervening territory. The work took five months, beginning June 15.

I found the plantations generally doing well with the interest and demand increasing. I booked no one this season for more than 1,500 trees as we were likely to be a little short of stock to supply a heavy demand from all quarters. I think it better not to give too many trees at a time and 1,500 is probably a very good average.

I marked off quite a lot of names this season, as when a man has been called upon three times he should be pretty capable of planting and caring for trees and we will have more time to devote to newer men.

Although last spring was very late the season was cool with an abundance of moisture and the trees did well, as did also the willow cuttings.

The percentage growing of all trees planted to date is about 85 per cent.

The maple, ash, cottonwood and willows are all doing well. The elm is the least satisfactory, being more sprawly and very subject to being cut off by rabbits. I noticed some Carolina poplars on the street in Regina which had done well for three years and think that this may become a useful tree.

I am still in favour of sending out more of our hardy fast-growing willows.

The district from Manor east to the Manitoba boundary was struck by a very bad hail storm early in the season and a good many plantations were very badly damaged. I advised that the young trees should be cut back pretty close to the ground and no doubt most of them will come again.

I had the pleasure of visiting the Forestry Nursery at Indian Head a couple of times during the season and was pleased to see everything in such splendid condition. On account of the late spriug the young stock will be a little smaller than usual, but that is better than having the trees too large.

The farmer is a very busy man in the spring of the year and fair-sized seedlings are the best for him to plant. I have always found that most beginners in tree-planting think they have quite a large contract on hand when they have a couple of thousand trees to plant when it should not take one man and one boy more than eighteen hours to do the work.

When I started out last spring I took a dibble and a few seedlings with me and I lost few opportunities of giving a practical lesson in how to trim a seedling and how to plant it, and I may say that an object lesson of that kind is very much appreciated. Showing a man once in a practical way is worth more than telling him a dozen times over. As long as it is my duty and privilege to travel among the farmers in this work I will take my dibble, also a few seedlings and cuttings. I feel that I can make myself more useful in that way and may be the means of saving a great deal of hard labour.

Before closing my report I would like to add that we have south of Virden some thousands of acres of sandy land poorly adapted for agricultural purposes but well adapted for growing such trees as spruce, tamarack, cottonwood and willow. Fuel is becoming scarce and higher each year, and I believe it would be a paying proposition for the government to plant some of this land. I think it would be well to give this matter some consideration.

Your obedient servant,

JOHN CALDWELL.

APPENDIX No. 6.

REPORT OF WALTER B. GUITON, TREE-PLANTING INSPECTOR.

INDIAN HEAD, SASKATCHEWAN, November 30, 1908.

R. H. CAMPBELL, Esq.,
Superintendent of Forestry,
Ottawa.

SIR,—I have the honour to submit to you my report of the season's work in tree inspection as carried on through the co-operation of the Department of the Interior.

The territory given me this year was along the main line of the Canadian Pacific Railway from Pense to Moosejaw, thence south to North Portal; also along the Estevan line into the border of Western Manitoba. From here I received instructions to proceed along the main line to Lethbridge and south to Macleod, also doing Southern Alberta in what is known as the Mormon country where some of our finest plantations are to be seen on all sides of the roads. It is very gratifying to see the care which the people have taken to protect the trees from being broken by cattle. From Cardston I proceeded back along the line to Lethbridge, working my way to Medicine Hat; from there along the Crow's Nest railway into Calgary. This part of the line was one of the most difficult on my whole list, as the Canadian Pacific Railway have the land for some thirty-five miles back from the main line, and it is necessary to travel the whole stretch of country until one gets into the settlement along the Rosebud creek, in which we have quite a number of plantations growing.

The spring being very late this year, I was not able to commence till July 1 so as to give the young trees, which were set out this year, a chance of showing how they were doing. The trees were in all cases received in excellent condition owing to the

way in which they were incased in sacking and wet moss, so as to keep from drying out until they arrived at their destination. The applicant having received word beforehand as to when the trees would arrive, there was no leaving of them at the station until they were dried but they were planted at once before the buds opened up, the ground having been prepared the summer before, which does away with the necessity of spring ploughing.

Great care should be taken to see that the trees are set out the required number of feet apart in the plan which is sent to each applicant. Also the trees should be firmly planted in the ground so that, should one try to pull them up by the thumb and first finger he would be unable to do so without breaking the tops of the trees. With the majority of planters the green ash is very much in favour and is giving increased satisfaction every year, when planted in alternate rows with the Manitoba maple, Russian willow and Dakota cottonwood. The elm, although a slower grower, make a desirable addition to a plantation. These do well when set out in rows four feet by four feet and have a remarkable tendency to stop the working of the insects, which at present are not numerous, although a slight demage was done to some of the leaves on the willow by the tent caterpillar this season. Some complaints have been made as to the damage done to the ash trees by the jack-rabbit which eats off the tops of the green ash during the winter. The rabbits seldom bother the maple, although this tree is very often killed back in the winter by too late a cultivation in the fall and trying to force them ahead. This is a mistake as they should not be cultivated later in the fall than the middle of August, but one can go through them with a hoe and take the big weeds out of them without doing any damage.

Do you want the trees pruned, is the question asked very often. As these trees are given for windbreaks and not ornamental purposes, they should be allowed to grow as close to the ground as possible, and when the trees are too big so that cultivation is no longer required, they will then hold the moisture in the ground and shade it so much that there are very few weeds which will grow to any great extent. The number of applicants who have not got the ground in shape or properly prepared for another year, is getting less every year, showing that the people are finding that it is one of the things which have to be done at the proper season of the year. While it is possible to get a sandy loam into a proper state for trees in the first year, yet on heavy clay soil this cannot always be done. The applicant who heeds the inspector's advice, and has the ground as it should be, is farther ahead in one year than if he were allowed to plant trees on badly worked ground, in two years or even more, showing that the ground well worked up absorbs the moisture more readily and is in fact easier to keep weeds down on.

I have not given any Manitoba maple west of Swift Current as they do not seem to do so well as the ash, cottonwood, elm and willow, the maple coming out so early in the spring on account of the hot winds that they are checked or killed back again by frosts, so much so that if it were not for its rapid growth it would be killed entirely.

While at Maple Creek I saw some crab-apple trees which were grown within the shelter of one of our shelter-belts loaded down with fruit, and the smaller fruits were doing exceedingly well. I was able to give some good advice to the farmers about these fruit trees, as I have had good experience in fruit and ornamental trees with the well-known firm of Stone & Wellington for five years. This knowledge has been very useful to me during the season's work. I had a good many foreigners on my list this year who show a great fondness for trees, having raised them successfully in the Dakotas of the United States where trees were one of the principal features on the farm to stop the winds and keep the snow from accumulating around the buildings.

In closing my report, I beg to say that the plantations visited are, on the whole, in a very satisfactory state and that the efforts of the department are meeting with a success which is encouraging, as the work at present is only in its infancy. Some

inducement should be made to try and encourage the farmers who visit the Experimental Farm at Indian Head, to drive out to the Forestry station as it will give them an object lesson in what can be done in a few years. As far as observations go for the season closing 1907, I would say that 95 per cent of the trees set out since 1902 are alive and 85 per cent of them doing well.

Your obedient servant,

WALTER B. GUITON,
Tree Inspector.

APPENDIX No. 7.

REPORT OF JAMES LEAMY, CROWN TIMBER AGENT.

NEW WESTMINSTER, B.C., March 20, 1908.

R. H. CAMPBELL, Esq.,
Superintendent of Forestry,
Ottawa, Ont.

SIR,—I beg to submit the following report in connection with fire-guarding timber within the railway belt in the province of British Columbia, during the season of 1907.

During the season we had no large fires that caused us very much trouble, the season being rather a favourable one and not excessively dry. On the upper Columbia river, that is between Surprise rapids on the north and the boundary of the railway belt on the south, we had very little difficulty in coping with any small fires that occurred, although a number of small fires did occur which were promptly attended to by the fire rangers in charge of that district and no damage was caused by them. No fires happened along the Kicking Horse river, between Golden and Field, and very little trouble was given the rangers in this district by fires. The only fire of any consequence was at Surprise rapids, just near the north boundary of the railway belt, which fire was caused by a number of students from some American college who were on a camping tour during the summer and who located themselves just outside of the railway belt, lighting bonfires and neglecting to extinguish same when leaving, consequently quite a serious fire occurred on account of their negligence, which extended slightly into Timber Berth No. 85 but was carefully watched and attended to by Mr. Cameron Fisher, the fire ranger of that district, and did no damage of any consequence to Dominion timber. In the early part of the season I was compelled to divide the upper Columbia district into two parts: Mr. Frank Ashdown looked after the Kicking Horse district and the upper Columbia south to the Spillimacheen river, which is at the boundary of the railway belt, while Mr. Cameron Fisher attended the district from Golden to the northern boundary of the railway belt at Surprise rapids up the Beaver creek to the summit of the Selkirk mountains, that is Roger's Pass.

A number of small fires occurred along the line of the railway from Beavermouth, but did not spread to any extent being carefully looked after by Mr. Fisher. From Roger's Pass west to Revelstoke and Sicamous along the line of the railway, a number of small fires occurred, but the greatest difficulty in that district was down the Columbia river from Revelstoke to Arrowhead in which part a number of fires took place and were attended to by Mr. Alexander McRae and his assistants, also the Canadian Pacific Railway employees, therefore were not permitted to spread and do any damage, and I am pleased to report that no timber of any value was destroyed. In the Eagle's Pass there were numerous small fires, but they did not do any damage.

From Sicamous down to the boundary of the railway belt at Armstrong, part of which district was looked after by Mr. Alex. Reid and Mr. J. D. McGuire, fires were comparatively few and did not cause much trouble, no timber having been destroyed. In the valley of the Salmon river also, in Mr. J. D. McGuire's district, a number of fires occurred which were caused by farmers clearing up their lands, and some trouble was occasioned by having to attend to them, but no government timber was lost, although endangered by fires on the settlers' lands and had to be attended to almost constantly.

Along the Shuswap river from Enderby to Marble lake a number of small fires occurred, but were promptly attended to by Mr. Alex. Reid, whom I appointed in the latter part of the season to look after that district, therefore they did not do any damage at all, no merchantable timber having been destroyed.

The Notch Hill and the Shuswap Lake districts were looked after by Mr. W. R. Peacock, and only one fire occurred of any consequence, that was on the north shore of the Shuswap lake in the Meadow Creek district; this fire was caused by settlers who were squatted in that district, but did very little damage, having been promptly attended to by Mr. W. R. Peacock and also the employees of the Lamb-Watson Lumber Company who promptly turned out their men to assist in looking after that fire.

From Little Shuswap lake west to Kamloops the only fires which occurred were caused by the sparks from the engines of the Canadian Pacific Railway setting fire to the dry grass and burning up their own fences along the railway, but did not extend any distance away from the track; no timber being burned in that district.

In the vicinity of Ashcroft, which is looked after by Mr. Angus McGillivray, extending from Savona west to Lytton, a few small fires occurred which may be chargeable against the Canadian Pacific Railway and people engaged in the clearing of lands, but no damage was sustained by these fires. Still further west a few small fires occurred along the line of the railway between Yale and Agassiz, but were attended to by the fire ranger in charge of that district, Mr. F. W. Hughes, and did not do any damage. These fires might be attributed to the Canadian Pacific Railway section men clearing up the refuse along the right of way, such as bush, old ties, &c. However, no damage was sustained by these fires. From Agassiz west to Slave river, also attended to by Fire Ranger Hughes, no fires occurred. A fire occurred on Stave river which was caused by the clearing of the island on which the Stave Lake Power Company were erecting their plant and building the dam across the river. This fire got away across the Stave river and set fire in some old logging works in cancelled timber berth No. 138. The fire assumed considerable proportions, but was attended to by Mr. Murdock Martyn, with the assistance of the Stave Lake Power Company's employees and those of Messrs. E. H. Heaps & Company, who succeeded in subduing the fire before any damage of any consequence occurred, and I think the ranger in question deserves great credit for the prompt manner in which he attended to this fire.

From Stave river west, Mr. Murdock Martyn's district, a few small fires occurred, which were caused by the clearing of the right of way by the Canadian Pacific Railway employees and caused no damage whatever, except that they had to be watched and attended to. About the western boundary of the railway belt, also in charge of Mr. Martyn, I was obliged to employ a ranger to attend to the north arm of Burrard inlet, owing to the large number of campers along the North Arm and Burrard inlet, and owing to his vigilance no fires occurred as he was constantly on the alert.

The south side of the Fraser river touching the international boundary line was looked after by Mr. M. G. Fadden, Mr. John Bell, Mr. Neil Johnson and Mr. Geo. E. Gairns. In Mr. Fadden's district, which extends from Hope to Lower Sumas taking in Cultus Lake district, no fires occurred.

In Mr. John Bell's district, which extends from Lower Sumas to Langley, comprising Matsqui and Langley municipalities, a few fires occurred in American territory, but were carefully looked after by Mr. Bell, assisted by Mr. John Dennison,

whom I had to employ for a short time during the dry season. These fires did not cross into Dominion timber.

The Surrey and Delta districts were looked after by Mr. Neil Johnson, assisted by Mr. Geo. E. Gairns. A number of fires occurred, only one of which gave us very much trouble. This fire occurred on some settler's land adjoining limits 'R' and 87, being private property which was being logged. It was supposed to have been caused by sparks from the logging engine. However, it assumed large proportions and spread over private lands, but Mr. Johnson, assisted by Mr. Gairns and the employees of the McNair Shingle Company, promptly established a fire line along the Johnson road, having barrels of water, also men felling dead timber, and preventing the fire from extending into the timber limits. After a fight of some weeks' duration, I am pleased to be able to report that no timber in which the government had any interest, was burned.

In concluding this report I beg to commend the different fire rangers for the able and efficient manner in which they discharged their duties, and I consider that by their constant vigilance they protected a large quantity of valuable timber which otherwise might have been destroyed, and I beg to also thank you for your very valuable assistance and advice in connection with all matters pertaining to the conservation of timber within the railway belt.

Your obedient servant,

JAMES LEAMY,
Crown Timber Agent.

APPENDIX No. 8.

REPORT OF W. J. MARGACH, CHIEF FOREST RANGER.

CALGARY, ALBERTA, April 21, 1908.

The Superintendent of Forestry,
Ottawa, Ont.

SIR,—I beg to report that during the summer of 1907 on the eastern slope of the mountains south of the Saskatchewan river, seven fire rangers were employed during the early summer and late autumn. The season was wet during the summer, and men were taken out of the woods at that time.

There was no fire that did any damage to standing timber during the season. Some of the rangers reported several small fires to have got away from settlers clearing land, which were extinguished without doing damage. Two of these settlers were prosecuted and fined. It is a very difficult matter to get evidence showing breaches of the Act.

In respect of fire from locomotives setting fire to the prairie, in my opinion a mechanic should be appointed as a ranger who is capable of getting on to a locomotive and finding if the appliances are on the engine and if they are being kept in condition to prevent the throwing of sparks.

I lately returned from a trip to the Macleod river, a hundred and twenty miles west of Edmonton, and made an inspection of the manner in which the Grand Trunk Pacific Railway were clearing their right of way. The work is being done by sub-contractors by Foley, Welch & Stewart, who are the contractors from the company. The right of way is being cleared in a great many places to a width of 200 feet, and I found them burning all the material upon the land, none of it going outside of the right of way. The engineers have got this under their supervision, and I believe that the requirements of the department are in this respect being met.

Your obedient servant,

W. J. MARGACH.
Chief Forest Ranger.

APPENDIX No. 9.

REPORT OF W. A. DAVIS, CHIEF FOREST RANGER.

GRAND VIEW, MANITOBA, December 24, 1907.

R. H. CAMPBELL, Esq.,
Superintendent of Forestry,
Ottawa.

SIR,—I have the honour to make my report as Chief Forest Ranger for the Riding Mountain, Turtle Mountain and Porcupine Forest Reserves in Manitoba.

I commenced my duties on May 1, 1907. My first step was to lay off my territory into districts. For example, there are three permanent rangers for the Riding Mountain reserve, to each of whom has been allotted his own special tract to patrol, the average face of which is about 45 miles. The men appointed are well acquainted with their own individual locality, living inside of their own patrol precincts, and are used to the bush and conversant with all the different trails through the mountain.

The first duty I strongly impressed on them was to see that no fires got into the bush inside of their respective locations. The next was, that each was to see to it that there should be a clearly defined line or road allowance cut all along the outside limit of the reserve. As it now stands even the settler who lives in close proximity does not know when he is over the line, and this causes us a great deal of trouble in dealing with trespassers, as of course they invariably take advantage of this and when questioned as to where the wood or posts have been taken from, profess ignorance as to the exact section, but always say they believe it was outside of the reserve. It will take a considerable time to have these lines all cut out, and where they run through a great depth of bush it would be hardly fair to expect the ranger of that district to do all the work, for if he were compelled to do so it would take up his entire time, and I would suggest that a small appropriation should be made at the present session for this purpose.

I have also asked each ranger to furnish me before my next report with a map of his territory, showing the different kinds of trees, and the land they cover and where burnt over, defining the area of same, and giving approximately the quantity of dry wood that could be obtained, and how far from the nearest station in a direct line. This map is to be made out for an average depth into the reserves of eight miles. This is an idea of my own, as in my opinion some steps should be taken as soon as possible to remove as much as possible of all dry and dead timber, as it is a great source of menace to the growing timber. In the event of fire once getting started in such a place it is sure to cause a great deal of damage.

The rangers are also instructed that all persons who bring out either timber or wood from these reserves must have a permit therefor, and if not, the ranger is authorized to seize the same and collect dues from such delinquents. There are a great number of such as it seems to be a recognized idea that to steal from the reserves is no crime. We are trying to show such people that the laws governing these reserves are made solely for the people and we are meeting with a fair measure of success. Very few seemed to know before that this timber and wood were reserved for the use of actual settlers, and that for a nominal office fee only.

While on this subject of dues I would say I believe it would be to the interest of the department and would facilitate the duties of each ranger, if the ranger were notified of the name of each individual taking out a permit in his district and the particulars of the permit. I found in several instances, where the ranger came across wood cut in large quantities and saw the person who took out same, that he claimed

to have a permit and before the ranger could get back word from the Dauphin office, even though information was sent in all cases by first mail, such wood had been removed although permit for the same had never been granted.

I would also suggest that a Dominion land surveyor be sent out as early as possible to run the lines of the Porcupine reserves which have never yet been run, and if this is not done at once it will surely become a source of trouble. As you know, that is specially a timber country and there are timber berths around all the lines and there is danger of the holders cutting over the boundaries.

There was not a very large cut of lumber on account of the extreme depth of snow in the mountains, in fact there were hardly any portable saw-mill outfits at work. But even with the large reduction in the year's cut of lumber there will be more lumber carried over by the large mill owners of Manitoba than was ever known before. But this I consider, although a great hardship for the lumberman, will be a blessing for the farmers and users of such lumber. Before this the demand for lumber had been so great the lumberman could not supply it. But from now on a good supply of dry lumber can be obtained.

Taking up the wood supply, of which there was a great deal said last winter, there was plenty on hand, but it could not be put on the market as the railways could not cope with the situation. We had an abnormally large snowfall. I am most happy to say that for this winter, namely, 1907-8, we are so far blessed with the very opposite. Better weather and for a longer continuous period has never been known. In consequence there will be a larger output of wood, and a greater number of portable saw-mill outfits at work than has been known for a number of years.

I would respectfully draw your attention to the fact that I have had to appoint two temporary rangers for a short term only in each case, one to look after the Lake Manitoba West reserves and the other to look after the Canadian Northern railway extension from The Pas northward on what is called the Hudson Bay Railway, as I deemed it only wise that, on account of the large number of camps used along this line, it should be patrolled to guard against fire.

I was more than pleased that you came out personally and looked over the ground and I am trying my best to follow your instructions as your experience in such work has given you a keener insight into what is required, and at the same time you will be better able to appreciate the different obstacles we as rangers have to contend with.

I am pleased to say that there has been no damage done by fire to the forests in this district whatever. There were quite a few started, but in all cases our rangers, thanks to the new system, have been on the ground and in no instance has the fire got away. The work done by the rangers has reduced the danger in this respect.

Before closing my report I would respectfully draw your attention to the fact that I have not been able to give the whole of my time to this work, much as I would have liked to do so, on account of the other onerous duties which fell to my lot, and which I have already covered in my previous report to you, and this work being imperative had to be done. But I fully expect to give my full time in the future to the Forestry Branch, and hope ere another year rolls round to be able to show you that something tangible has been accomplished.

Your obedient servant,

WM. A. DAVIS,
Chief Forest Ranger.

APPENDIX No. 10.

REPORT OF C. A. WALKINSHAW, FOREST RANGER.

Boissevain, Manitoba, March 28, 1908.

R. H. Campbell, Esq.,
Superintendent of Forestry,
Ottawa, Ont.

Sir,—I beg herewith to submit my annual report in regard to the conditions in the Turtle Mountain Timber reserve.

In the first place I would like to say that the general conditions have been extremely favourable during the year just past owing to the fact that there has been an almost complete freedom from fire—only one small fire having got into the reserve and burning about four acres in sections 34 and 36, township 1, range 21, west of the 1st meridian, but doing very little damage because it was principally all grass.

A fire which threatened to do much harm was stopped by the able efforts of my assistants in confining it to sections 3, 2 and 10, township 2, range 21, west of the 1st meridian.

I am pleased to be able to report that seven of the squatters on the reserve, namely, Mrs. Foster and family, Frank Chisholm, John R. Kelly, Benjamin Pagels, William Hunter and family, Joseph Tomlinson and family, and John Rever and family, left last fall and have taken up land near Benito, Saskatchewan, and that the remaining squatters, namely, William H. Cox and family, William Madden and family, and Philip Mulholland, have agreed to vacate the places occupied by them on the reserve and to accept the assistance offered to them to take up locations also near Benito. It is expected that they will leave in about three weeks.

The half-breeds who had located at the western end of the reserve left almost immediately after our visit to them and have not been seen or heard of since.

The past winter has been an exceptionally favourable one for the people who have come for wood, owing to the fact that there was an almost entire absence of snow, and they were able to gather a great deal of the fallen timber that had lain on the ground for some years and in previous seasons could not be gathered on account of snow. The picking up of this wood is a great benefit to the reserve.

There have been at least 250 permits issued for twelve cords each, making a total of 3,000 cords of this fallen wood that has now been taken away. All over the reserve the growth of the young trees referred to in my last report has been continued and has been very rapid.

According to instructions received by me I have destroyed all the habitations of the squatters who have left, and this will be continued in the case of those about to leave as before referred to.

The fish in the lakes on the reserve is an attraction to the American people just across the lines and we have been able to turn back several parties who came this winter with the intention of fishing through the ice. The winter season is the only time when there is much trouble experienced with them.

Your obedient servant,

C. A. WALKINSHAW.
Forest Ranger.

APPENDIX No. 11.

REPORT OF JOHN STEWART, D.L.S., C.E., COMMISSIONER AND CHIEF ENGINEER OF IRRIGATION.

CALGARY, ALBERTA, March 31, 1908.

Hon. FRANK OLIVER,
Minister of the Interior.
Ottawa.

CANADIAN IRRIGATION SURVEYS.

In the spring of 1907, I sent two engineering parties into the field, one in charge of Mr. R. J. Burley, in Saskatchewan, and the other in charge of Mr. P. M. Sauder, in Alberta. Both these men had instructions to make inspections of all ditches authorized, gauge all streams and make surveys of lands to be purchased under the terms of the Irrigation Act, also to inspect all reservoir sites set apart by order in council for irrigation purposes, and to inspect all licensed schemes in each of their territories.

The territory covered by Mr. Burley extends from township 16 south to the international boundary, and from range 8, west of the 4th meridian eastward to range 10, west of the 3rd meridian. Under the above instructions, Mr. Burley made 138 inspections of schemes authorized, 65 surveys of lands to be purchased under the terms of the Act, 23 inspections of licensed schemes, 4 inspections of reservoir sites, and made 19 gaugings of the principal streams in his territory, and sent in to this office 190 reports. Mr. Burley was only able to gauge the largest streams, as the meter he had was too large for small creeks.

The second party was in charge of Mr. P. M. Sauder, in Southern Alberta. The territory covered by Mr. Sauder extends from Bow river, south to the international boundary, and east to range 8, west of the 4th meridian. During the season, Mr. Sauder made 65 inspections of ditches authorized, 10 surveys of lands to be purchased under the terms of the Act, and gauged 131 streams and set 5 gauge rods. He also inspected 23 licensed schemes and 15 reservoir sites and made survey and estimate of the Fisher and Barnes ditch and sent in 140 reports to this office. He also erected two cable stations for gauging streams. Mr. Sauder also made a trip to Montana to get particulars of how work was carried on in the United States, and he also made a survey of the Red Deer river to find out if water could be got on to the lands lying east of the Canadian Pacific Railway block.

In September last, I inspected the following schemes at Saskatchewan Landing: Jones and Webster, at Miry creek, and J. L. Smart and F. Goodwin, at Saskatchewan Landing. I also made a survey of 1,000 acres of land in the Stony Indian reserve, sold to the Calgary Power and Transmission Company, of Calgary.

With reference to the inside work of this office, since April 4 last, there has been the following number of communications received and sent out, viz.:—

Letters received to date	3,662
Letters sent out	4,846
Agreements for water received and recorded	1,380
Applications for water received and recorded	168
Gauge rod readings received	72
Right-of-way plans examined and recorded	110
Plans with applications for water examined and recorded	336

Transfer of water agreements and notices of cancellation of water agreements	236
Notices of application for water rights prepared for publication.	168
Number of forms of application for right-of-way over Crown and other lands	95
Applications to construct works across road allowances	125
Number of final licenses recorded, in triplicate. Making 176 entries in records.	44
Number of certificates under section 20 of the Act	98
Number of certificates under section 33 of the Act	40
Number of reports received from R. J. Burley	190
Number of reports received from P. M. Sauder	140

In a great many of the letters received there were enclosures which had to be recorded in the books of this office, and do not figure in the number of letters received.

It will be noticed from the above figures, that the work of this office has doubled within the past year.

For the coming season it is intended to carry out practically the same programme of work in the field as last year, with the exception that in Southern Alberta there will be cable stations established on all main streams to enable the gauging of these streams to be performed by two men in the years to follow, thus cutting down the expense on such work, and in Saskatchewan there will be gauge rods placed on all the main streams and all streams will be gauged.

Your obedient servant,

JOHN STEWART.

APPENDIX No. 12.

REPORT OF P. M. SAUDER.

CALGARY, ALBERTA, March 31, 1908.

JOHN STEWART, Esq.,
Commissioner of Irrigation,
Calgary, Alta.

SIR,—I beg to submit the following report of work performed by me during the season of 1907.

HYDROGRAPHIC WORK.

Having completed the organization and equipment of my party, field operations were commenced on the first of May. Moving in a southerly direction, measurements of the discharge were made on all the more important streams between Calgary and Macleod. From Macleod we travelled westward to a point near the junction of the South Fork and Oldman rivers and gauged the tributaries of the latter. Proceeding southward from Pincher creek to the Waterton lakes and thence eastward to the head works of the Alberta Railway and Irrigation canal, discharge measurements were made on the Waterton, Belly and St. Mary rivers and tributaries.

Having completed this circuit early in August we decided to return to Calgary by a similar route and make a second discharge measurement of all the streams already gauged. A number of smaller streams tributary to the South Fork river, Crownest river and the North Fork of the Oldman river which had not formerly been included were gauged on the return trip.

Besides determining the actual discharge at the date of measurement, sufficient data as to the general slope of the bed of the stream and its character were obtained to enable us to calculate the probable discharge at high water and flood stages of the streams by use of Kutter's formula for the flow of water in open streams.

The gauge heights which had been formerly established were examined and put in good repair, and five new ones erected.

In August I worked for a week with Mr. Follansbee, of the United States Hydrographic Survey, and obtained much valuable information as to the system under which the work is carried on in that country.

On October 25 having finished the season's work, the outfit was stored and the men paid off.

INSPECTIONS.

This work consisted of the inspection of all applications for water-rights, the inspection, survey and examination of proposed locations in connection with applications to purchase lands under the irrigation system, the inspection of reservoir sites set apart by Order in Council, and the inspection of licensed irrigation works.

A very careful examination and survey of Mr. John Lineham's schemes for the diversion of water from Macabee creek and Mr. W. H. Quail's scheme for the diversion of water from Muddypound creek were made and I found it necessary to relocate some portions of these schemes.

A very careful examination and survey of the Fisher and Barnes irrigation scheme were made to determine the cost of construction and to form a basis for settlement of the various matters in dispute between them, which occupied considerable time.

In accordance with your instructions I proceeded to Red Deer river in November to determine the feasibility or otherwise of diverting water from that river, to irrigate the land lying south of it and east of the Canadian Pacific railway tract, and found that owing to the high banks and small fall in the river it was not a practicable scheme. From information since received it appears that it may be possible to irrigate this tract by diverting water from the Bow river at a point near the east boundary of the Blackfoot reserve.

Your obedient servant,

P. M. SAUDER.

APPENDIX No. 13.

REPORT OF RALPH J. BURLEY.

CALGARY, ALBERTA, March 31, 1908.

JOHN STEWART, Esq.,
Commissioner of Irrigation,
Calgary, Alta.

SIR,—I beg to submit the following report of the work performed by me during the season of 1907.

My party was organized in Calgary and the outfit loaded and shipped to Medicine Hat on May 6. From there we drove to Medicine Lodge near the detachment and after completing the work of inspections and surveys there and in the vicinity of Medicine Hat moved to Maple Creek on May 25.

From there we moved in a southeasterly direction inspecting all schemes on the north side of the Cypress hills, and then moving across to the south side and working westward completed the circuit of the hills and arrived at Maple Creek on November 25.

The work consisted of inspections of all licensed and authorized schemes, inspections of reservoir sites set aside by Order in Council, inspection and survey of proposed schemes involving the purchase of land under the irrigation system and gauging of the more important streams flowing out of the Cypress hills.

From the attached lists it will be seen that the work in the Maple Creek district is increasing rapidly and as several schemes needed two and sometimes three inspections during the season it was impossible for me to devote as much attention as should have been given to the hydrographic work. In addition I located the Fearon, Moorhead and Hastie ditch, a rather extensive scheme which involved the placing of some twenty-six miles of location stakes, transit traverse of the ditches and reservoirs and the running of check levels over all the located ditches. This work delayed me some three weeks just at a time when a close check should have been kept on the flow of water in the various streams, and as a result I could only make some nineteen gaugings of the larger streams. A smaller meter should be supplied for gauging the spring creeks, small coulees, &c.

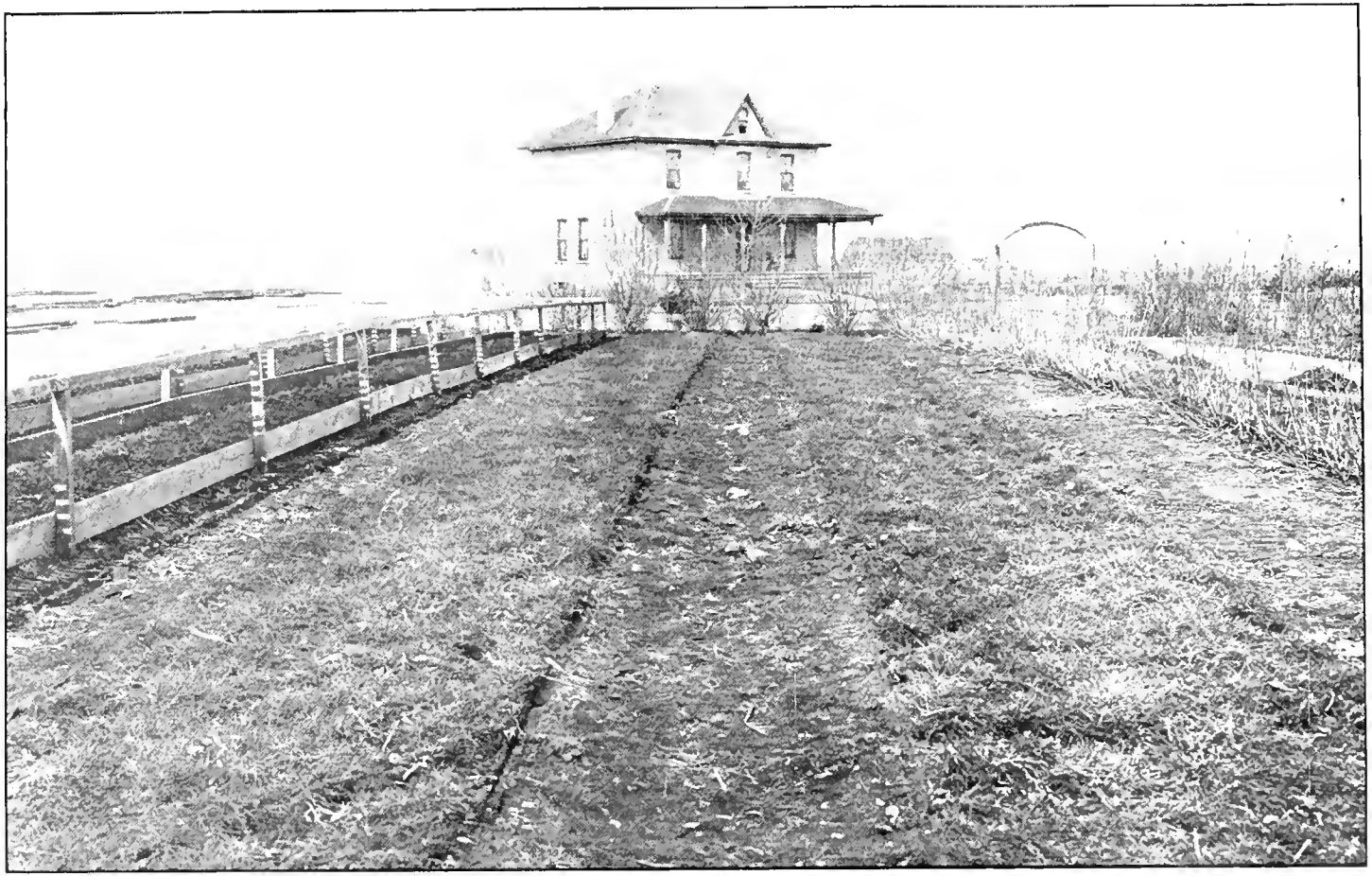
Weather conditions prevented further field work being advantageously carried on, and on November 25 I struck camp, and stored the outfit at Maple Creek, shipped the horses to Calgary and paid off my party in accordance with your instructions.

Your obedient servant.

RALPH J. BURLEY.

Lumberman's Dam, Duck Mountain Reserve.

Shaded Conifer Beds, Indian Head Nursery.



Two year-old Scotch Pine Seedlings, Indian Head Nursery, Saskatchewan.

Sowing Tree Seed at Indian Head, Saskatchewan.

Squatter's Hut, Turtle Mountain Reserve.

Planting on the Reserves.

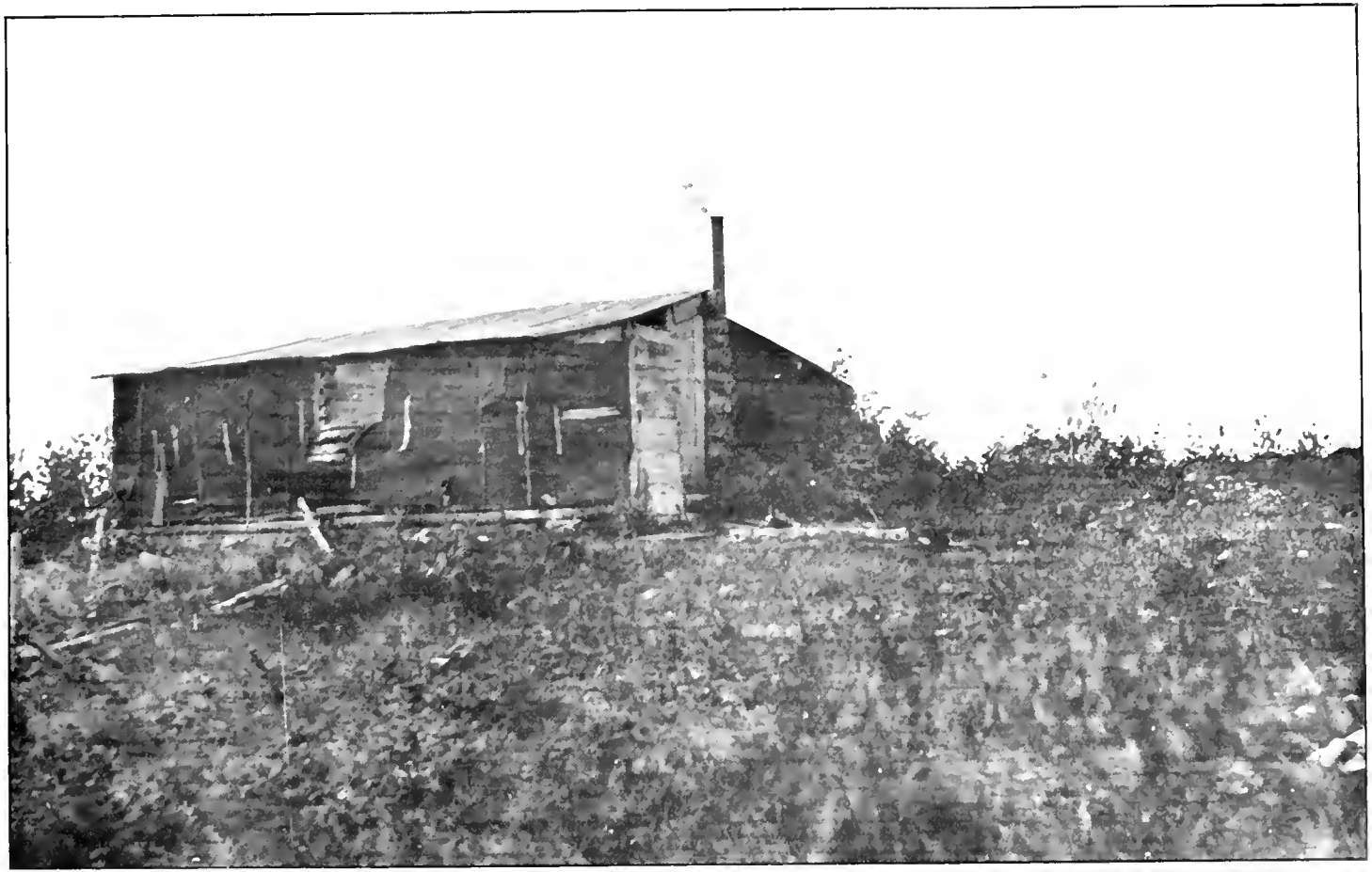
THREE-YEAR OLD NORWAY SPRUCE SEEDLINGS (*Picea excelsa septentrionalis*) AT INDIAN HEAD, SASKATCHEWAN.

Forest Survey Party, Riding Mountain Reserve

Ravine in the Riding Mountain Reserve.

Camp of Survey Party, Riding Mountain Reserve.

Fruiting Branches of White Spruce and Larch.



Squatter's 'Improvements,' Turtle Mountain Reserve.

DEPARTMENT OF THE INTERIOR

REPORT

OF THE

CHIEF ASTRONOMER

FOR THE

YEAR ENDING MARCH 31

1908

PRINTED BY ORDER OF PARLIAMENT

OTTAWA
PRINTED BY C. H. PARMELEE, PRINTER TO THE KING'S MOST EXCELLENT MAJESTY
1910

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REPORT OF THE CHIEF ASTRONOMER AND INTERNATIONAL BOUNDARY COMMISSIONER.

DEPARTMENT OF THE INTERIOR,
DOMINION ASTRONOMICAL OBSERVATORY,
OTTAWA, CANADA, June 24, 1908.

W. W. CORY, Esq.,
Deputy Minister of the Interior,
Ottawa.

SIR,—I have the honour to report as follows upon the work of the Astronomical Branch of the Department of the Interior, and on the surveys under my direction, namely, the International Boundary Surveys and the Geodetic Survey of Canada, for the fiscal year ending March 31, 1908.

The correspondence of the branch from April 1, 1907 to March 31, 1908, was:—

Letters received (exclusive of circulars)	1,864
Letters sent	3,135
	4,999

Showing an increase of 26 per cent.

Accounts dealt with, 848.

Increase, 14 per cent.

A statement of the work of the photographic division is appended. (Appendix No. 5).

The library contains 3,144 bound volumes, besides pamphlets, unbound periodicals, &c., and is increasing rapidly from the addition of scientific journals, exchanges with other observatories, &c. An upper flooring has been placed in the library room, with a number of steel bookcases, almost doubling the accommodation.

A small room in the basement has been fitted out for the purpose of a chemical laboratory. This is a great convenience for many purposes, especially in connection with the astrophysical work.

The meridian circle, objective 6 inches aperture, and 7 feet focal length, with circles 36 inches diameter, was received from the makers, Messrs. Troughton & Simms in October, and was erected in the western wing of the observatory. Unfortunately it was found on examination that both the circles were bent, doubtless through rough handling in shipment of the case containing them. They consequently had to be sent back to the makers and they have not yet been returned here. Without the circles, the instrument could have been used as a transit instrument merely, but certain improvements and alterations were found necessary to the building, which have so far prevented its use. In the meantime, all the time work of the observatory is done, as hitherto, with a portable transit instrument in the temporary transit shed to the east of the main building.

Collimators have been placed north and south of the meridian circle, in its building; it is intended to place meridian marks outside, at as great a distance as practicable, both north and south.

The building of the coelostat house was begun last fall, but not completed before frost. The work has been resumed this spring and it is expected that the building,

with the apparatus, will soon be in use. This house stands behind the main building, with which it is connected by a tunnel. Through this tunnel the sun's rays will be reflected by the mirrors into a room in the basement where a grating spectroscope and other instruments for investigation of the radiation will be installed.

The workshop has proved its utility both in economy and convenience. A large amount of repair work has been done both to observatory instruments and to those used on the surveys. Besides this a registering micrometer has been made for one of the portable astronomical transits. A polarizing photometer for use on the large equatorial has been made, as well as several attachments to the spectrograph. It has been found necessary to appoint an assistant to the mechanician, as there was too much work for one man to attend to.

A building to contain the comparators of linear measures used on the surveys is in course of erection on the observatory grounds. Provision will be made in this building for apparatus for the comparison of tapes and other measures up to 50 metres in length.

The practice of opening the observatory to the public on Saturday evenings has been continued. A member of the staff is always present on these occasions to exhibit the large telescope, and to explain the various celestial objects observed. Appreciation of this is shown by the large attendance, when the night is fine.

Much interest is also manifested in the lectures of the Royal Astronomical Society of Canada, which are given every two weeks from October to May in the observatory lecture room. While the want of easy means of communication from the city no doubt keeps many away, there have been occasions when our room has been taxed to its utmost capacity. The astronomical and other scientific work of the observatory comprises the following:—

1. Geophysical work. This is under the direction of Dr. Klotz; it comprises seismological observation and investigation, and observations for the values of the magnetic elements at outside points. Gravity observations also come under this heading, but, for various reasons, nothing in this line has been done during the year. Daily records of the seismograph have been kept.

An invitation from the International Seismological Association, extended through its president, to Canada to join the association, was accepted by Order in Council of July 10, 1907. The association has for object co-operation between scientific workers over the world in the study of the earthquakes and earth movements, with a view to the ascertainment, so far as possible, of the conditions of occurrence of earthquakes, and of the internal constitution of the earth. Dr. Klotz was present at the meeting of the association, at the Hague, last September.

The magnetic observations, which have been taken at many stations, covering a wide range of longitude westward from the Atlantic coast, also are of scientific interest in connection with the investigation of the structure of the earth, as well as having practical value to those who use the magnetic compass. For details of the work done the reader is referred to the report of Dr. Klotz, in Appendix No. 1, to this report.

2. Astrophysical, and allied work. This is under the direction of Mr. Plaskett, and is described in his report in Appendix No. 2.

The observations comprise measurements of the velocities in the line of sight of binary stellar systems, other spectrographic work, solar photographs, photometric and micrometric star measurements, observations of occultations of stars by the moon, and miscellaneous phenomena. Special attention has been paid to the first mentioned, the measurement of radial velocities and the reduction of the observations with their application to the determination of the forms of the orbits. As there are not a great many observatories engaged in this kind of work, the subject being indeed a comparatively new one, it has been thought that systematic investigation in this line, for which our instruments with the improvements and adaptations devised by Mr. Plaskett are well suited, was a proper contribution of Canada to science.

3. Meridian observation and time service. This is under the direction of Mr. R. M. Stewart. (See Appendix 3.) As the meridian circle has not yet been installed, observations under this heading taken in the observatory have been confined to transit observations having for purpose to determine the time regularly for the service of the observatory and the time system in the city, and to serve the purpose of the time exchange when the longitude of distant points is being determined.

The time service to the government buildings has been satisfactory. It has been extended to the city post office, which has several dials and a large illuminated tower clock, all operated by a synchronized clock of the usual pattern in the basement. From this circuit is also operated a public clock which has been erected by the Ottawa Electric Company in front of their office on Sparks street. Dials have also been placed in the Printing Bureau, the Archives Building and the Royal Mint, but, owing to delay in the preparation of a room for the governing clock and its apparatus, these dials have not yet been put in operation.

In Mr. Stewart's report will be found a description of some improvements in mechanism which have been made under his direction in connection with the synchronized clock, and in the recording transit micrometers, as well as an account of an investigation which he has made of the errors of observations with the portable transit, in which he has had in view the securing of greater accuracy in the astronomical field work.

4. The determination of latitudes and longitudes, for geographical purposes, has been continued as usual. Five stations in Yukon Territory, Dawson, Selkirk, Tantalus, Whitehorse and White-Pass, have been determined in latitude and longitude. The longitude of Dawson was first determined by exchange of signals with the station on the 141st Meridian, which was occupied for longitude in 1906 for international purposes; the other longitudes were then determined by exchange with Dawson. The observers were Messrs. F. A. McDiarmid and W. C. Jaques.

The following stations in Eastern Canada were also determined:—Pembroke, Mattawa, Labelle, Roberval, Lake Edward, Rivière à Pierre, Barry Bay, Scotia Junction and Chapleau. The observers were Messrs. McDiarmid, Jaques and French. The longitudes were determined by direct exchange of time with the observatory, Mr. Stewart taking the observations here.

The operations of the Geodetic Survey, under the direction of Mr. C. A. Bigger, comprised extension of the reconnaissance, preparation of the stations for observing by two signal building parties, observing the angles, and precision levelling by two parties along railway lines in the southern part of the province of Quebec. The scheme of triangulation, as far as to this date developed by the reconnaissance, is shown on a map accompanying this report. The preparation of the stations over this area is well advanced.

Only one observer could be put in the field to measure the angles of the triangles, since we had but one instrument of suffieient size and power to secure the required accuraey. This was a twelve-inch theodolite, made by Messrs. Troughton & Simms. Two more twelve-inch theodolites have been procured, and the measurements will progress more rapidly hereafter.

The area actually covered by the angle measurements last year was about 3,500 square miles, situated between the Ottawa and St. Lawrence rivers. A high degree of accuracy was obtained, the average of the closing errors of the triangles being less than one second.

A base line several miles in length has been laid out near Coteau Junction, with a well conditioned expansion to the triangle sides, but it has not yet been measured.

The International Boundary Surveys have comprised the survey of the 141st Meridian, and that of the boundary of the coast strip of Alaska, the re-survey of the 49th parallel and the re-survey of the 45th parallel.

After the determination of the initial azimuth at the crossing of the Yukon river, which was spoken of in my last annual report, had been completed, the 141st Meridian was produced south about 130 miles. Great care was taken to secure accuracy, and a special method of production, using a transit with micrometric eyepiece, was employed. A plane table survey, checked by photographs, based upon a triangulation was made of the country adjacent to the line, and a vista was cut out through the woods, where such were found. As the line production considerably outstripped these auxiliary operations, more force will be employed in the latter this year. It is intended also to place the permanent monuments this season at points indicated in last year's line production.

Mr. A. J. Brabazon had charge of the Canadian share of the work. In connection with this survey a line of levels will be run by Mr. D. H. Nelles, from Whitehorse to connect with the boundary line.

The survey of the coast strip boundary was divided into the following sections:—

A United States party, under Mr. Fremont Morse, made a triangulation up Glacier bay in order to determine the geographical position of the peak S. 7450, which lies to the northwest of the bay, and near the height of land between it and Alsek river. As the next peak to the west determined upon by the Tribunal, lies on the other side of Alsek river, and at a distance of about fifty miles from this one, and the two peaks are not intervisible, it was necessary to accurately determine the geographical positions of both peaks, in order that the important point where the boundary line crosses the Alsek river may be correctly placed. The more westerly peak was determined in the previous year by Mr. Morse, and an attempt was made to locate S.7450, from the Alsek river side, but unsuccessfully.

It was located by last year's operations, and this year Mr. Morse will proceed to the marking of the line at the Alsek. Mr. D. H. Nelles, D.L.S., accompanied Mr. Morse last year as the Canadian representative, Mr. Geo. White-Fraser, D.T.S., accompanied him this year.

Mr. O. M. Leland, of the U.S. service, determined the position of the peaks to the east of Lynn canal, continuing his work of previous years southward from White Pass, and completing the connection with the peaks already determined from Taku river. Two Canadian parties worked in the region between peaks 'P' and 'T' of the Tribunal. The Tribunal did not define the boundary line between these peaks, a distance of some 125 miles. By a supplementary agreement made in March, 1905, the line was defined as following from summit to summit of certain peaks, from peak 'P' which is north of Taku river, to a peak near Whiting river. Thence by the terms of the agreement the line is to go to 'T' by peaks to be selected by the Commissioners after survey, but not departing more than a specified distance from the straight line.

The line was surveyed in 1906 from Taku river to Whiting river by Messrs. J. D. Craig and W. F. Ratz, Dominion Land Surveyors. The work between Whiting river and peak 'T' involves, under the agreement, a topographical survey and map as a preliminary to the selection of peaks by the Commissioners.

With a view to the mapping of this region, Mr. Ratz last year proceeded up Stikine river until he found, at Flood Glacier, a suitable point of entrance into the mountainous region to the west. By the photo-topographic method, based on a triangulation, he developed the topography of the region near 'T' and north of it for a considerable distance. This year he continues this survey, proposing to enter the region at a point further north, approaching this time from the Pacific side at the upper end of the Endicott Arm of Holkham bay.

Mr. Greene, assistant to Mr. Ratz, completed the cutting out of the vista and its marking of the boundary line at the Taku and Whiting rivers early in the season, joining Mr. Ratz later on the Stikine river.

Mr. J. D. Craig's survey had for purpose the survey of the boundary joining the Tribunal peaks from Mt. Whipple, southeast of Stikine river to near Unuk river.

This part of the boundary lies among rugged mountains a considerable distance from the coast and, in part, on the eastern side of the watershed of Iskut river, a large tributary of the Stikine, coming from the southeast.

Mr. Craig entered this region by the way of Bradfield Inlet. He carried a triangulation from the U. S. Coast Survey triangulation up Bradfield river to connect with the boundary peaks. Considerable topographical work also had to be done, since the survey made by the Joint Commission in 1893 was in this region incomplete. Unfortunately many of the photographic plates exposed for the purpose of developing this topography were lost by the upsetting of a canoe in the river during the high water of the latter part of the summer. Every effort was made to recover the plates which were enclosed in stout tin cases, and subsequently a reward was offered for their recovery, but unsuccessfully. The loss affects a part of the topographical survey only, and not the triangulation for the determination of the boundary line.

As above stated, it was found that the line in part falls within the Iskut drainage. It was judged that the line would cross a southerly tributary of that river at a low altitude in a timbered valley.

It was not practicable to reach this part of the line from the Bradfield side, and this year Mr. Craig is on his way up the south branch of the Iskut to complete the survey of that portion of the line. Mr. Bates, one of his assistants, with a small party, will again ascend Bradfield river, to complete the topographical work, including that section of which the plates were lost last year.

The survey of the 49th parallel west of the Rocky Mountains was completed during the season, including the vista cutting, line measurements, topographical work and setting of the permanent monuments, but excepting a part of the triangulation through the Coast range. This is being done this year by Mr. E. T. de Coeli, a member of Mr. J. J. McArthur's staff.

A technical examination of the line tracing and the monuments to ensure accuracy was begun by Mr. Sinclair, of the U. S. Coast and Geodetic Survey, and Mr. N. J. Ogilvie, D.L.S. They completed this inspection from Osoyoos lake to the summit of the Rocky Mountains.

In July and August, in company with Messrs. O. H. Tittmann and C. D. Walcott, the U. S. Commissioners, I engaged in a general inspection of the work.

The re-survey of the 49th parallel east of the Rocky Mountains has been begun. Mr. McArthur, with a party, is working from Coutts eastward, under a tentative agreement with the U. S. Commissioners, whereby the survey is to be made in alternate sections, by each country, of 100 miles.

The re-survey of the boundary line between Quebec and Vermont, the so-called 45th parallel has been completed. This work has been done by a joint party under Mr. G. C. Rainboth, D.L.S., and Mr. J. B. Baylor, of the U. S. Coast and Geodetic Survey. It comprises a re-survey of the line, clearing out the vista, re-setting the old monuments, and placing numerous new ones to meet the needs in that respect, and making a topographical survey, by plane table, of a belt extending one mile on each side of the line.

The re-survey has been begun this spring, under Messrs. Rainboth and Baylor, of the line between Maine and New Brunswick, northward from the source of the St. Croix river.

Owing to the increase in the surveying work, both of the boundary surveys and the Geodetic Survey, the office space in the observatory was found altogether insufficient. It was therefore decided to provide quarters elsewhere for the former, and rooms were rented in the Trafalgar block, at the corner of Bank and Queen streets. These have been occupied during the winter.

Appended hereto will be found the following:—

Appendix 1.—Report by Otto Klotz, LL.D., on seismological and magnetic work.
Appendix 2.—Report by J. S. Plaskett, B.A., on the astrophysical work.

Appendix 3.—Report by R. M. Stewart, M.A., on meridian work and time service.

Appendix 4.—Report on observations for latitude and longitude by J. Macara, Chief Computer.

Appendix 5.—Report of work done in the photographic division.

Appendix 6.—Description of a method for determining, from radial velocity observations, the elements of the orbit of a binary system, with tables by W. F. King, LL.D.

Appendix 7.—Report by C. A. Bigger, D.L.S., on the geodetic survey.

I have the honour to be, sir,

Your obedient servant,

W. F. KING,

Chief Astronomer and Boundary Commissioner.

APPENDIX 1.

REPORT OF THE CHIEF ASTRONOMER, 1908.

SEISMOLOGY, TERRESTRIAL MAGNETISM AND GRAVITY

BY

OTTO KLOTZ, LL.D.

CONTENTS.

ILLUSTRATIONS.

APPENDIX 1.

SEISMOLOGY, TERRESTRIAL MAGNETISM AND GRAVITY, BY OTTO KLOTZ, LL.D.

OTTAWA, ONT., April 1, 1908.

W. F. KING, Esq., B.A., LL.D.,
Chief Astronomer,
Department of the Interior,
Ottawa.

SIR,—I have the honour to submit the following report on the work carried out under my charge:—Seismology, Terrestrial Magnetism and Gravity, for the period July 1, 1907 to March 31, 1908, the latter date being the end of the newly adopted fiscal year.

SEISMOLOGY.

The Bosch photographic seismograph has been in continuous service and has given satisfaction. However, constant vigilance is necessary, as with all instruments when high efficiency is desired.

The source of light for the reflected beam from the small silver mirror at the point of support of the pendulum is from an alternating 104-volt current. As the observatory machine shop is run from the same circuit, the intensity of the light suffers some variation, depending on the running of the machinery. The light itself is from a single filament; the ordinary commercial electric lights with looped filaments are inapplicable as the image can not be condensed to a point or small spot of light on the sensitive paper on which the photographic record of the seismograph is made. It is found necessary to obtain these single filament lights in Germany (from Siemens & Halske), as none are made in Canada or the United States.

It may be interesting to record the following occurrence. Recently some fresh lamps were received of 25 c. p.; they were similar, but not identical with those used for the past two years. The glass tube is of somewhat larger diameter, the single filament is 22·5 cm. long, and the upper end is, as in the former case also, attached to a spiral spring, but of less than half the length of the other and open wound, having six coils. In both cases the return is by an outside thin uncovered twisted copper wire. The images as seen at the box surrounding the cylinder or drum are each about 2 cm. —long straight lines; these are condensed by a cylindrical lens to two small light spots on the photographic paper. When the new light was installed it gave a bright white light. It has been found with all the lamps that although they give a white light at first, in a very few hours it becomes reddish, and then remains fairly constant for weeks. The first day's record was satisfactory with the new light, but on the second day after recording for about five hours normally, both records (of the two pendulum mirrors) suddenly widened from a fine black line to a blurred one about 3 mm. wide, and continued so, with the exception of an hour or so when the usual black line was made. To be able to read the record or have a time-scale, the light is cut off by closing the slit every minute for two seconds. The seismogram had a startling appearance (Plate 1), it looked like a brick wall, the blurring was just about the width of the thread of the screw on the cylinder by which it is moved laterally, thus making the record look solid, with the minute-breaks for mortar. The cause of the trouble was

not at once apparent. A new lamp was installed; it behaved well for a day, and then the same trouble arose. By this time it was evident that the phenomenon was produced by the vibration of the filament. From the above data it will be noticed that the filament of the new lamp is a little longer (2·5 cm.) than that of the old lamp; that it is attached to a shorter spiral spring, and does not pass through a narrow glass neck within the glass tube. The next question was, what sets the filament in vibration? All possible external causes—earth tremors, mechanical disturbances of whatsoever nature—received due consideration and comparison with the record, but were all ruled out of court, so that by the principle of exhaustion and elimination, the electric current itself was left as the disturbing factor. The current, as stated, is an alternating one, with 120 alternations to the second, the variation of which is confined to a few per cent,—less than five. The alternating current passing through the spiral spring (which may be likened to a solenoid) produces a magnetic effect so that the convolutions are alternately attracted and released, that is, the spring opens and closes with each alternation like an accordion or concertina and this action is more or less reciprocated by the filament, especially if its period of vibration is coincident with the number of alternations per second. To assure myself that the position of the outside copper wire, lying along the glass tube, played no part whatever on the phenomenon, I cut it and led away one end straight up and the other straight down, by means of a long covered wire, but without producing any effect. I had the lamps removed to my room, set up on a frame and connected with the electrolier and the current turned on in order to watch the behaviour of the light. For a day or two they resented, apparently, the exposure. I then applied two bar magnets on opposite sides of the middle of the glass tube putting thereby the current in the magnetic field, when one of the filaments went into violent vibrations. The light presented two phenomena in the subsequent experiments, sometimes, but far less frequently, it appeared as a bright spindle; but more generally it had the appearance of a bright ribbon, tapering at both ends, a section of a spindle. When oscillating in this ribbon form, it readily responded to the approach of the magnets and would follow them, the plane of vibration being at right angles to the line between the magnets. This response could be effected too by a single magnet held perpendicular to the filament and 30 or 40 cm. away. The position of rest that the oscillations assumed was not quite indifferent, although not confined to one invariable position. The position assumed seemed dependent upon the plane of the spiral spring, *i.e.*, either in the plane or normal to the plane of the tilt. When withdrawing the magnets, the ribbon light would oscillate bodily, as if on pivots, for a few moments before coming to its position of rest. When both magnets, with opposite poles, were close to or in contact with the glass tube in opposite sides respectively, and kept there, then the oscillations were of the spindle form and not that of a ribbon. A gentle tap of the glass tube would assist in starting the oscillations under the influence of the magnets, and a sharper tap, at times, without the magnets produced the same result, that is, in starting the vibrations of the filament. From the phenomena that have been observed it would appear then that the light begins to vibrate when left to itself when everything is tuned, so to speak, to respond to the inherent note of the filament, that is, the alternations, the spiral spring and filament must be in unison. The behaviour of the light under the influence of the magnets is a very pretty phenomenon.

Attention may be drawn to another point of the record of the oscillation. It is well known that with photographic records of earthquakes as the amplitude increases the records become fainter and fainter, due to the rapidly moving light spot, until no record is seen save faint spots at the turning points of the forward and backward swing of the light spot, there being a momentary rest at the turning point and hence the photographic effect. For this same reason the edge or range of these very rapid oscillations, that have been under discussion above, will be photographed more intensely, and the edge or margin will appear darker as is seen in the diagram (Plate 1). It is

needless to say that the lamps that are responsive to the alternations are useless for recording purposes. The cure is new and shorter lamps.

One of the prime requisities in the study of seismograms is a thoroughly accurate time-scale, besides having the scale of such ratio that time may be read to individual seconds, this latter may be done when the scale is 15 millimetres to the minute, as is provided on many of the modern instruments. But with reference to the time itself, there is room for considerable improvement. It is unnecessarily burdening the difficult problems of seismology when the utmost confidence can not be placed on the time record. The studies of seismic disturbances have now advanced to that stage that an accuracy to a second is demanded. The most satisfactory arrangement is to have the time-recording mechanism of the seismogram in electric circuit with a standard mean time clock, itself under control by a master clock, as is the case with our instrument; there should then never be any correction of the magnitude of a second to the seismogram. Time records which only indicate the hours, obviously no longer meet the requirements of investigations of the present day.

Another point about time records that is not yet universally satisfactory is the want of co-ordination with reference to Greenwich, the prime meridian for international time. All records should be expressed in standard time, and not in local time, that is, the time adopted for the time scale of the seismogram in every country should differ from Greenwich time an even hour or hours. This avoids confusion not to say annoyance in the inter-comparison of records.

Various writers on seismology have made reference to the observations made by F. Napier Denison at Victoria, B.C., the results of which were published in the Quarterly Journal of the Royal Meteorological Society No. 120, October, 1901, under the title 'The Seismograph as a Sensitive Barometer.' The Milne horizontal pendulum there is mounted, p. 293, 'upon a concrete pier rising from the water's edge.' Let it be noted here that the water's edge is that of Victoria harbour, subject to the influence of the tides to be noted hereafter. Mr. Denison had, p. 294, 'frequently found that in the course of twenty-four hours the boom would swing off the photographic paper, and to bring it into its proper position it was necessary to alter the levelling adjustment.' To study the phenomenon 'wanderings of the boom' accurate measurements were made of the position of the boom, and tri-daily observations of the barometer, also tri-daily records of the direction and velocity of the wind and precipitation were made. From them, p. 295, 'it was found that the diurnal change was most pronounced during periods of high barometric pressure, as is usual during the summer months, while shortly before the passage of areas of low pressure across the province from the Pacific, the diurnal change would be completely masked by the steady easterly movement of the boom. These plottings were then studied in conjunction with our bi-daily synoptic weather charts for the corresponding period. From this comparison the following results have been deduced:—That when the barometric pressure is high over the Pacific slope from British Columbia to California, while off the Pacific coast the barometer is comparatively low, the horizontal pendulum tends to move towards the eastward. This movement appears to be due to distortion of the earth's surface, caused by the heavier air over the Pacific slope depressing the underlying land-surface below its normal position, while, on the other hand, the comparatively light air over the adjacent ocean tends to allow the sea and earth beneath to rise above its normal level; hence a horizontal pendulum as delicately poised as the one under discussion will, under these conditions, swing towards the region of greatest terrestrial depression, provided it be free to move in that direction. This theory of the earth's distortion under unequal atmospheric pressures is borne out when cases during these three months are taken, when the barometer is high over the ocean and a trough of low pressure covers the Pacific slope and Rocky Mountains, then the boom is found to travel towards the westward and continue to do so until a change in the distribution of air pressure occurred.' It will be observed that the investigations that Denison carried

out were in connection with the tilting and not with vibrations of the earth's surface; tilting caused by an unequal pressure or weighting of the surface. In the whole of the paper not a word is said about the effect of tides, although the instrument is within stone's-throw of the tide line. Further on we read, p. 297: 'It has been found that when an extensive storm area is approaching from the westward, and often 18 or 24 hours before the local barometer begins to fall, the pendulum swings steadily to the eastward, completely masking any diurnal fluctuations that might have existed, as the storm area approaches; and in the event of it being followed by an important high area, the pendulum will begin to swing towards the westward before it is possible to ascertain this area's position on the current Weather Charts. The principle already stated, that areas of heavy and light air cause a distortion of the earth's surface under which they prevail, is proved conclusively by types similar to the above illustration.'

With reference to the effect of the moon upon the solid crust of the earth we may refer to Sir G. H. Darwin*: 'The various effects which the moon may exercise on a pendulum are very complex. First, as regards simplicity, is the effect of the force to which the oceanic tides are due. If the earth were absolutely stiff and unyielding, this tide-generating force would produce a periodic oscillation of the pendulum of an amplitude which can be calculated with a close degree of approximation. That amplitude is so small that the measurement of it, even by the most delicate instruments, is a matter of the greatest difficulty. But in the second place the moon's tide-generating force acts not only on the pendulum, but also on the earth; and as the earth cannot be, as a whole, absolutely stiff, it must yield to the force. If it yielded as freely as water, the earth's surface would necessarily be perpendicular to the pendulum, and the pendulum would remain at rest. But it does not yield with perfect freedom, and therefore, in as far as it yields, its movement imparts to the pendulum an apparent deflection which tends to mask the true deflection due to tide-generating force. Lastly, at places within a few hundred miles of the sea, the varying load of the oceanic tide must produce a deflection of a pendulum, which is partly real and partly apparent. The real portion is almost certainly by far the smaller; it is due to the direct attraction of the sea, which will vary in intensity with the alternations of high and low water. The apparent portion is due to the warping of the superficial strata by the varying load of the tide, the slope being towards the sea at high water, and away from it at low water.'

Victoria lies at the eastern end of the straits of Juan de Fuca, which have an average width of about 15 miles, and is distant from the broad waters of the Pacific ocean about 70 miles. The Spring tides at Victoria vary between 7 and 10 feet, while the Neaps vary between 5 and 8 feet. On the other hand the barometric variations during the year lie within a range of 1·5 inches. The work of Denison shows undoubted care and considerable labour in making the many measurements, but it is questionable whether his results warrant the conclusions arrived at. The writer undoubtedly believes that change of atmospheric pressure can be read by a sensitive seismograph, but at the same time has very grave doubts as to the interpretation of the 'wanderings of the boom.' The point under discussion does not refer to pulsations or oscillations in the earth's crust, but to the bending of the same under varying loads, thereby causing a change in position of the pendulum zero. For an observing station on the sea-coast where the tide ebbs and flows, and the rise and fall is measured in feet, it is obviously wanting in completeness of investigation to ignore the effect caused by the loading and unloading of the coast line and sea bottom by the tides and deal only with the changing atmospheric pressure. Atmospheric pressure is equivalent to about fifteen pounds per square inch when the barometer stands at thirty inches, *i.e.*, for a fall of one inch in the barometer the atmospheric pressure is reduced by half a pound. Now a fall of one inch (25 mm.) is not a very common occurrence within 24 hours, yet during that time the immediate

* Seismology: Milne p. 263.

coast and sea-bottom have been loaded once or twice with a wedge of water, having a base of several feet in height. This tidal load may be compared to an area of high barometer. The specific gravity of sea-water is about 64 lbs. to the cubic foot, and hence the pressure per square inch of a column one foot high is slightly over half a pound, *i.e.,* it is fully as much as produced by a change of atmospheric pressure indicated by a fall of one inch of the barometer at sea-level. Now the amount of bending of the earth's crust is dependent not only upon a difference of pressure, but also upon the gradient, in other words, upon the relative position of the isobars. Examining our Weather Maps, it will be found that isobars differing by one-tenth inch and at distances apart of 150 miles are considered to give pretty steep gradients, so that to give a difference of one inch the barometric 'high' will cover an area 3,000 miles in diameter; or we may say that the distance between an area of high and one of low barometer, differing by one inch in pressure, will be approximately 1,500 miles. Even disregarding the tides at Victoria itself, which are on an average 8 feet, *i.e.,* considering the straits of Juan de Fuca as land, we cannot get away from the fact that at a distance of 70 miles, less than half the distance we have assumed for a steep gradient between isobars differing by one-tenth inch barometric pressure, we have the broad waters of the Pacific loading and unloading the continental coast and the sea-bottom with a volume of water, that may be safely assumed as being two feet in depth. It must be obvious, that as far as the bending of the earth's crust is concerned, the latter is subject to greater stresses in the vicinity and along continental coast lines by virtue of the rise and fall of the tides than through variations in atmospheric pressure. And hence to study for a coast station the bending of the earth's surface due to difference of atmospheric pressure without taking into consideration the tidal effect, would necessarily seem to lead to conclusions based on inadequate data. It may be observed that as the Milne pendulum is mounted north-south, and the co-tidal lines of the North Pacific along the American continent have a general north-south direction, the pendulum will thereby receive its maximum effect, as the 'wanderings of the boom' are east and west. Another point may be referred to, and that is the effect of variation of barometric pressure upon the water, upon the tides. A high barometer will decrease the height of the tide, and the effect may be taken at about one inch of the mercury column to one foot of water. Hence the combined effect of barometric and tidal pressures may in one case increase and in another decrease the bending effect of either.

As there is as yet little definitely known about the relationship between atmospheric pressure and the zero position of a horizontal pendulum, and furthermore there is a divergence of opinion among those who have occupied themselves with the subject, it was considered that in the interest of the important question involved, the weak points in the Victoria investigation should be referred to.

The graph which Denison constructs from measurements of the 'wanderings of the boom' for the year 1899, he studies by 'carefully examining the Victoria bi-daily Weather Charts, which cover the above-mentioned land area, and also the monthly charts of normal barometric pressure published in the Summary of the International Meteorological Observations from 1878 to 1887 (Washington). Referring to the Victoria Weather Charts for January, 1899, we find an abnormal amount of high barometric pressure prevailing over the Pacific slope from northern British Columbia southward to California, while off the coast at this latitude the normal winter low pressure remained constant. The combined influence of the heavier air over the Pacific slope and diminished pressure over the ocean probably caused the abnormal easterly movement of the pendulum during this month.'—In the first place, referring to the above quotation it is not at all clear what the normal barometric pressure for the period 1878 to 1887 has to do with the barometric pressures for 1899, the ones to which the pendulum movements are supposedly due. It is a question of cause and effect; what the pressures were in any other year than 1899 can not move the boom in 1899. In the next place, the statement that in January 'an abnormal amount of

high barometric pressure prevailed over the Pacific slope' does not appear quite accordant with the data in the 'Report of the Meteorological Service of Canada' for 1899. In that report there are four stations given for the Pacific coast in British Columbia from latitude 54° 34′ to 48° 24′, viz.: Port Simpson, Rivers Inlet, Carmanah and Victoria, for which the monthly mean, maximum and minimum pressures are given. It is found that in every case the monthly mean for January is not greater than the annual mean, so that the 'abnormal amount of high barometric pressure' is not apparent. The following are the figures taken from the report:—

	Mean for Jan.	Mean for year.
	Inches.	Inches.
Port Simpson	29·76	29·81
Rivers Inlet	29·89	29·95
Carmanah	29·79	29·82
Victoria	29·94	29·94

Data for the Pacific coast south in the United States are at the moment not available. It may be observed that as the pendulum is mounted north and south, areas of high and low barometer must lie east and west of each other to affect the pendulum materially, for the zero position of the pendulum would not be sensibly affected were those areas north and south respectively, of the station. From the preceding short presentation it would appear, therefore, that the conclusions arrived at by the investigation of Denison at Victoria in 1899 must be taken with reserve. It is not denied that the fact may be established that the 'Seismograph is a sensitive barometer,' but if such a conclusion is arrived at by observations at a station on the sea-coast, the effect of the tides as well as the weighting or loading effect influenced by coastal configuration of the change of level of the water due to difference of atmospheric pressure must enter into consideration.

Earthquakes Recorded.

The official year began with an earthquake in the forenoon of July 1, 1907. The seismogram gives the following data:—

(Time is expressed in Greenwich Mean Time, counting from midnight to midnight, the hours, *i.e.*, from 0^h to 24^h.)

	N. S. Component.			E. W. Component.		
	h	m	s	h	m	s
First preliminary tremors began	13	15	49	13	15	49
Second preliminary tremors began	13	18	14	13	18	38
Principal portion began	13	21	08	13	21	14
Duration of earthquake		59	00	1	02	00
Maximum amplitude		4^{mm}			4^{mm}	
Period of pendulums		$5^s{\cdot}7$			$5^s{\cdot}7$	
Magnification		120			120	

This quake was neither preceded nor succeeded by any earth tremors, the trace of light point being a perfectly straight line up to the time of the arrival of the preliminary tremors, which gave a greater (4mm) amplitude to the N. S. component than to the E. W. Component (2·5mm). The former showed two maxima markedly, while the latter showed only one. The beginning of the second preliminary tremors is somewhat uncertain on account of the occurrence of two, if not three, distinct minima for the N. S. component. The amplitudes for the phase of the second preliminary tremors is for each pendulum only about one-half that for the first preliminary, which is rather the reverse of what usually obtains.

For the 'principal portion' the amplitudes for the E. W. component are somewhat greater than for the N. S., the former being 4mm, the latter 3mm. In the latter part of the principal portion the superposition of the harmonic motion of the pendulum and of the periods of the earth's particles in the quake motion is well shown, (Plate 1). The waves of the principal portion have a period of 20s. Judging the earthquake by the amplitude, the shock was greater than that recorded by the destructive Kingston earthquake. The distance from the epicentre was estimated at about 3,500km. It may be remarked that a circle described with a radius a little greater—say 3,800km—will pass through Iceland, Azores, the Windward Islands of the West Indies, will skirt Central America, Mexico on the Pacific side and pass through and along the west of California. On this arc of over three-quarters of a circle, we find many seismic areas, so that even when we can interpolate the distance from a single seismogram accurately, when it happens to be near the above distance it is more difficult to suggest the locality than when the distance is such that confines the probable place to a single known seismic area.

The next earthquake record was on the morning of August 8, 1907. The earth began to show unrest from 10 p.m. on August 6, and set up the characteristic 'saw-tooth' tremors which continued until relieved or neutralized by the small quake thirty hours afterwards. In this case the cause or origin of the earth tremors seems very clear, for the barogram (20cm equals a week) for that week shows a zigzag line, (range 1mm) beginning shortly after 10 p.m. of August 6, dropping from 756mm to 753mm in 15 hours, and then rising with less fluctuation to 760mm in 18 hours, whereafter the pressure remained fairly constant for the following day. There does not seem to be any doubt that the barogram and seismogram are records of the same phenomenon, the former showing directly the rapidly varying atmospheric pressure, while the latter showed the effect of that varying pressure in causing pulsations to be set up in the crust of the earth. When the barogram shows rapid fluctuations we can frequently find the effect on the seismogram, although there are exceptions, notably in the twelve hours forenoon of April 30, last, when the barogram showed some twenty fluctuations in that time, and just before noon dropped suddenly over 2mm, yet the seismogram showed no disturbance. It is perhaps correct to assume that the earth's crust has for any given area an inherent period of vibration, and when the rapid fluctuations of atmospheric pressure synchronize with the former, or the period of one is a multiple of a period of the other, then will the oscillation of the surface of the earth be more marked than would otherwise be the case.

For the above quake the amplitudes of the first preliminary tremors were about the same as those of July 1, and relatively too for the two pendulums, but the whole quake only lasted about 15 minutes, followed by small earth-tremors, smaller in amplitude than those which preceded the quake, for several hours until quiet was restored. The following are the data:—

	N. S. Component.			E. W. Component.		
	h	m	s	h	m	s
First preliminary tremors began	9	23	20*	9	23	18*
Second preliminary tremors began	9	25	12	9	25	14
Principal portion	9	25	56	9	25	52
Duration of earthquake		11	00		12	00
Maximum amplitude			3mm			1·6mm
Period of pendulums			5s·7			5s·7
Magnification			120			120

*Greenwich Mean Time.

Then followed the quake at noon of August 17. Before the quake, minute earth tremors, ·2mm amplitude, for some hours manifested themselves. When the earth

is in a state of unrest it is not always easy to recognize the beginning of the first preliminary tremors, when the impulse was either not great to begin with, or when the epicentre is very distant. The present one is a case in point.

	N. S. Component.			E. W. Component.		
	h	m	s	h	m	s
First preliminary tremors began	17	38	07*	17	38	07*
Second preliminary tremors began	—	—	—	—	—	—
Principal portion began	17	47	06	17	47	05
Duration of earthquake		47	00		50	00
Maximum amplitude			1mm			1·6mm
Period of pendulums			5s.7			5s.7
Magnification			120			120

*Greenwich Mean Time.

The Press reported a despatch from Laibach, Austria, 'A violent distant earthquake was recorded at the observatory here on Saturday night, beginning 6h 38m, and lasting 50 minutes.' The time would be equivalent to 5h 38m p.m. Greenwich time, or as is generally expressed, 17h 38m G.M.T., so that the record seems to be of the same earthquake.

On the afternoon of August 22, 1907, the seismogram showed the occurrence of an earthquake. For hours before, the earth had been almost perfectly quiescent. The records of the first impulse by the two pendulums are fair reciproeals of each other. While the N. S. component showed a maximum amplitude of 1·7mm at the beginning and then decreased, the E. W. component did the reverse, within 40 seconds, amplitude 2·2mm.

The data are:—

	N. S. Component.			E. W. Component.		
	h	m	s	h	m	s
First preliminary tremors began	22	41	00*	22	40	56*
Second preliminary tremors began	—	—	—	—	—	—
Principal portion	22	52	00	22	52	04
Duration of earthquake		26	00		31	00
Maximum amplitude			1·7mm			2·2mm
Period of pendulums			5s.7			5s.7
Magnification			120			120

*Greenwich Mean Time.

The second preliminary tremor was not clearly recognizable as such and hence no time is given therefor.

One of the best seismograms yet obtained here was that of the earthquake of September 2, 1907, as shown on the accompanying copy (plate 5). The data are:—

	N. S. Component.			E. W. Component.		
	h	m	s	h	m	s
First preliminary tremors began	16	12	19*	16	12	18*
Second preliminary tremors began	16	21	28	16	21	12
Principal portion	16	28	32?	16	28	36?
Duration of earthquake	2	55	00	3	00	00
Maximum amplitude			15mm			13mm
Period of pendulums			5s.7			5s.7
Magnification			120			120

*Greenwich Mean Time.

At 16h 35m both pendulums begin slow oscillations with large amplitudes, about 10mm, and period of approximately 24 seconds, these continue with more or less regularity, with, however, constant diminution of period, for about half an hour, when the period is approximately 13 seconds. It will be observed that the intervals between the 1st P. T. and the 2nd P. T., and the P. P. are not in the ratio fairly well known for distant earthquakes; the interval between the 2nd P. T. and the P. P. being too small. The record between 16h 28m and 16h 35m undoubtedly shows undulatory waves of a period of fully 40 seconds, which after 16h 35m, no longer show the undulatory characteristic, but simply of pulsatory waves of long period as already indicated above. Attention may be drawn to another feature of the diagram, and that is, to several distinct pulsations for both pendulums between the 1st and 2nd P. T. (preliminary tremors). Some seismologists explain this phenomenon as being produced by reflection at the earth's surface of the longitudinal wave, once or more times. The explanation is plausible, but far from obvious. It may be due too to the fact that the earthquake or debacle at the hypocentre is not one crash, but there may be several, following each other at short intervals, at such intervals, that for distant stations their impulses may arrive before the arrival of the transverse waves or second preliminary tremors, in which case their records would be readily identified on the seismogram.

On September 23, in the afternoon, a well-marked earthquake was recorded. With most earthquakes, or more specifically, their seismograms, the most readily recognizable feature is the arrival of the first preliminary tremors, especially if the earth has been in a state of rest and no earth tremors immediately precede the quake. On the above date, the earth showed no signs of unrest, the seismograph was recording straight lines, yet the beginning of the 1st P. T. shows no easily distinguishable offset, but instead the merest departure, this latter is particularly the case for the E. W. component, which throughout shows a smaller amplitude, from which one might infer that the epicentre had a more southerly than easterly or westerly direction from here. I advisedly say southerly instead of 'southerly or northerly' as the archaean country to the north of us, is, as far as known, free from earthquakes. The period of the principal portion of the maximum amplitude is for both pendulums 9s, which in a few minutes later diminished to 7s. The following are the data:—

	N. S. Component.			E. W. Component.		
	h	m	s	h	m	s
First preliminary tremors began	21	51	09*	21	51	09
Second preliminary tremors began	21	57	30	21	57	36
Principal portion	—	—	—	—	—	—
Duration of earthquake		50	00		50	00
Maximum amplitude		15mm			12mm	
Period of pendulums		5s.7			5s.7	
Magnification		120			120	

*Greenwich Mean Time.

On the forenoon of October 16, 1907, a severe earthquake was recorded. The behaviour of the two pendulums was decidedly different for the first preliminary tremors. In the first place, it may be noted that preceding the quake the earth showed but very minute earth tremors, so that the arrival of the 1st P. T. could scarcely be obscured by them, as sometimes happens. While the E. W. component shows a decided abrupt amplitude for the first impulse, and a period of 5s·7, which is the period too of the pendulum, the N. S. component shows but very minute oscillations of about 3s·3 period, and these persist for nearly six minutes with slightly increasing distinctness, until a change in their character supervenes. These minute oscillations, of about half the period of the pendulum for the N. S. component, can be seen too here and there in the seismogram for hours before the quake, and which are recognized as 'earth

tremors.' The earth tremors on the E. W. component are never shown to be of such short period, but are always practically the period of the pendulum. After the beginning the E. W. component oscillates fairly regularly, period 5s·7 with varying amplitudes up to 6mm. until 14h 10m 14s G.M.T., when wave interference takes place. This wave interference takes place on the other, N. S., component a minute earlier, at 14h 09m 12s G.M.T. Henceforth the regularity of the oscillations for both components is more or less interrupted, until at 14h 15m both pendulums start such wide oscillations that with a somewhat weak light the photographic record is no longer continuous. This condition obtains for about seven minutes, when again the amplitudes are fully recorded. Although for the first preliminary tremors the N. S. component seemed less responsive to the waves than the E. W. one, yet when the principal portion sets in, and onward to the end of the quake, its amplitude is fully as large as that of the other for the corresponding time. The following are the data:—

	N. S. Component.			E. W. Component.		
	h	m	s	h	m	s
First preliminary tremors began	14	04	00?*	14	03	50*
Second preliminary tremors began	14	09	12	14	10	14
Principal portion	14	14	40	14	14	44
Duration of earthquake	2	00	00	2	00	00
Maximum amplitude			24mm			24mm
Period of pendulums			5s·7			5s·7
Magnification			120			120

*Greenwich Mean Time.

As this severe earthquake was not recorded by the Press it must have occurred either in the ocean or in uninhabited parts. The distance estimated, 4,800km, about 3,000 miles, would appear to make the disturbed area near the boundary line between Colombia and Ecuador.

A few days later, about midnight of Sunday, October 20-21, 1907, occurred another marked earthquake. The earth had been in a state of unrest and tension since Saturday, as shown by the earth tremors recorded by the seismograph, and which made it difficult to determine, at least for the E. W. component, the accurate time of arrival of the first preliminary tremors. The seismogram immediately showed that we were dealing with a very distant disturbance. It is generally found that the greatest amplitude is attained after the arrival of the long period surface waves, when the pendulum no longer retains its theoretical position of a steady point, but is set oscillating. In this case we have the maximum amplitude 10mm for N. S., 5mm for E. W. component, occurring immediately after the arrival of the second preliminary tremors, which are well marked, more so than the beginning of the succeeding long period surface waves. Comparing the earth tremors for several hours preceding the quake with those several hours afterwards, it is found that there is practically no difference.

An earthquake is always a neutralizing of the stresses set up in the earth, a restoration towards a state of equilibrium, and hence in the epicentral area we should expect no earth tremors, as far as they are not due to barometric or atmospheric variations. However, distant earthquakes could scarcely affect local stresses, not due to external causes, and hence earth tremors are recorded after as well as before the quake as in the above case. The following are the data:—

	N. S. Component.			E. W. Component.		
	h	m	s	h	m	s
First preliminary tremors began	4	37	00?*	4	37	00
Second preliminary tremors began	4	47	24	4	47	24
Principal portion	4	57	28?	5	00	16?

Duration of earthquake	1 25 00	1 25 00
Maximum amplitude	3mm	2mm
Period of pendulums	5s·7	5s·7
Magnification	120	120

*Greenwich Mean Time.

It is to be observed that the above tabulated maximum amplitude refers as heretofore to the principal portion or surface waves. As has already been noted in this particular quake the amplitudes of the transverse waves, 2nd preliminary tremors, are the greatest.

It was estimated that this quake was distant at least 9,000km. Press despatches the following day brought the news of a most disastrous earthquake in central Asia near Samarkand, of which we in Ottawa here had such a complete record. Not only was the earthquake very destructive as far as buildings are concerned, but hundreds of lives were sacrificed too.

In the early hours of December 30, 1907, a severe earthquake was recorded, making a particularly fine seismogram. The earth had been almost wholly free from earth tremors preceding the quake, so that there was no interference phenomenon, and the arrival of the first preliminary tremors is well marked. From the intervals to the second preliminary tremors and the beginning of the principal portion the distance to the epicentre was found to be 4,000km. The quake lasted for nearly two hours. The following are the data:—

	N. S. Component.			E. W. Component.			
	h	m	s	h	m	s	
First preliminary tremors began	5	33	48*	5	33	48*	
Reflection	5	35	08	5	35	10	
Second preliminary tremors began	5	39	24	5	39	20	
Principal portion	5	43	40†	5	44	00†	
Maximum portion 11·5mm	5	50	00†	5	47	40†	15·5mm
Duration of earthquake	1	40	00	1	40	00	
Maximum amplitude		12mm			16mm		
Period of pendulums		6s·3			6s·3		
Magnification		120			120		

*Greenwich Mean Time. †About.

Such clear and good records of an earthquake as the above seismogram when compared with similar ones from other and distant stations, will contribute much to the proper interpretation of the wave impulses.

A slight earthquake was recorded on the evening of February 1, 1908. It was at the time that the peculiar phenomenon of vibrations of the single filament of the electric light was experienced, so that the record is very blurred and difficult to read. The first preliminary tremors for both components arrived apparently at 23h 25m 20s G.M.T. The maximum amplitude was 6mm, and the quake lasted for 45 minutes.

During the night of February 8-9, two small earthquakes manifested themselves distinctly, but being of small intensity combined with the earth tremors that were present, it is somewhat difficult to recognize the various phases. With some uncertainty the following are the readings:—

	N. S. Component.			E. W. Component.		
	h	m	s	h	m	s
First preliminary tremors began	3	28	12*	3	28	18*
Second preliminary tremors began		?		3	32	18

Principal portion	3	34	48	3	35	00
Duration of earthquake		35	00		38	00
Maximum amplitude			2mm			3mm

*Greenwich Mean Time.

There is a distinct oscillation lasting about 40s and beginning at 3h 23m 28s G.M.T. for the N. S. component, but the E. W. component shows absolutely no corresponding disturbance.

For the other and smaller quake we have:—

	N. S. Component.			E. W. Component.		
	h	m	s	h	m	s
First preliminary tremors began	9	15	08*	9	19	36*
Second preliminary tremors began	—	—	—	—	—	—
Principal portion	9	28	40	9	26	30
Duration of earthquake		16	00		23	00
Maximum amplitude			1mm			1·5mm
Period of pendulums			5s·7			6s·3
Magnification			120			120

*Greenwich Mean Time.

The record for E. W. component is far better than that for the other, being sharper, hence discrepancy in reading the times.

Two days afterwards another slight quake was recorded. The first preliminary tremors arrived at 13h 09m 48s G.M.T. (February 11), the maximum amplitude being only 1mm, and the quake lasted about 16 minutes.

On February 14 two earthquakes were recorded; the data are as follows:—

	N. S. Component.			E. W. Component.		
	h	m	s	h	m	s
First preliminary tremors began	9	01	04*	9	01	20*
Second preliminary tremors began	9	08	20	9	08	18
Principal portion	9	14	00?	9	14	00?
Duration of earthquake		40	00		40	00
Maximum amplitude			4mm†			5mm†
Period of pendulums			5s·7			6s·3
Magnification			120			120

*Greenwich Mean Time. †At 9h 08m 30s.

For the other quake:—

	N. S. Component.			E. W. Component.		
	h	m	s	h	m	s
First preliminary tremors began	11	44	28*	11	44	00?*
Second preliminary tremors began	11	47	08	11	47	14
Principal portion	11	48	08?	11	48	28?
Duration of earthquake		16	00?		16	00?
Maximum amplitude			3·5mm			3·5mm

*Greenwich Mean Time.

From the time intervals of the different phases for each earthquake, it appears that they did not emanate from the same hypocentre, that for the latter being very much nearer than for the former. Subsequent, rather vague, press reports announced earth-

quake shocks about this time in the Azores, but the distance to the latter, being about the mean of the two deduced for the above, almost precludes a connection between the seismograms and the disturbances in those islands.

On March 3, 1908, the record showed the earth to be fairly quiescent, with the exception of a slight, yet well marked disturbance in the evening, lasting about 10 minutes. The nature of it makes it somewhat uncertain whether it was a slight earthquake or only a passing earth tremor, although the barogram gives no evidence of the latter. The disturbance began at 11h 48m and had an amplitude of 1·5mm.

On the following day, in the evening, a slight but distinct earthquake was recorded, especially by the E. W. component. As the disturbance was of small intensity, it is impossible to separate clearly the various phases. The following are the notes of the reading of the seismogram:—For the N. S. component we find as beginning, a faint trace at 2h 43m 24s (G.M.T. March 5), a distinct 'kick' at 2h 43m 35s, a slight disturbance between 2h 45m and 2h 45m 18s, a slight wave at 3h 25m; from 3h 26m to 3h 27m 14s three distinct waves, period 24s; last faint trace of undulating line at 3h 38m, period 20s?. For the E. W. component the beginning is shown by a faint trace at 2h 36m 48s G.M.T.; it will be noticed that this is about 7 minutes earlier than recognized on the other component. The oscillations then recorded have a period of about 7 seconds and have the appearance of earth tremors. Between 2h 55m and 2h 56m there are slight irregularities, and between 2h 58m and 3h 03m well-marked oscillations of about 7 seconds period. From 3h 20m to 3h 28m begin long waves of 24 seconds period; shorter waves of 20 seconds period appear between 3h 40m and 3h 50m. End of quake was about 4h. Amplitude was 1mm. As already indicated the N. S. component scarcely responded to the disturbance. From a press despatch the following day from the seismological station at the Isle of Wight, where a 'very big earthquake' was recorded, beginning at 2h 30m, it would appear that the above is a record of the same phenomenon, and as the Isle of Wight record very materially (16 minutes by press report) precedes the one here, it is inferred that the epicentre must have been nearer to and east of the English station.

About 12 hours after the above, another small disturbance took place, which affected the two pendulums about equally. It does not show any characteristic of an earthquake by first and second preliminary tremors or principal portion, yet it is a very distinct disturbance, the record otherwise showing quiescence. It began at 14h 46m G.M.T. (March 5) and continued for 16 minutes, giving an amplitude of 1mm.

EARTHQUAKES RECORDED BY THE BOSCH PHOTOGRAPHIC SEISMOGRAPH AT OTTAWA, CANADA.

Date.	Component N.—S. or E.—W.	Greenwich mean time. First preliminary tremors began.	Second preliminary tremors began.	Principal portion began.	Duration of earthquake.	Maximum double amplitude.	Magnification of record.	Period of pendulum.
1907.	—	h. m. s.	h. m. s.	h. m. s.	h. m.	mm.	—	s.
July 1	N.—S.	13 15 49	13 18 14	13 21 08	59	4	120	5·7
	E.—W.	15 49	18 38	21 14	1 02	4	120	5·7
Aug. 8	N.—S.	9 23 20	9 25 12	9 25 56	0 11	3	120	5·7
	E.—W.	23 18	25 14	25 52	0 12	1·6	120	5·7
" 17	N.—S.	17 38 07	.....	17 47 06	0 47	1	120	5·7
	E.—W.	38 07	.....	47 05	0 50	1·6	120	5·7
" 22	N.—S.	22 41 00	.....	22 52 00	0 26	1·7	120	5·7
	E.—W.	40 56	.....	52 04	0 31	2·2	120	5·7
Sept. 2	N.—S.	16 12 19	16 21 28	16 28 32?	2 55	15	120	5·7
	E.—W.	12 18	21 12	28 36?	3 00	13	120	5·7
" 23	N.—S.	21 51 09	21 57 30	... .	0 50	15	120	5·7
	E.—W.	51 09	57 36	.....	0 50	12	120	5·7
Oct. 16	N.—S.	14 04 00?	14 09 12	14 14 40	2 00	24	120	5·7
	E.—W.	03 50	10 14	14 44	2 00	24	120	5·7
" 21	N.—S.	4 37 00	4 47 24	4 57 28?	1 25	3	120	5·7
	E.—W.	4 37 00?	4 47 24	5 00 16?	1 25	2	120	5·7
Dec. 30	N.—S.	5 33 48	5 39 24	5 43 40*	1 40	12	120	6·3
	E.—W.	33 48	39 20	44 00*	1 40	16	120	6·3
1908.								
Feb. 9	N.—S.	3 28 12	?	3 34 48	0 35	2	120	5·7
	E.—W.	28 18	32 18	35 00	0 38	3	120	6·3
" 9	N.—S.	9 15 08	.....	9 28 40	0 16	1	120	5·7
	E.—W.	19 36	.....	26 30	0 23	1·5	120	6·3
" 14	N.—S.	9 01 04	9 08 20	9 14 00?	0 40	4	120	5·7
	E.—W.	1 20	8 18	14 00?	0 40	5	120	6·3
" 14	N.—S.	11 44 28	11 47 08	11 48 08?	0 16?	3·5	120	5·7
	E.—W.	44 00?	47 14	48 28?	0 16?	3·5	120	6·3

*About.

Microseisms.

By this designation are included all pulsations not directly attributable to what are generally known as earthquakes, that is, of abrupt, more or less violent, and momentary movements of the earth's crust, the effect of which may, however, continue for some hours. Attempts have been made to classify these microseisms according to their cause, but so far without complete success. During the past year the writer has paid considerable attention to these disturbances, and in doing so has studied and compared the daily seismograms with our weekly aneroid barograms and also with the daily weather maps, which give the isobars at 8 a.m. for Canada and the United States, roughly between latitudes 25° and 55°, and the Atlantic and Pacific oceans. The

average time of the beginning of the seismogram sheet is about 10 a.m., so that the above isobars and gradients dependent upon them are for a time preceding the former by two hours. From the examination of the local barogram alone, not much information can be gathered as to the behaviour of the seismograph except when very rapid and marked fluctuations, say of a millimetre or more, take place in the pressure, comparable with the 'pumping' of a mercurial barometer at sea. The barometer may show little or no change in pressure at a given place, yet areas of high and low (barometer) may be rushing along to the north and south of it, setting up vibrations or pulsations of the earth's surface that may be markedly felt at the given place by the seismograph. Similarly from a large rise or fall of the barometer during 24 hours at a given place alone, we can draw no gradients to determine the atmospheric movements; the position of the isobars, and highs and lows being unknown. We have simply the record of the vertical movement of pressure at one point. In the following table are given the microseisms, although not when showing merely the faintest trace here and there, recorded between July 1, 1907, the close of the last annual report, to March 31, 1908, the close of the newly adopted fiscal year; also the state of the barometer for the respective day taken from the weekly barogram sheet of an aneroid; and lastly the position of the areas of 'high' and 'low' barometer at 8 a.m. of the respective day, taken from the daily weather maps covering Canada and the United States. The isobars are drawn at intervals of a tenth of an inch. The normal to the isobars is called the gradient, and when spoken of, generally refers to the gradient between a low and high passing through Ottawa. The maximum absolute amplitude of the microseism is expressed in microns (μ). It is to be noted that the beginning of each seismogram is about 10 a.m., that is, two hours after the time of the isobars of the weather maps.

The object of the tabulation is to show various phenomena of the same time, and trace if possible any connection or relationship between them. The word gulf refers to the Gulf of St. Lawrence. It may be observed that St. Johns is in Newfoundland and St. John in New Brunswick, as both places are referred to. For purposes of orientation of highs and lows, a blank weather map, plate 2, accompanies this report, in order that places referred to in the following tables may be readily identified. 'Steep gradient' signifies a difference of pressure of one-tenth inch in 150 miles or less. The other terms used under the column 'gradient' are based on the preceding scale.

Date.	Microseisms.	Barometer in mm.	High and Low areas.	Gradients.
1907.				
July 9	First since July 1....	Nearly constant	Low, 29·5, lower St. Lawrence.	Not steep.
" 29	Marked, 8μ...	Practically constant 750..	Low, 29·6, Gulf; low, 29·7, Abitibi, high 30·1, Denver	Long.
" 30	Marked, decreasing 11μ	Practically constant 750..	Low, 29·8, St. Lawrence; high, 30·1, Kansas and Bermuda.	Very long.
" 31	Marked, 13μ....	Practically constant 750..	Low, 29·7, Montreal; high, 30·2, Wyoming and Bermuda.	Very long.
Aug. 14	Very minute	Gradually rising..... ..	Low, 29·5, Gulf; high, 30·4, Sault Ste. Marie.	Fairly steep.
" 16	Small, 4μ.	Gradually falling.	Low, 29·5, Port Arthur; high, 30·3 off Nantucket.	Fairly steep.
" 29	Small....	Constant 756.....	Low, 29·6, Gulf; high, 30·0, Detroit.	Not steep.
" 30	Small, 4μ..	Slightly rising....	Low, 29·7, Gulf; high, 30·0, Port Arthur.	Not steep.
" 31	Well marked, 13μ. ..	Nearly constant 758.....	Low, 29·8, Gulf; high, 30·2, Sault Ste. Marie.	Fairly steep.
Sept. 3	Minute.	Nearly constant 754.....	Low, 29·8, The Lakes; high, 30·1, Gulf.	Fairly steep.

Date.	Microseisms.	Barometer in mm.	High and Low areas.	Gradients.
1907.				
Sept. 13	'Sawtooth' type.....	Nearly constant	Low, 29·8, Gulf; high, 30·3, The Lakes.	Fairly steep.
" 14	'Sawtooth', well marked.	Nearly constant	Low, 29·9, Port Arthur; high, 30·4, New Brunswick	Fairly steep.
" 18	Well marked.....	Falling.	Low, 29·4, off Newfoundland; high 30·4, Ottawa.	Steep.
" 19	Well marked, 8μ...	Falling.....	Low, 30·0, Newfoundland; high, 30·3, off Maine coast.	Long.
" 24	Small.....	Rapidly rising.....	Low, 29·1, White River; high, 30·1, Bermuda.	Pretty steep.
" 25	Small, less than yesterday.	Rising	Low, 29·3, mouth St. Lawrence; high, 30·1, Bermuda; another, 30·3 Omaha.	Pretty steep.
" 30	Very strong, 25μ ...	Gradually rising.....	Low, 29·5, Sable Island, surrounded by steep gradients to coast; high, 30·0, Gulf; another, 30·3, St. Paul.	In part steep.
Oct. 1	Well marked, 12μ....	Nearly constant 761. ...	Low, 29·8, Sable Island; high, 30·3, Toronto.	Pretty steep.
" 2	Well marked, but less than yesterday.	Slightly falling.....	Low, 29·6, off Sable Island; high, 30·2, Ottawa.	Steep in ocean.
3	Well marked, 15μ....	Rapidly falling to 743 ..	Low, 29·2, St. Johns; high, 30·2, Hatteras.	Very steep in Gulf but not on land.
" 4	Well marked, 9μ. .. .	Gradually rising.....	Low, 29·6, Newfoundland; Low, 29·5, Ottawa.	Not steep.
" 4	Diminish much following morning.	.....	High, 30·1, Bermuda...	.....
" 7	Well marked, 13μ....	Falls 8 mm. and rises again to 750.	Low, 29·8, St. Lawrence to Texas; high 30·2, Wyoming and Bermuda.	Fairly steep.
" 9	Well marked, 13μ ...	Gradually falling to 752..	Low, 29·6, Newfoundland; low, 29·7, Port Arthur; high, 30·2, New York	Steep in Gulf.
" 16	Slight increase to 16μ	Nearly constant 763. ...	Low, 29·7, Newfoundland; high, 30·4, Washington.	Steep in Gulf.
" 19	Slight increase to 10μ	Nearly constant 761.	Low, 29·8, Gulf; high, 30·3, Philadelphia	Not steep.
" 20	Well marked, 12μ and decrease.	Gradually rises to 765....	Low, 30·0, Chicago; high, 30·4, Winnipeg.	Not steep.
" 21	Strong, 21μ	Falls rapidly 12 mm....	Low, 29·5, Sable Island; high, 30·4, Detroit.	Very steep around low.
" 22	Very strong, 25μ. ...	Falls rapidly 5 mm., then rises.	Low, 29·1, St. Johns another, 29·6, White River; high, 30·3, off Norfolk.	Extremely steep in Gulf.
" 23	Very strong, 21μ.. .	Gradual rise to 762.....	Low, 29·5, mouth of St. Lawrence; high, 30·1, Bermuda; high, 30·2, Port Arthur; high, 30·1, Galveston.	Steep.
" 24	Fairly strong, 11μ. ..	Falls 10 mm. to 752.. ...	Low, 29·6, Sable Island; high, 30·3, Toronto.	Fairly steep.
" 25	Strong, 17μ.....	Rapid rise to 766	Low, 29·8, Gulf; high, 30·2, Hatteras.	Not steep.
" 26	Fairly strong, 12μ ...	Falls to 756	Low, 29·7, Gulf; high, 30·4, Toronto.	Fairly steep.
" 27	Well marked, 8μ	Nearly constant 754.....	Low, 29·8, Georgian Bay; high, 30·4, Halifax.	Steep.
" 29	Fairly strong, 14μ..	Nearly constant 755. ...	Low, 29·6, off Boston; high, 30·3, Port Arthur; another Lonisville, 30·2.	Steep around low.
" 30	Fairly strong, 12μ....	Gradually rising to 772. .	Low, 29·4, Gulf; high, 30·4, Toronto.	Very steep.
" 31	Well marked, 9μ.....	Nearly constant 771. ...	.....	....
Nov. 4	Slight, but increase to 16μ.	Nearly constant 754.....	Low, 29·3, mouth of St. Lawrence; high, 30·1, Chattanooga.	Steep.

Date.	Microseisms.	Barometer in mm.	High and Low areas.	Gradients.
1907.				
Nov. 6	Slight, increase after 5 p.m. to 9 a.m. 21μ.	Rapid fall to 733.....	Low, 29·7, Norfolk; high, 30·3, Gulf; another 30·1, Galveston.	Fairly steep.
" 7	Strong, 18μ.....	Rises rapidly to 751.. ..	Low, 29·1, Montreal; high, 30·2, Newfoundland; another, 30·1, Montgomery.	Exceedingly steep.
" 8	Fairly strong, 10μ....	Nearly constant 751.	Low, 29·3, mouth St. Lawrence; high, 30·2, Jacksonville.	Fairly steep.
" 25	Very marked, 17μ ...	Gradually falls 11 mm. to 750.	Low, 29·9, off New York; Low, 29·8, Port Arthur; high, 30·6, Gulf; high, 30·3, Vicksburg.	Steep on Atlantic coast.
" 29	Very strong, 25μ ...	Gradually rises to 765...	Low, 29·7, Gulf; low, 30·0, Jacksonville; high, 30·5, Salt Lake.	Not steep.
" 30	Marked, falling off, 14μ	Gradually falling to 760..	Low, 30·0, off Hatteras; low, 29·9, St. Louis; high, 30·3, Quebec.	Not steep.
Dec. 2	Marked, reading 17μ.	Rising 10 mm. to 765 ...	Low, 29·2, Gulf; high, 30·5, Salt Lake.	Very steep in Gulf.
" 5	Become very strong, 21μ.	About constant, 759.....	Low, 29·8, off New York; high, 30·5, Chattanooga.	Steep along coast.
" 6	Very marked, 17μ....	About constant, 759.....	Low, 29·4, Gulf; high, 30·4, Chattanooga.	Steep in Gulf.
" 7	Strong till midnight, 12μ.	About constant, 760	Low, 29·9, Gulf; high 30·3, Charleston.	Not steep.
" 13	Fairly quiescent till 6 p.m., then increase by 6 a.m., to 12μ.	Nearly constant, 764, with many fluctuations of 1 mm.	Low, 29·6, Gulf; high, 30·3, Washington.	Steeper, Lower St. Lawrence.
" 17	Fairly strong, 13μ. .	Nearly constant, 757	Low, 29·5, off Sable Island; high, 30·2, Charleston.	Not steep.
" 24	Fairly strong, 11μ. ..	Rises rapidly, 13 mm. to 755.	Low, 28·7, mouth St. Lawrence; high, 30·2, Texas.	Very steep.
" 25	Fairly strong, 13μ ...	Falls to 751, then rapidly rises to 765.	Low, 29·5, Gulf; another, 29·5, N. Michigan; high, 30·2, Jacksonville.	Steep.
" 31	Strong, 17μ.....	Falls 4 mm., then nearly constant, 754.	Low, 28·9, Gulf; high, 30·3, Chattanooga.	Very steep.
1908.				
Jan. 1	Begins with strong, then diminish.	Gradually rises, 5 mm..	Low, 29·6, Gulf; high, 30·3, Charleston.	Not steep.
" 5	Strong, increase to midnight, 17μ.	Gradually falling to 754.	Low, 29·2, Gulf; high, 30·3, Chicago.	Very steep.
" 12	Fairly strong, 9μ	....	Low, 29·2, Cincinnati; high, 30·2, Gulf.	Steep about low.
" 14	Increase to midnight, 8μ.	Rises 9 mm. to 761	Low, 29·2, Gulf; high, 30·3, Memphis.	Steep.
" 23	Marked.....	Nearly constant, 763	Low, 29·6, Gulf; high, 30·7, Omaha.	Steep, Lower St. Lawrence.
" 24	Strong, 15μ..... .	Rapidly falls, 17 mm. to 747.	Low, 29·5, off Hatteras; low, 29·6, Winnipeg; high, 30·3, Anticosti; high, 30·5, Memphis.	Very steep low to low.
" 25	Well marked, decreasing.	Rises to 753.....	Low, 29·1, Sable Island; high, 30·2, Jacksonville.	Steep about low.
" 27	Small, 8μ.	Rises rapidly, 18 mm. to 754.	Low, 28·9, Quebec; high, 30·1, Memphis.	Extremely steep about low.
Feb. 1	Increase after 6 p.m., 11μ.	Falls 13 mm. to 732, then rises to 745.	Low, 29·1, Detroit; high, 30·4, Sable Island.	Extremely steep about low.
" 2	Strong, 13μ..	Gradually rises to 755. ..	Low, 28·9, mouth St. Lawrence; high, 30·6, Memphis.	Very steep.
" 15	Small, increasing, 9μ.	Falls 5 mm. to 730, then rises rapidly to 746.	Low, 29·0 Buffalo; high, 30·4, Salt Lake.	Steep about low.
" 16	Well marked, 11μ...	Slight rise	Low, 29·0, Anticosti; high, 30·3, Denver.	Steep about low.

Date.	Microseisms.	Barometer in mm..	High and Low areas.	Gradients.
1908.				
Feb. 20	Fairly strong, 10μ....	Nearly constant, 754....	Low, 29·5, St. John; high, 30·5, Vicksburg.	Fairly steep.
" 21	Strong, 13μ....	Rises 3 mm. to 756	Low, 29·4, St. Johns; high, 30·4, Montgomery.	Fairly steep.
" 22	Well marked, decreasing, 9μ.	Nearly constant, 754...	Low, 29·7, mouth St. Lawrence; high, 30·4. Galveston.	Fairly steep.
Mar. 6	Fairly strong, decrease after 16 p.m., 11μ.	Rapid fall, 18 mm. to 741 midnight, then rise to 749.	Low, 29·2, Wisconsin; high, 30·3, Boston.	Very steep.
" 10	Fairly strong, decreasing, 9μ.	Rapid fall, 18 mm., to 753	Low, 29·4, St. Johns; high, 30·7, Cincinnati.	Very steep in Gulf.
" 25	Marked, decrease after 7 p.m., 8μ.	Falling 15 mm., with many fluctuations to 751.	Low, 29·6, St. Johns; high, 30·3, Ottawa.	Fairly steep.
" 30	Small, 5μ.....	Gradually falls, 10 mm., to 756.	Low, 29·5, off Sable Island; high, 30·4, Philadelphia.	Fairly steep.
" 31	Small, strongest during night.	Rises, 8 mm., to 764.	Low, 29·8, off St. Johns; another, 29·9, Detroit; high, 30·3 off Nantucket.	Fairly steep.

In connection with the relationship that may exist between microseisms on the one hand and the statical and dynamical conditions of the atmosphere on the other, the following table has been compiled. In it are given all the well-marked or strong microseisms and all the strong winds and gales predicted at 8 a.m. for the Ottawa and Upper St. Lawrence valleys for the respective day, including the period July 1, 1907, to March 31, 1908, so that at a glance we can see whether more or less strong microseisms were accompanied by strong winds or gales, and on the other hand whether strong or high winds produced marked microseisms. As the observatory is not yet supplied with an anemometer and pressure gauge for comparison of the dynamical conditions, we are at present dependent upon the daily forecast as given below:—

The maximum (double) absolute amplitude or range is expressed in microns.

Date.	Microseisms.	Forecast for day.
1907.		
July 2.	Quiescent	Strong northwesterly winds.
" 26.	Very slight	High " "
" 27.	" become more marked.	Strong westerly "
" 29.	Slight, increase to 8μ	Thunderstorms.
" 30.	Marked, decreasing 11μ	Westerly winds.
" 31.	Marked 13μ	" "
Aug. 2.	Quiescent	Fresh to strong southerly winds, shifting to west.
" 24.	"	Strong southerly winds, shifting to west and northwest.
" 31.	Marked 13μ	Light to moderate winds.
Sep. 12.	Very faintest	Fresh to strong west to northwest.
" 13.	"Sawtooth" type	Light to moderate winds.
" 14.	Well marked	" "
" 18.	"	Fresh to strong northeasterly to easterly winds.
" 19.	" 8μ	Easterly to southerly winds.
" 20	Present, not as strong as yesterday	Winds increasing to strong breezes and gales S. to W.
" 24.	Small	Strong winds and gales south, shifting to W. and N. W.
" 25.	Slight	Strong winds and gales west to northwest.
" 28.	Very minute	Strong winds and gales east to northeast.
" 30.	Very strong, 25μ	Fresh to strong west to northwesterly winds.
Oct. 1.	Well-marked, 12μ	No forecast for winds.
" 2.	"	" "
" 3.	" 15μ	" "
" 4.	" 9μ	Fresh to strong northwesterly to westerly winds.
" 7.	" 13μ	Fresh winds.
" 8.	Small	Northwesterly gales.
" 9.	Well-marked 13μ	Showery, high winds to-night.
" 16.	Slight, increase to 16μ	Southwesterly winds.
" 17.	Slight	" " increasing to gales.
" 18.	" , increase to 7μ	Strong northwesterly winds.
" 19.	" " 10μ	Moderate winds.
" 20.	Well-marked 12μ	
" 21.	Strong 21μ	Moderate westerly winds.
" 22.	Very strong 25μ	Strong southwesterly winds.
" 23.	" 21μ	" northwesterly winds.
" 24.	Fairly strong 11μ	Westerly and southwesterly winds.
" 25.	Strong 17μ	Strong westerly and northwesterly winds.
" 26.	Fairly strong 12μ	Moderate winds.
" 27.	Well-marked 8μ	
" 29.	Fairly strong 14μ	Strong northerly winds.
" 30.	" 12μ	Northerly winds.
" 31.	Well-marked 9μ	No chart.
Nov. 4.	Slight, increase to 16μ	Westerly winds.
" 6.	Slight, increase after 5 p.m. to 9 a.m. 21μ	Northeasterly winds.
" 7.	Strong 18μ	Northwesterly and westerly gales.
" 8.	Fairly strong 10μ	Strong westerly winds.
" 9.	Marked 8μ	High southwesterly winds.
" 21.	Small, very weak	" south and southwesterly winds.
" 25.	Very marked 17μ	Northeasterly winds.
" 29.	Very strong 25μ	Strong northerly winds.
" 30.	Marked 14μ	Easterly winds.
Dec. 2.	" 17μ	Fresh northerly to westerly winds.
" 5.	Becoming very strong 21μ	Westerly winds.
" 6.	Very marked 17μ	Moderate to fresh southerly to southwesterly winds.
" 7.	Strong till midnight 12μ	Moderate southwesterly to southerly winds.
" 9.	Almost quiescent	Winds increasing to strong breezes, gales E. and S.
" 10.	Very slight	Strong winds and gales W. to N.
" 11.	"	Fresh to strong northerly to northwesterly winds.
" 13.	Fairly quiescent till 6 p.m., then increase by 6 a.m. to 12μ	No forecast for wind.
" 14.	Less strong than yesterday	Northeasterly to northerly gales.
" 17.	Fairly strong	No forecast for wind.
" 20.	Slight	Fresh to strong southerly winds.
" 23.	Not strong	Strong winds.
" 24.	Fairly strong 11μ	No forecast for wind.
" 25.	" 13μ	" "

Date.	Microseisms.	Forecast for day.
1907.		
Dec. 27.	Not strong	Strong southerly and southwesterly winds.
" 30.	Small	Strong winds and gales shifting to W. and N.W.
" 31.	Strong 17μ	Fresh to strong westerly to southwesterly winds.
1908.		
Jan. 1.	Begin strong and then diminish.	No forecast for wind.
" 4.	Almost quiescent	Strong southwesterly winds.
" 5.	Strong, increase to midnight 17μ	No forecast for wind.
" 12.	Fairly strong 9μ	" "
" 14.	Increase to midnight 8μ	Westerly winds.
" 15.	Weak	Strong winds.
" 16.	Slight	Strong northwesterly winds.
" 22.	"	High " "
" 23.	Marked	Northerly winds, decidedly cold.
" 24.	Strong 15μ	No forecast for wind.
" 25.	Well-marked, decreasing	" "
" 27.	Small 8μ	Strong westerly to northwesterly winds.
Feb. 1.	Increase after 6 p.m. 11μ	Strong winds and gales eastern quadrant, shifting to W. and N. W.
" 2	Strong 13μ	No forecast for wind.
" 5.	Practically none	Strong winds and gales, E. to S.
" 6.	Weak	" " shifting to W. and N.
" 15.	Small, increasing 9μ	Strong winds and gales, N.E. to N.W.
" 16.	Well-marked 11μ	No forecast for wind.
" 19	Very minute	Strong easterly to northeasterly winds.
" 20.	Fairly strong 10μ	Fresh northwesterly to southwesterly winds.
" 21.	Strong 13μ	Fresh to strong southwesterly to westerly winds.
" 22.	Well-marked, decreasing 9μ	No forecast for wind.
" 25.	Practically none	Fresh to strong winds.
" 26.	Very minute	Strong winds, shifting to N. and N.W.
Mar. 2.	Very slight	Strong northeasterly winds.
" 6.	Fairly strong, decrease after 6 p.m. 11μ	High southeasterly winds.
" 10.	Fairly strong, decreasing 9μ	Moderate westerly winds.
" 11.	Slight	Fresh to strong southwesterly winds.
" 13.	Very slight	Strong southerly winds.
" 16.	Practically none	Strong northwesterly winds.
" 24.	Small	" "
" 25.	Marked	No forecast for winds.
" 26.	Small	Strong northwesterly winds.

It may be stated at the outset before discussing the preceding data that there is never a day in the year on which some trace of microseisms can not be seen on a seismogram from a Bosch photographic seismograph. It is all a matter of degree. That microseisms should be ever present is but natural, for the earth is in a continual state of stress and strain; many varied and different causes contributing thereto. The term microseisms as here used excludes any deviations of the vertical or movements of the zero position of the pendulum. Some writers have divided microseisms into 'earth tremors' or 'pulsations,' and 'earth pulsations' or 'pulsatory oscillations.' The writer, however, from the seismograms at this station sees no reason for this division, as it is not at all evident from them that the contributory causes, whatever they may be, manifest themselves in such a manner as clearly to differentiate themselves. Furthermore, from the examination of the seismograms the oscillations of the pendulum are excluded, on the one hand, from the frequent change of period on the same seismogram, which would be inadmissible for a pendulum, and on the other hand, if the pendulum were made to oscillate we should expect to see the damping effect in the decrease of amplitude, and a more or less sudden beginning, unless the oscillations of the earth particles them-

selves were of a period commensurable with that of the pendulum, which, of course, is sometimes the case. It is evident that a photographic registering apparatus with high magnification will record microseisms when a seismograph with mechanical registration will draw only a straight line.

Of the contributory causes to stresses and strains and manifesting themselves as microseisms, we may consider: secular cooling of the earth; unequal heating and radiation during the day and night; statical effect of atmospheric pressure, areal or local; dynamical effect of atmospheric pressure, areal or local; precipitation, as rain or snow.

The vanishingly small effect of secular cooling, whatever its constants may be, becomes evident from the fact, that although it is ever present and its manifestations would be of a constant nature, the recorded microseisms are of the most fluctuating character both in time and magnitude, completely masking the effect of secular cooling. The daily alternations of unequal heating and radiation during the 24 hours are not shown by their effect on microseisms. The case of precipitation is similar in regard to microseisms to the preceding. It may be noted that the stresses set up over large areas, hundreds of miles in extent, by differential loading of rain is small compared with that of barometric pressure. Taking an area say of a 1,000 miles with a rain-fall of an inch, which is a pretty heavy rain, and decreasingly distributed, we would have a maximum pressure of a little over one thirtieth of a pound per square inch, and the rain pressure diminishing to zero for the edge of the area. An average barometric gradient, on the other hand, over such an area would be several times as great, due to a differential atmospheric pressure equivalent to about three-tenths of an inch of the mercurial barometer. The rain-pressure may make itself, however, felt locally, as has been observed. The result of a heavy rain-fall soon fills the valleys and streams much beyond the direct precipitation on them, so that this loading and bending of the surface may become a measurable quantity by an observing station in the neighbourhood. This effect is, however, one of tilting, of change of vertical or change of pendulum zero and not of microseisms, the subject at the moment under discussion

The effect of difference of atmospheric pressure and of change of atmospheric pressure may be manifested in two ways by the seismograph. We are here dealing with large areas, say 1,000 miles in extent, for local barometric conditions have little or nothing in common with microseisms. In the one case, considering the earth as having an elastic crust, the pier is tilted towards the area of greatest pressure, in consequence of which the pendulum will move in that direction, i.e., its zero line will be displaced. Besides this effect of statical loading, there appears to be no doubt, based on the records here, that vibrations are set up by this statical loading, quite apart from the dynamical effect of change of pressure. In the other case, by change of pressure over a wide area vibrations are set up on the earth's surface, and these may be produced by two causes from the one phenomenon. The one of these is the passage of Highs and Lows over the surface, equivalent to the dragging of a weighted meniscus over the surface; and the other is the winds set up or resulting from the atmospheric gradient due to difference of pressure. The action of the winds would be most likely from frictional resistance along the surface of the earth rather than from impact on unevenness of surface or obstructions. In studying various phenomena collectively in an investigation for co-relationship, considerable restraint must be exercised not to draw conclusions as to cause and effect from a limited number of coincidences. For a conclusion once drawn is apt to become an obsession to the investigator, and he is more or less blinded to facts that do not fit his theory.

In examining the record of microseisms the first question that presents itself is whether the recorded motion is that of the ground or of the pendulum, in the first case the pendulum acts as a steady mass or point, while in the latter case it is set oscillating either by impulses from the ground or by an undulatory movement of the ground. Let us consider the case of microseismic records of the 'sawtooth' type, where we see

regular and almost wholly uniform oscillations kept up for hours and longer. If in this case the pendulum actually oscillates it will do so with the period inherent to it. After receiving the first impulse or impact let us suppose it to oscillate, if no further impact were received the oscillations would soon die out and the amplitudes would decrease in the given ratio of the damping co-efficient. When a second impulse is given the pendulum will continue its uniform swings, provided the time interval from the preceding impulse is that of the period of the pendulum or a multiple thereof. Is this not the case, then we will have interference and this would be shown on the record. But such interference is not present in our supposed diagram, hence we must conclude that even if we admit that the diagram is a record of the oscillations of the pendulum, we see that in reality it is only a counterpart of the actual movements of the ground, that is of horizontal to and fro motions of the earth particles. If the pendulum is kept swinging uniformly it can only be done so by some force acting at intervals of the period of the pendulum. As indicated, this may be done by the periodic oscillating movements of the earth particles; or the same effect may be produced by rhythmic undulatory movements of the ground. Now, the period of microseisms recorded here lies mostly between 5 and 6 seconds, which it may be remarked is also approximately the period of the two pendulums, and the period of the undulatory movements manifested in the 'principal portion' of tectonic earthquakes is 20 seconds or more, so that for microseisms we find the period only about one-quarter of the preceding, provided we admit that the record of the microseisms is due to undulatory motion and not to horizontal movements. The shorter period might perhaps be assigned to a far thinner part of the crust of the earth being affected in the microseisms than is involved in the undulatory motion connected with microseisms. As an analogy we may give the short period of the ripples in water from a breeze, or the much longer one of waves from a storm when a greater depth of water is involved in the motion.

A priori reasoning does not appear to furnish a conclusive reply to the question whether the microseisms are attributable to the horizontal or to the undulatory movements. However, from the consideration of the simultaneous occurrence of microseisms together with certain atmospheric or barometric conditions lead to the conclusion that microseisms are mostly attributable to horizontal displacements.

Having made daily comparisons with the seismograms, local barograms and weather maps, the following conclusions have been deduced. It is believed that identical atmospheric conditions prevailing over different parts of the earth's surface will not necessarily produce similar microseisms as these are affected by the elasticity of the particular area under consideration, also by the geological formation, the presence of well-marked dykes and faults, and by the proximity of large sheets of water, the ocean. One effect of the proximity of the ocean caused by barometric pressure is the change of the level of the water, quite apart from the tides, and this change through loading or unloading along the coast produces a displacement of the pendulum zero, referred to in another place. In the sea then, we have the dual effect of the direct barometric pressure and the correlated one of displacement of the water, while on land we have only the former.

The feature to strike one most in the above comparisons is that when marked microseisms are present we are almost certain to find in the morning of the day of record for the following 24 hours an area of Low about the Gulf of St. Lawrence. That is, the condition of Low in the gulf precedes the record of marked microseisms. The greater part of the gulf is less than 150 fathoms deep. Through it runs a deep from the mouth of the St. Lawrence (Matane), along the south of Anticosti, passing between Cape Breton and Newfoundland reaching a depth of 250 fathoms before joining the Atlantic ocean. This deep is over the eastern part of the Great St. Lawrence and Champlain Fault, shown on the geological maps, for nearly 700 miles. The waters about Nova Scotia and Newfoundland are all within the 150-fathom line, so that the Lows over the gulf and Sable island are over waters the greater part of

which is less than 150 fathoms deep. The distance from Ottawa to the gulf is about 700 miles, direction east-north-east; and from Ottawa to the nearest broad waters of the Atlantic, off the State of Maine, 300 miles, direction east-south-east.

Next to the presence of a Low in the gulf co-incident with microseisms we find the isobars to cut the valley of the St. Lawrence (in which lies the great fault) at right angles, that is, the gradient is along the St. Lawrence valley, which is in general parallel to the Atlantic coast, and to the line of the Alleghany mountains.

Furthermore, it is found that if a High prevails along the South Atlantic coast, northward from Florida the microseisms are intensified.

The passing of Highs or Lows across the coast-line, i.e., from land to water is not found to be marked by the occurrence of microseisms. As the whole atmospheric movement is for Canada and the United States from west to east, it is uncommon for a High or Low to cross the coast line from the Atlantic to the continent.

It appears that the reversal of the position of Low and High with reference to the gulf for the former is not so closely associated with the subsequent appearance of microseisms as obtains in the case first stated.

When there is a persistence of Low in the gulf and High on the Atlantic coast to the south as indicated, the microseisms set up in the first instance become intensified in amplitude, so that the maximum microseisms are not necessarily co-incident with the greatest difference of pressure. It appears that the difference of barometric pressure is in the first instance responsible for the microseisms, and when favourable conditions continue the microseisms will increase in amplitude, although the pressure difference may have decreased. Furthermore, another condition is that the line of High-Low preserves its direction along the St. Lawrence valley.

When a Low with even very steep gradients is to the west, say over the lakes, and High over the Lower St. Lawrence or gulf, microseisms are generally weak or even absent altogether, although there are exceptions. This is not the case when the Low is to the east, especially when over the gulf. When the Low with steep gradients moves up to Lake Erie by 8 a.m. of the day of the seismogram we may expect to see the beginning of marked microseisms, which increase as the Low moves down the St. Lawrence towards the gulf. From the immediately preceding it is seen that the microseisms give no indication of the approach of a Low or storm centre, but on the contrary are the result of the passage of a Low, and especially of its presence in the gulf. Some investigators believe and are in hope the microseisms may be the forerunner of coming weather conditions, and hence may assist in making forecasts. The seismograms examined here are not very encouraging on that point, the microseisms indicating rather 'that we have had weather, than that we are going to have weather.' This prognostication refers to the microseisms and not to the effect of bending, or displacement of the pendulum zero, brought about by unequal pressure over a large area. The writer is not as yet prepared to say whether the approach of a Low, with the consequent lifting or rising of the earth's surface, is a distinctly measurable quantity as registered by our seismograph, for the measurements of the two components of the change of pendulum zero for the year have not yet been tabulated and critically compared with the movements of Highs and Lows in the eastern part of the continent.

In connection with the bending of the earth's crust due to difference of atmospheric pressure, reference may be made to two exceptionally marked results obtained by Professor Omori. The conditions prevailing were undoubtedly unusual, and the angular values obtained so large, that one would be led to conclude that under ordinary atmospheric conditions, i.e., of barometric difference, the tiltometer would always respond to a degree that was readily measurable. Of this fact, however, the text, in the references given below, says nothing.

In No. 21 of the Publications of the Earthquake Investigation Committee in Foreign Languages is given the record, with its interpretation, of a horizontal

pendulum at Tokyo during a storm, October 10-11, 1904. The weather chart which accompanies the paper shows that a Low (750mm) prevailed and moved along the east coast of Japan past Tokyo. This Low had a gradient for Tokyo of 10mm in about 220km. This is an excessively steep gradient. Elsewhere it has already been stated that a gradient of one-tenth inch for 150 miles is a pretty steep gradient; it will be seen then that the former is fully four times as great as the latter. The tilting diagram shows the movement of the Low very well, and from the constants of the pendulum, the angular motion or tilting, is found to be 3″·5, a very large quantity. As the Low was east of Tokyo, the natural inference would be that the pendulum would swing to the west towards the High, which depresses the surface of the earth, but the opposite was found to be the case. On this interesting and important point Omori says: 'The explanation of this apparently anomalous phenomenon is probably to be found in the accumulation of sea waters under the low pressure centre to a degree greater than the amount of the diminution of the atmospheric pressure, thereby creating an increase in the resultant pressure at sea bottom.'

In interpreting the above phenomenon it seems necessary to consider the effect of the hydrographic features and coast line, for statically considered the difference of barometric pressure over the ocean raises the water under low pressure to a height equal to the difference between the High and Low, to produce hydrostatic equilibrium. However, when the Low is along or near the coast and the waters from the ocean flow from the High towards the Low, then there may be and probably is a piling up of waters along the coast due to configuration, which would not be the case on the broad ocean.

In the comments on Mr. Denison's paper, the dual effect of difference of atmospheric pressure over the ocean has been pointed out, and Professor Omori's observations show it so glaringly.

The other case is the record obtained at Mito (Japan) during a storm 22-24 March, 1907, given in 'Bulletin of the Imperial Earthquake Investigation Committee,' Vol. II., No. 1. The atmospheric conditions were similar but not identical. The gradient in this case was 10mm in about 400km, and furthermore two Lows moved simultaneously northeasterly along the Japanese islands, one on each side, thereby materially changing the direction of the gradient and of the direction of tilting as well as of its progressive movement. From the constants given, the instrument used seems to have been identical with the one used at Tokyo. The tilting recorded at Mito was 3″·7, a little higher than at Tokyo, although the atmospheric conditions were seemingly somewhat less favourable. An additional record of interest in this case is the mareogram for the time of the storm. From it is seen that the effect of the Low is to raise the water 75cm or two and a half feet 'higher than the level according to the usual tide movement.' The direction of the tilting with reference to the position of the Low was similar to the case of Tokyo; Omori saying: 'The passage of the centre of the cyclone producing, as in the case of the storm on October 10-11, 1904, not an elevation but the depression of the ground. This is probably due to the fact that the deep barometric cyclone was accompanied, or rather followed, by an increase of the height of sea water, to an amount greater than the equivalent of the barometric fall.'

We see then from these two cited cases that the secondary effect of difference of atmospheric pressure for coastal stations may completely mask, in fact reverse, the direct pressure effect upon the earth's surface produced by an atmospheric gradient. These cases seem to make it clear that the direct gravity effect produced by the cumulating waters is very much greater than that of the difference of atmospheric pressure, and is of opposite sign.

It is found that, broadly speaking, the microseisms are more numerous during the colder season than during the warmer one, and some have sought therein a relationship of cause and effect. In our climate here we have a large range of temperature; during

the past year of 127° F. (96° and —31°). During February when the thermometer reached its lowest and we had some continuously very cold weather the seismograph showed no evidence thereof. The connection is assumed to be from the fact that the frozen ground on the one hand lends itself for the better transmission of pulsations, and the other that the act of freezing itself sets up stresses and consequent oscillations that manifest themselves as microseisms. From extreme cold it does not necessarily follow that the ground is frozen to any great depth, as was the case during the past winter. The reason that there was very little frost in the ground, was that an early and heavy snowfall together with its subsequent accumulation to many feet, covered the earth with a mantle that the cold could not penetrate.

By far the large majority of microseisms show themselves by a serrated record, 'sawtooth' type as I designate them; more rarely are those of the 'spindle' type, where the oscillations or rather the amplitudes rise and fall, increase and decrease, with a certain cadence, as in the oscillations of a string between two fixed points. The interval between these maximum amplitudes is very variable, varying from one to several minutes. The rate of increase and decrease of the amplitudes is less than that produced by the damping of the pendulum, so that we can scarcely attribute it to the latter on the supposition that the pendulum itself is set in motion and the oscillation dies down by damping, the former to be renewed by a fresh impulse. The latter, however, would preclude a gentle increase, but instead would show a more or less abrupt beginning, which is not the case. Intermittent rhythmic vibrations of the ground, synchronizing with the period of the pendulum, setting the pendulum in motion could produce the phenomenon. Other suggestions might be made, but none seems satisfactory to explain the more or less rhythmic fluctuations in amplitude as shown on Plate 1.

The validity of a supposed relationship between different phenomena, as cause and effect, is readily tried by predicting the effect when given the cause. This has been done with reference to the existence of a Low in the gulf and a High over the Atlantic coast to the south, or in general by taking the daily Weather Map with its isobars and from them predicting the resulting microseisms. The result has in so far been satisfactory that in the large majority of cases the microseisms have fairly well answered in presence and magnitude the prediction. There are, however, still important outstanding differences that require further explanation. Just why the Low about the gulf should have such an influence in the production of microseisms is by no means apparent. The two main physical features are the shallow gulf and the St. Lawrence valley in which lies the Great St. Lawrence and Champlain Fault 700 miles long, already referred to. As secondary, is the general trend of the Atlantic coast, and possibly that too of the Alleghany mountains.

On infrequent occasions there is a Low over the gulf, another Low over Arkansas, while one High rests north of Lake Superior and another over Bermuda. When those conditions obtain with steep gradients we are pretty sure to have marked microseisms. The line of the Lows then lies in the St. Lawrence valley, while that of the Highs is at right angles to the former. In this case the maximum strain is along the valley of the St. Lawrence, along the Great Fault, so that from a priori reasoning marked microseisms might be expected.

In concluding this preliminary investigation of the well-marked microseisms recorded here, we will repeat that the presence of a Low over the gulf surrounded by steep or fairly steep gradients on a given morning is indicative of more or less well-marked microseisms following at Ottawa that day.

It has already been stated that the large majority of microseisms have a period of about 6^s with small fluctuations. Why the fluctuations, is by no means apparent, unless it be the varying depth of the earth's surface involved. Even this supposition is not quite satisfactory; for all impulses, vibrations of whatsoever nature must pass

through the pier on which the instrument rests before being recorded, and the pier itself must have its own inherent and constant period.

On occasions the above common period changes to one of about one-half, or about 3[s], showing, however, a transition time during which there is an irregularity and interference, so that the period is unrecognizable. At present no explanation can be offered for this sudden change. When the period is so short, the amplitudes are very minute, although visible to the naked eye.

From the preceding tabulation it will be observed that the strongest and most numerous microseisms were recorded during the month of October, and the fewest and weakest during the summer months of July and August when the atmospheric barometric gradients were very long. Coming now to the next table in which the days for all the well-marked microseisms and for all the strong winds forecast are given, we find that of these 100 days between July 1, 1907, and March 31, 1908, there were only 18 coincidences of such microseisms and such winds. It must be remembered, as already noted, that the winds are those of the forecasts and not recorded ones, as at present the observatory is not provided with the necessary meteorological instruments. However, the probability of the forecasts is and has been high for years.

On these data and conditions we are led to infer that strong winds have little effect in causing microseisms by setting up pulsations over large areas of the earth's surface or crust, i.e., the dynamical effect by friction or impact is not the governing factor in the production of microseisms. We are dealing here with the larger effect of strong winds upon large areas and not the local effect upon buildings, which as is well known are set in oscillation, and these in turn are communicated to the ground. When the building within which the seismograph is housed is large, the oscillations of the former will be recorded.

We have in the period, July 2—March 26, one hundred days during which 51 marked or well-marked microseisms are recorded, and 36 strong winds are predicted. Considering the two phenomena as independent events we see that the probability of the simultaneous occurrence of the two events is as great as the actual happening, i.e., as far as the observations go there is very little to show any causal relationship between the two.

I attended the first general meeting of the International Seismological Association and the second meeting of the Permanent Commission held at the Hague, September 21—September 26, 1907.

There are now 21 countries—Austria, Belgium, Bulgaria, Canada, Chile, Congo States, Great Britain, Greece, Hungary, Italy, Japan, Mexico, Netherlands, Norway, Portugal, Roumania, Russia, Servia, Spain, Switzerland and the United States—represented in the association. The meeting took place under the patronage of the government of the Netherlands and many courtesies were extended that were highly appreciated by the members. There were some fifty seismologists, including the leading seismologists of the world, who attended the conference. The meetings were to have been held in the Ritterzaal, but as those quarters were still occupied by the Peace Conference, the government assigned the Diligentia for the conference. Professor Van der Stok, vice-president of the association, and his assistants made all the arrangements, and they were indefatigable in their endeavours to make the visit of the members as pleasant as possible, in which they were highly successful. A cloudless sky during the whole session added not a little to the enjoyment.

The meetings opened by a two days session of the permanent commission under the presidency of Professor Luigi Palazzo, Director of the Central Meteorological and Geodynamic Bureau at Rome, who delivered his presidential address in French. During the session the usual routine business pertaining to reports and finances of the association was disposed of.

It has long been felt that there should be a material increase in the number of seismological recording stations and to this end a cheap yet suitable and satisfactory

instrument was desired. To secure the latter, instrument makers had been invited to submit working apparatus and the cost was limited to 300 marks, about 75 dollars. This limit was subsequently considered, and rightly so, too low. A number of instruments were submitted for examination, and a committee was appointed, including the writer, to report on their efficiency. The committee, however, on due examination and deliberation recommended that a satisfactory test could only be made by setting up the instruments at a station and let them do actual work, recording seisms of various kinds, for a considerable length of time before a conclusive report could be made as to their suitability. This recommendation was adopted and the instruments will be set up at the Central Bureau at Strassburg under the supervision of Director Gerland and Professor Rudolph.

The association being a new organization, its work is not yet differentiated and so ordered as obtains in older societies. At the present time there are two points particularly, that strike the writer as being important for the study of earthquakes and the geophysical questions involved, which should receive immediate attention. The first point is, and one involving little expense, if any, that the Central Bureau at Strassburg should through the press publish in brief the occurrence of every large (tectonic) earthquake. If the reading and interpretation of a seismogram were as simple and easy as that of a chronograph sheet for transits, then there would be little object for the above desired information. Such, however, not being the case, the reading of a seismogram can very often only be effected satisfactorily by comparison with another or others. Earth tremors or microseisms sometimes mask the arrival of the first preliminary tremors so that not even an approximate estimate can be made of the distance to the epicentre or disturbed area. The first question that presents itself to the reader of the seismogram as well as to the public is, where was the earthquake? The answer to this question would be materially enhanced in value were the information referred to made available. It may be noted too that each comparison between the record of the Central Bureau and one's own will assist towards the independent reading or interpretation of every following seismogram.

The other point involves some expense, no doubt. It pertains to the rapid reproduction and distribution of seismograms from stations where efficient seismographs are installed and above all, where a very accurate time scale is recorded. This last condition is absolutely essential if the seismogram is to be of any use in studying the geophysical problems involved in an earthquake record. It is almost futile to attempt the solution of the many seismic questions presented by the study of one's own seismogram only. We have the same phenomenon, waves of different kinds supposedly, emanating from the same source, sending their pulsations along paths yet not well known, to every part of the earth to be recorded, and now the problem becomes to trace these pulsations, tell us their nature, the medium or mediums through which they have passed, and their properly differentiated velocities. The most expeditious method would seem to be that those stations which are provided with efficient seismographs and with an accurate time scale immediately interchange copies of the record of a tectonic earthquake also giving the instrumental constants involved. The reproduction of the seismograms of the various stations by the Central Bureau, as was done for the Valparaiso and North Pacific quakes, is rather expensive and involves too much time. Only by such means can we hope to successfully attack the problems of seismology.

The general meeting was opened on Tuesday by His Excellency, Mr. Fock, the Minister of Colonies, who in the name of Queen Wilhelmina extended a welcome to the members. After a suitable reply by the president, the meeting proceeded to business, and continued in session for the following two days. German and French were the prevailing languages at the meetings; Professor Omori of Japan and the writer were the only ones to address the congress in English.

The following is a list of the papers presented:—

Lagrange.—A propos des Mistpoeffers de la mer du Nord.

Rosenthal.—Sur le catalogue microséismique de l'année 1904.

Rudolph.—Comment faut-il analyser les sismogrammes?

Oddone.—Discussion statistique du grand catalogue des tremblements de terre connu, survenus dans l'année 1904.

Rudolph.—Sur la publication de sismogrammes du 16-17 août 1906.

Mainka.—Über die neueren Arbeiten im Strassburger Observatorium.

Lagrange.—Mouvement élastiques du sol de la station de Quenast.

Goultieff.—Présentations des sismogrammes.

Prince B. Galitzin.—Seismometrische Studien.

J. Mihailowitsch.—Über die Organisation des seismischen Dienstes in Serbien.

Rosenthal—Remarques sur la propagation des ondes sismiques longues.

Agamennone.—L'eau, cause indirecte des tremblements de terre.

Omori.—On San Francisco, Formosa & Indian earthquakes.

Wiechert.—Die Verwendungen der Erdbebenregistrierungen zur Bestimmung der Beschaffenheit des Erdinnern.

The important question of cataloguing earthquakes, after some discussion was referred to a committee to report thereon. The question may be viewed from different standpoints, and the conclusions arrived at will accordingly differ. To the geophysicist who is particularly interested in the propagation and nature of seismic waves as dependent upon the interior of the earth, it is essential that all the tectonic or world-shaking earthquakes be tabulated for the principal or all the observing stations in the world, giving the data—first preliminary tremors; second preliminary tremors; principal portion; and duration—similar to those given under 'Liste A, Hauptbeben,' in the catalogue of the registered seismic disturbances for the year 1904, and issued by the International Seismological Association. With such data at hand each investigator can utilize them independently. The occurrence or registration of minor or local quakes are of little, or at least less, importance to him. It seems, therefore, highly desirable that these severe earthquakes be catalogued, and chronologically.

For studying the seismicity of the earth's surface, which would include the record of all felt earthquakes, the regional collation of the seisms represented graphically, somewhat on the lines of Montessus' 'Tremblements de Terre,' would probably give one a better grasp of the subject than a numerical tabulation chronological or regional. The graphic representation has the advantage too that in the chart or map the orographic features may be shown, and the relationship between the former and latter established or indicated.

The new science of seismology is developing so rapidly that it is desirable to publish annually a bibliography on the subject, and a committee with that end in view was appointed.

The conference was closed by the government providing a visit to the observatory at Leyden and an excursion over the network of canals. To many the most interesting part of the well-equipped observatory is its historical exhibit,—the clock, the quadrant, the mural circle and other instruments of the great Huyghens. The clock is still kept going, being one of the first pendulum clocks constructed, as Huyghens was the first to apply the pendulum to clocks (1656), although Galileo had anticipated (1641) the idea. It is provided with cycloidal cheeks, a theoretical consideration for isochronoism, but now abandoned in clocks.

The chartered steamer for the round trip to Braasemer Meer was in holiday attire. The greater part of the district passed over is some seven metres (23 feet) beneath the level of the sea; and the canal on which we were, was considerably higher than the meadows adjoining, on which the black and white cattle were grazing. The Braasemer Meer is the remains of the former Haarlemer Meer which has been reclaimed by pumping.

The net result of this conference, in fact of any conference of scientific men, is not the reading of scientific papers, for as a rule there is no time for their discussion, and this is or would be the important feature, but in the personal contact and acquaintance of men labouring in the same field. One learns to appreciate more the work of others, and besides obtains a proper perspective of his own endeavours. As a matter of fact there is probably more benefit derived outside of the regular meetings, than at the sessions. At luncheons, at dinners, at social gatherings in the evening,—at such occasions questions are discussed, points elucidated, and information riveted that no reading or a formal address can give. The manifestation was general that the first meeting of the International Seismological Association was an undoubted success and augured well for the future.

After leaving the Hague various scientific institutions and observatories were visited, and much valuable information was gathered in the various branches or fields of our own work.

The first place visited was the earthquake station at Hamburg. The building with its splendid equipment, the time-service being particularly complete, is due to the generosity of a private citizen and scientist, Dr R. Schütt. To be noted first is that beneath the two instrument rooms are two massive concrete blocks about 26 × 11 feet, and 6½ feet deep, the bottom thereof being 22 feet beneath the surface and resting on marl. A 12-inch air-space separates the blocks from the walls of the building, and the top of the blocks is some four feet beneath the floor of the instrument room. The merit of the blocks is the greater stability, as well as the convenience of requiring to build only small piers resting on it for any other instruments that may be installed at a future time; otherwise it would be necessary to tear up the floor for getting the necessary foundation. This idea of having large cement blocks, deeply imbedded, as a huge pillar on which many small piers may be erected, I found applied at other institutions, and the writer considers it a very advantageous arrangement.

The earthquake equipment consists essentially of a Wiechert astatic 1,000 kilogram pendulum seismometer with two components, air damping and 200 magnification, and of a Hecker horizontal pendulum. The time service was installed according to the design of Riefler of Munich. From the depth of the foundations and piers, together with lack of proper drainage at that depth there is an accumulation of moisture which in spite of the free use of chloride of lime, ranges between 70 to 80 per cent, that is, the relative humidity is that amount. This circumstance seems rather common from my observation at earthquake stations. Weekly and monthly bulletins are issued by this station. This efficient and complete institution is solely for earthquakes and is not an appendage to a larger one.

The next place visited was the Geodetic Institute at Potsdam, where I discussed gravity work with Prof. Helmert and Dr. Borass, the former expressed the desirability of Canada carrying a series of pendulum observations across the continent from Newfoundland to the Pacific. Their new pendulum apparatus (half-seconds) is a frame carrying four pendulums, the object being to have them at the same temperature, and the chamber which can be kept under constant pressure need not be opened till the four observations have been made, and then reversal made. By means of mirrors and prisms all four can be made to give an image in the flash apparatus with which the coincidences are noted similar to ours. The pendulums are at right angles to each other. The observations are made with a pendulum clock (used in field work) for flashing, and which serves too for the necessary time observations. Helmert considers chronometers inferior for pendulum work, and said that if observations of only an hour's duration for a swing are made, as theirs are, then the pendulum clock should be used. However, for observations of eight hour's duration the chronometers are satisfactory.

The apparatus for gravity work on the high seas, as carried out by Professor Hecker between Lisbon and Rio Janerio and in the Pacific, was shown and explained.

It had long been recognized that theoretically it was possible to determine gravity at sea by the comparison of simultaneous readings of the mercurial barometer and of the temperature of boiling water. In the first case the atmospheric pressure is measured by the weight of the mercurial column of the barometer, which is generally expressed in height instead of by its weight. The observed height is not a true measure of the pressure, because it changes with the temperature of the mercury and with the variations in the value of gravity; this latter is the important feature here to be noted. In the second we have water heated in the free air, the elastic force of its vapour gradually increases, until it becomes equal to the overlying pressure of the atmosphere. Then, the pressure of the atmosphere being overcome, the steam escapes rapidly in large bubbles and the water boils. Thus the temperature at which water boils becomes a measure of the pressure of the atmospheric column above it.

The difficulty in the application of these methods hitherto has been the accurate reading of the barometer at sea and the vicissitudes attendant upon the determination of the boiling point. This has in so far been overcome as to render fairly good and accordant results, in giving some definite information over areas where before only surmises prevailed. For the barometric determination five barometers are suspended in a case hung in gimbals and carrying the whole apparatus for recording. To minimize the effect of 'pumping' at sea, the middle of the barometer tube is very contracted. A single small lamp by means of mirrors throws the shadow of the mercury column on a photographic sheet wound on a small cylinder operated by clock-work; on the sheet too is recorded by a clock with electric circuit, a time scale. The barometers are thus self-registering, and the barogram is a serrated line, still due to some pumping. For measurement the mean is taken of these serrations for the time corresponding to the 'boiling' of the thermometers. These latter are read visually to one thousandths of a degree centigrade, the graduations being to hundredths. I was informed that the accuracy of a gravity determination by this method is about one-tenth that by pendulum (on land).

A horizontal pendulum seismograph, Hecker design, is installed too. In connection herewith an interesting statement was made by Helmert, that with such a pendulum at a depth of some 20 metres beneath the surface the effect of the attraction of the moon as well as of the sun was observed, the quantity being about two-thirds of the theoretical value, the other third being lost in the tide of the earth's crust itself.

My next investigation was with reference to the means of measuring base lines. This is effected by an invar wire (not tape) 1·8mm diameter, and 24 metres long, made by Guilliaume (or Charpentier) in Paris. The wire terminates at each end in a triangular piece of about 8cm length, and graduated on one edge, a continuation of the wire to millimetres which are read to tenths. The modus operandi of use is somewhat as follows: Along the base line say of 5 kilometres, pegs (about 2½ inches square) are driven in alignment at 24m, a nail driven in the head, and levels taken of the pegs. At the end of the base line, stone monuments with suitable marks are supposed to be placed. The measurements are made with the wire suspended over two tripods (each over a peg) and under a tension of 10 kilogramme weights, supported on two large tripods, one on each side of the other tripods. Experience shows that the readings, or rather the length of the wire between two tripods, will agree within two-tenths of a millimetre, and that base-lines can readily be measured with a probable error of a millionth of the length. The whole operation of setting up the tripods and taking measurements was carried out for me on the grounds, and I myself took readings and manipulated the tripods supporting the weights, to see with what ease the alignment can be made over the small hemispherical heads of the smaller tripods on which the scale of the wire rests. The method appealed to me for its ease and rapidity of execution. The measurement of a base-line can be made as rapidly as five men can set up (in advance) the tripods over the pegs. For temperature, little or no regard in handling, or exposure to sunshine or rain, is had, on account of the extremely small

co-efficient of expansion. However, the wire requires to be handled with care to prevent torsion or other deformation or damage, as it has its idiosynerasies. It was noticed that when the wire was suspended and under the strain of 10 kgm., that the curve was not a true catenary, but was wavy, irregular however, as if bent. Guilliaume recommended in taking up the wire to allow it to assume its natural bent, which is to roll up like a spiral, and simply gather the coils. However, doing so, it was found that they become smaller and smaller, so that the wire is now wound on an aluminum drum, half a metre in diameter. About invar tapes, Helmert volunteered no opinion, simply as he said, because he had not used any.

A brief visit was paid too on the same grounds to the Magnetic and Meteorological Observatory, where particularly the meteorological instruments were examined. These are practically all provided with electrical apparatus for recording.

The following day was spent in a visit to Friedenau and Steglitz near Berlin at the workshops of Bamberg and Fuess, the former the maker of high-class surveying and geodetic instruments, the latter of a similar grade of meteorological instruments. Much valuable information was gathered at both establishments.

The next place visited was Göttingen, where the Geophysical Institute under the direction of Professor Wiechert was inspected. The prominence the director has obtained in earthquake investigations, makes Göttingen an important station. The earthquake building is built into the hillside, and over the outer entrance is the significant inscription 'Ferne Kunde bringt Dir der schwankende Fels, Deute die Zeichen.' Three seismographs were found installed, all of the Wiechert type, built by Spindler & Hoyer. One is a 1,000 kgm. horizontal pendulum, with two components E. W., N. S., one a 1,000 kgm. vertical pendulum, and a 17,000 kgm. (nearly 19 tons) horizontal one. It may be mentioned that the great weight (1,000 kgm.) of these pendulums is necessitated by the magnification (200 for the 1,000 kgm. and 2,000 for the 17,000 kgm.) desired and from the fact that the registration is mechanical where friction has to be overcome, which, of course, is absent in the photographic apparatus. The chamber is excessively moist, apparently saturated, and many vessels of chloride of calcium are in nse for absorbing the moisture. The roof or rather the ceiling is of cement with I irons. On these latter, by chains, hangs the wooden floor, so that walking about does not affect the pendulums. Atmospheric electricity, together with the electric discharges by rain form a particular line of observation and study here. In the absence of the director, various seismic phenomena were discussed with Professor Zoeppritz and Dr. Linke, recently returned from the earthquake station at Apia, Samoa. The workshops and establishment of Spindler and Hoyer were visited with profit; their specialty is earthquake instruments.

At Strassburg, the central station for Germany, and the central bureau for the International Seismological Association, the various seismographs were examined. The Director is Professor G. Gerland, founder of the association; the active investigator is Professor Rudolph; Dr. Mainka has charge of the instruments; and several specialists are generally engaged here. The examinations of the various instruments and the discussion with the scientists there of the many questions involved in the reading and study of seismograms were of undoubted value to the writer. Amongst other things, the desirability and value of establishing a station at Dawson was pointed out to me. It must be admitted that the reasons that were advanced were valid, and it is to be hoped that at no distant day Canada may add such an important station as one on the Yukon would be, to the series encircling the world.

During my stay in London a visit was paid to the earthquake station at Shide, Isle of Wight, where I met the veteran and eminent seismologist Professor John Milne. There are here two 100-pound pendulums, with mechanical registration, supported by the same iron column, and three with photographic registration. The time-record is hourly, making it thereby rather difficult to obtain very precise readings as regards time on the seismograms. The detached building for the photographic seismographs

is heated in the winter by means of a gas stove or jets, so that the seasonal fluctuation of temperature is confined within about 10° F. By an electrical device on one of the 100-pound pendulums an alarm is sounded when the amplitude becomes large, so that the observer is immediately informed of the occurrence of a severe earthquake, a convenience which cannot be carried out with photographic registration. Milne says he notices more movement of the pendulum due to rain, loading of valleys by water, than to barometric pressure.

In London the establishment of Negretti and Zambra was visited and the various types of meteorological instruments examined in detail. So far no satisfactory device has yet been invented for recording snow-fall, and the apparatus having a float in water for registration is unsuited for our rigorous winter weather. The meteorological station at Camden Square was visited, also the central station and forecast office under Dr. W. N. Shaw, where I was particularly interested in the micro-barograph (20 magnification). It gives relative records of atmospheric pressure, not absolute ones. It is believed by the writer that by means of this instrument some of the pulsations, microseisms, that we find recorded on seismograms may be explained and their cause determined. The introduction of this instrument for the study of meteorological phenomena is yet new, so that its service and value are yet unknown.

The large works of Troughton and Simms at Charlton were visited in connection with the large meridian-circle which they are building or have just built for our observatory, and I attended to its shipment.

I next proceeded to the Physical Laboratory and Meteorological Station near Richmond, and was most cordially received by the director, Dr. Chree. Regarding anemographs of the Robinson and Dines types, it was learned that the former gave a good average velocity but did not show gusts, and the larger the cups the more would gusts be smoothed out on the records, i.e., the cups would be made to spin rapidly and continue to do so after the gust had ceased. In the Dines, however, which depends upon pressure, this would not be the case; on the other hand, as the Dines depends upon pressure and this varies as the square of the velocity, it is not well adapted for small velocities. Examining a Dines anemogram it showed the wind (pressure) to be very variable, changes of from 12 to 2 miles an hour occurring continually within say fifteen minutes. If one drew a smooth curve through these oscillations a fair counterpart of the record of the Robinson would be obtained. For temperature record an electrical thermograph, Callendar method, was considered the best. The writer drew attention to the unsatisfactory results obtained for relative humidity due to the non-accordance of the tables for reduction. It was admitted that the problem was a difficult one, and particularly for low temperatures not much reliance can be placed on the deduced humidity. The hair-hygrometer was considered to do fairly good relative work, but its zero is not reliable. The three hours spent at this institution were most fruitful.

On the following day a brief visit was paid to the Solar Physics Observatory, South Kensington, and the larger problem of 'World Weather' discussed with Dr. W. J. S. Lockyer. It is a subject to which he has paid special attention.

TERRESTRIAL MAGNETISM.

During the past season the observatory began systematic observations for terrestrial magnetism. Mr. Geo. White-Fraser, D.T.S., was the observer, assisted by Mr. J. W. Menzies. Observations before and after the season's work were made at the Magnetic Observatory at Agincourt, near Toronto. For comparison several stations were occupied where officers of the Carnegie Institution, Washington, had observed the preceding year. Besides Agincourt, 32 stations were occupied, their names and position being shown on the accompanying map as well as in the tabular statement of results.

All the magnetic observations were made with a 'Tesdorpf' No. 1977, to be described more fully hereafter. Observations for time and latitude were made with an 8-inch alt-azimuth.

The following instructions were issued to the observer: Until the arrival of the sidereal chronometer, the pendulum apparatus will not be used, and the observations will be confined to those of terrestrial magnetism. As a general guide, as far as applicable to the particular form of instrument (Tesdorpf), the 'Directions for Measurement of Terrestrial Magnetism' given in Appendix 8, Report 1881, United States Coast and Geodetic Survey, will be followed. The records will be kept in their chronological order in a blank book, and in a manner similar to those in the above 'Directions.'

It may be noted that for declinations it is desirable to obtain the diurnal variation, for which purpose the observations should be begun before 7 a.m. and continued until the maximum reading has been reached and passed; and observations again begun shortly after noon, and continued till the minimum has been reached and passed. The mean between the east and west elongations will then be taken. Care must be exercised to remove the torsion of the fibre. Another observation will be taken at about 6 p.m., magnet erect and inverted for the declination.

The magnetic station is to be tied in distance and azimuth to the astronomic station (pier) of the place, and the pier to the nearest established corner, preferably the intersection of the sides of two streets. In case observations are taken where there is no astronomic pier, then connection will be made with some established corner as indicated above. Azimuth of the reference object will generally be taken by the sun. However, if the sun is obscured and Polaris available at night, the latter may be used for azimuth. Latitude may be obtained with sufficient accuracy by meridian altitudes of the sun. In the description for each station it is desirable to note in a general way (in the blank book) the topographical features, the geological formation, nature of any rock exposures and such other information that may assist in interpreting both magnetic and pendulum observations. The height of the top of the astronomic pier above the nearest point of the railway will be determined, and the position of the point with reference to the railway station given. Care should be taken that there is no magnetic substance (knife, keys, buttons, watch, suspenders, steel wire in hat rim) about the person observing.

Description of the Tesdorpf No. 1977.

This type of magnetic instrument was constructed by Tesdorpf of Stuttgart, according to the designs of Eschenhagen. The instrument has been extensively used in Germany, and was used on the German South Polar Expedition in various capacities: during the sea-voyage for the determination of the constants of the ship's magnetic instruments; at the winter stations for absolute measurements; and on the sled excursions in the south polar region; in every case did it serve its purpose well. One of the particular merits which the Tesdorpf has attained is the care which is bestowed upon the selection of thoroughly non-magnetic material in the construction of the instrument.

The Tesdorpf of the Dominion Astronomical Observatory consists of:—

1. Theodolite and Tripod—for the measurement of horizontal angles.
2. Declinatorium for pivot and fibre suspension.
3. Dip circle.
4. Magnetometer—for measuring horizontal intensity by means of deflections and oscillations—together with the intensity magnet. The parts 2, 3, 4 all fit snugly on the central part of the theodolite.

In the following description of the various parts the designations by letter refer to plates 3 and 4. On the two plates the same part has the same letter assigned to it.

On Plate 3 we have a view of the whole apparatus, exclusive of tripod, and on Plate 4 a view of the magnetometer on a larger scale.

The Theodolite.—It is mounted on a plate *U*, Plate 3, which in turn is secured to the tripod by means of a large milled-head screw, the latter serving also to hold the instrument firmly to a board in the packing box. The instrument is made of brass, bronze and magnalium. The limb is movable, is graduated to 20′ spaces, the graduation marks terminating in points, and is numbered to individual degrees. The diameter of the limb is 12 cm., and the reading is effected by two microscopes carrying each a ruling of 10 divisions covering two consecutive graduations on the limb, i.e., 20′, so that the divisions of the microscope represent 2′ and may be read readily by estimation to tenths, i.e., to fifths of a minute. As the theodolite must be used as a stand for the declinatorium, dip circle and magnetometer, the centre of it is free therefor. As the telescope *O* is mounted at the edge of the limb, a counterweight (not shown in plate) is attached at the opposite side. A circular level is mounted on one of the arms of the theodolite, and a striding level *L* is provided for the horizontal axis of the telescope. The telescope has a glass diaphragm attached to the tube of the ocular, having four ruled vertical lines, two very close in the centre and the other two symmetrically situate thereto. For illumination of the diaphragm there is a small opening in the tube of the eye-piece over which is an adjustable mirror *k* by means of which and a glass prism below the opening, light can be thrown on the lines of the diaphragm. The telescope, when observing for declination, is adjusted for focus by means of the reflected image of the lines by the mirror within the declination magnet. The adjusting for focus of object is done by moving the tube carrying both ocular and diaphragm in or out. The telescope being fixed in its Y's, it cannot be inverted.

The Declinatorium.—For the determination of magnetic declination two distinct methods are available; one is by supporting the magnet on a pivot, a fine point; and the other by suspending the (another) magnet by a fibre. Lamont, 1841, who was one of the early observers and investigators after the theory of terrestrial magnetism was placed on a scientific basis by Gauss, showed the preference of small suspended magnets to large ones, and furthermore believed in the greater accuracy attainable by suspension than by support on the pivot, on account of the friction which is always associated with the latter method. Eschenhagen, on the other hand, believed that for field observation where the instrument is subject to the effect of wind, that the pivot is preferable to suspension, especially if the pivot is made very fine—a needle point. It is with a view of meeting both cases that provision is made.

Taking first the pivot declinometer, a, a_1, Plate 3. On account of the difficulty of tempering steel to any great depth from the surface and for specific magnetic reasons, more effective permanent magnets can be produced by building them up of thin laminæ of steel, each of which is separately magnetized, than by magnetizing a solid bar. The magnet a_1, is composed of four magnetized lamellæ placed parallel to each other and separated by 2·5mm. The outer ones are 60mm. long and the inner ones 58mm. Their width is 10mm., and the whole magnet weighs 10 gr. As it is desirable to have the magnet invertible, it is provided with a double agate cap firmly secured in a hollow cylinder having a milled-head screw at each end. The construction of this double agate cap required infinite pains and labour, and great care must be exercised to preserve its virtue. At each end of the magnet there is a plane mirror for reflecting the lines of the diaphragm. Each mirror is adjustable with reference to the horizontal axis of the magnet.* As a rule the observations are made with the telescope pointing north, i.e., with reflections from the south mirror. The inversion of the magnet is effected by a skeleton carrier terminating in the milled-head seen at the

* See Terrestrial Magnetism, Vol. VII., 1902, p. 59, 'Ueber den Einfluss der Spiegel-Collimation bei Spitzen-Aufhaengung auf Declinations-Messungen.'

right-hand end of the chamber. Not only can this carrier be revolved, but within it are two forks or clamps which can be closed or opened for grasping and releasing the magnet. It will be observed that the inversion of the magnet is made without handling it or opening the chamber. As the position of the pivot when the magnet is swinging freely is in the centre of the chamber, it is necessary for the inversion of the magnet that the pivot be removed. This is done by means of the projecting screw on top of the chamber, which lowers and raises the pivot. The pivot itself is a very fine needle, the point of which would readily be broken off, were one to attempt to invert the magnet before first lowering the pivot. In the older form of instruments where heavier magnets were used, it was customary when the pivot was abraded through friction to regrind the point. This was always done at the sacrifice of the tempering. In the present case, a damaged pivot is replaced by a new one which can readily be inserted in its place and its proper height given by a special measuring contrivance supplied with the instrument. The left-hand end of the chamber is covered with a removable plane-glass front towards which the telescope is pointed when observing.

The fibre declinometer V_2 D_2 is seen on Plate 3. It consists essentially of a suspension tube, and a chamber with copper damping in which the magnet m is suspended. The chamber consists of two parts, D_2 and a similar one for the other side, both of which can be removed by unscrewing. In each is a heavy hollow cylinder of copper, within which the magnet moves. The ends of the chamber are covered by two glass fronts, both of which have ground parallel-plane surfaces. Beneath the covering cap V_2 is the screw for adjusting the length of the fibre. This screw passes through the 'torsion' head, moving over a graduation of 12 divisions for the circle, i.e., the intervals are 30°. The small screw b_3, and a similar one on the opposite side, when removed permits lifting off the upper part, when necessary for renewing the fibre. The movable plate y_1, serves for clamping the stirrup from which the magnet is suspended. It is necessary to clamp the stirrup when inverting the magnet, as well as when inserting the magnet, otherwise there would be danger, if not certainty, of breaking the fibre of brass, which when once done by an observer will ensure in the future due caution, as it is a rather trying process to replace it. For security against the dropping of the magnet in case the fibre should break, a pin, hidden in the photograph, passes through the large opening in the stirrup. Before renewing the fibre the pin must be removed by unscrewing, so that the stirrup may be taken out. The pin is also left out when putting in a new fibre until the torsion of the fibre has been removed by means of the small spherical weight T_1, whose mass is the same as that of the magnet m. Similarly the cylindrical weight T is used for removing the torsion from the fibre from which the intensity magnet M is suspended, to be referred to later. The declination magnet m is a hollow cylinder 35 mm. long, and its external and internal diameters 12 mm. and 8 mm., respectively. Within it at the centre and facing its south pole is a mirror for reflecting the lines of the diaphragm of the telescope. For inversion it is provided with two diametrically opposite small suspension bars. For inserting the magnet as well as for inverting it, the part D_2 or the opposite one must be first removed.

The Dip-Circle, J. Plate 3.

The dip-circle is composed of magnalium. The glass front is hinged at the bottom. The circle, 11·4 cm. in diameter, is graduated into 20′ spaces, and the reading is estimated with a magnifier to tenths thereof. Two dip-needles are provided. Instead of terminating in points, as is usual, the needles have rounded ends, and for reading on the graduated circle two short diametrically opposite lines have been cut with a diamond at the ends of each needle. The needles swing just in front of the graduated circle. The pivots of the needles, with which they rest on the horizontal agate supports, have a diameter between ·3 and ·4 mm. The small diameter reduces the error of eccentricity. The needles are placed by means of specially provided pincers

P upon the two forks beside the agate supports, then by moving the lever at the back of the dip-circle the forks are lowered and the needle swings on its support. It is found that it will swing a long time, showing thereby the trueness of the agate supports as well as of the pivots; even within the space of a 20′ division on the circle these oscillations are noticeable. For reversing the polarity of the needles, it is placed on the wooden block F in which there is a recess for the needle, and then by means of the two bar magnets R the reversal is effected. For cleaning and keeping the pivots clean and free from dust, elder-pith is provided. In the photograph the needle is in position in the dip-circle.

The Magnetometer V_1M. Plates 3, 4.

The essential parts are the magnet M, the suspension tube V, the closed box with glass front and back, the telescope h, and the thermometer Te. The suspension tube is similar to the one already described. The box is made of wood in preference to aluminum, which had been tried. The carrier M_4 has its end covered with rabbit fur, and is raised and lowered by means of the button M_3. The magnet M is laid on the carrier which is then raised to the highest point, when with proper adjustment of the length of the fibre the stirrup will just reach the cross bars of the magnet, and the latter may now be pushed over so as to catch when the support is lowered. During this operation the upper part of the stirrup frame M_7 is clamped by means of the clamp moved by the plate u, as is done with the fibre declinometer. The pin referred to before, which prevents the magnet from dropping in case the brass fibre breaks is also applied here and is as shown in M_6. In Plate 4 the suspension fibre and attachment are hung outside of the tube in order to show the different parts. Immediately above the stirrup is the plane mirror M_5, which reflects the scale division ruled on a thin glass disk and mounted in the side of the box, immediately in front of the object glass of the small telescope h. T is the torsion weight, of mass equal to that of the magnet M, and i is a protecting cap screwed over the stirrup when not in use, and when the suspension tube is removed from the box. Near the end of the telescope is seen a hole over which there is a circular adjustable mirror for throwing light on the scale and mirror. For the determination of the horizontal intensity two distinct operations are necessary; one is, by observing oscillations to be more fully described later, for which the immediately preceding described form of magnetometer is adapted; and the other is by observing deflections by a magnet whose magnetic moment is known. In Plate 3 will be seen the two arms, A and a similar one on the other side, into which the intensity or deflecting magnet M is placed. These arms are firmly secured to the theodolite frame by means of the binding screws N, and always fixed in exactly the same position. The arms are hollow cylinders and have the greater part of the upper half cut away for insertion of magnet. One edge of the remaining part of each has a millimeter scale on silver for giving the distance of the deflecting magnet from the centre of the instrument, and the brass millimeter scale bar, Q, which can be inserted through the arms, serves as a check for measuring the distances between various positions of the intensity magnet, when used as a deflecting magnet. The lower side of the arms is slotted for the adjustable blocks $g_1 \ldots . g_8$, which can be clamped at fixed distances, and against one or other of which the magnet rests when observing. As it is important to know the temperature of the magnet, the thermometer $Té$ is inserted into the arm, and to protect against the effect of change of temperature as much as possible the aluminum cylinders H (the second one is not shown) are slipped over the arms, being held by clamps over the binding screws N. The diameter of the cylindrical thermometer bulb is such that it readily enters the magnet when both are in position in one of the arms.

The remaining illustration on Plate 3 is B, which is the ordinary form of compass, and can also be mounted on the central part of the theodolite. The graduation on it

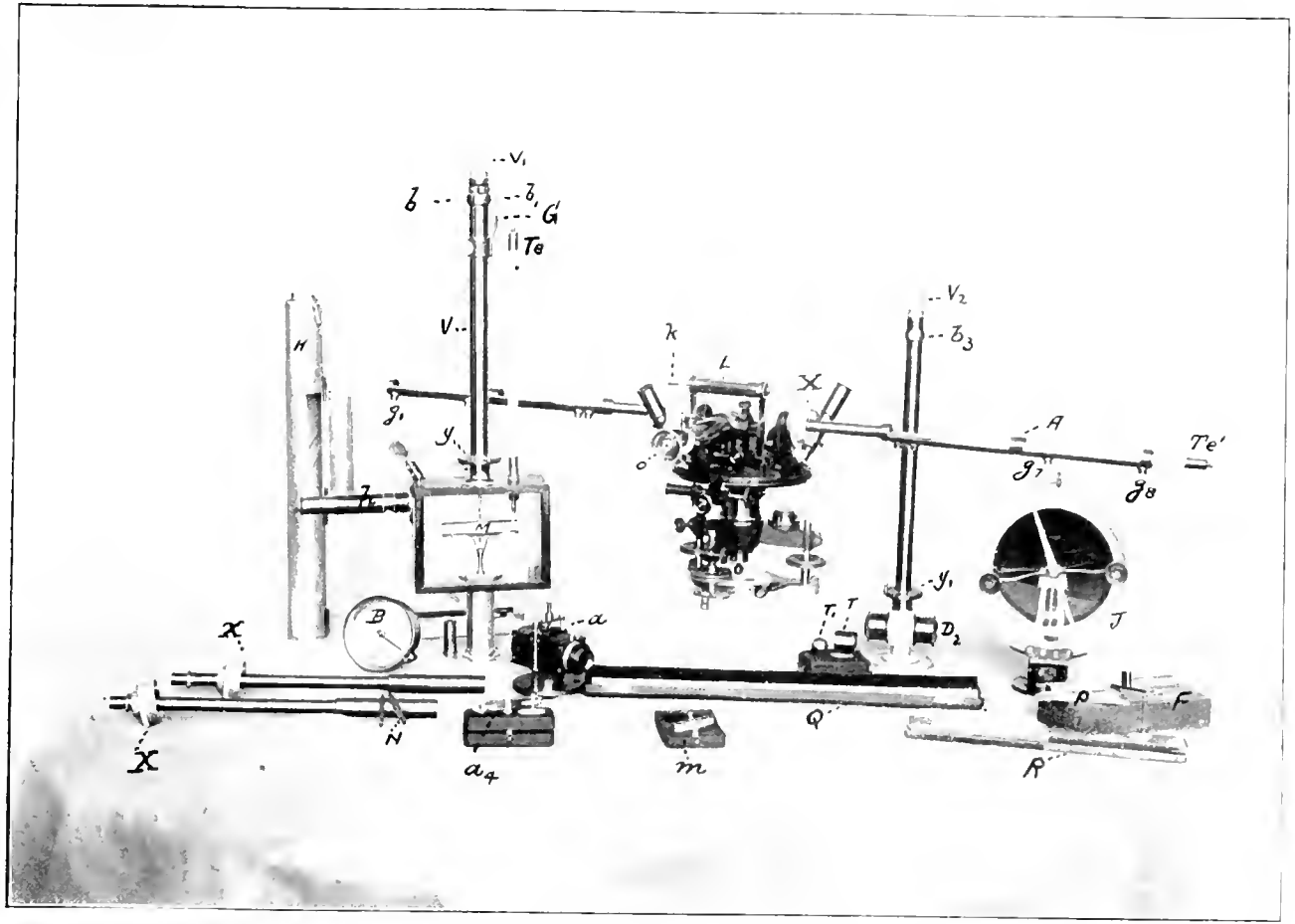
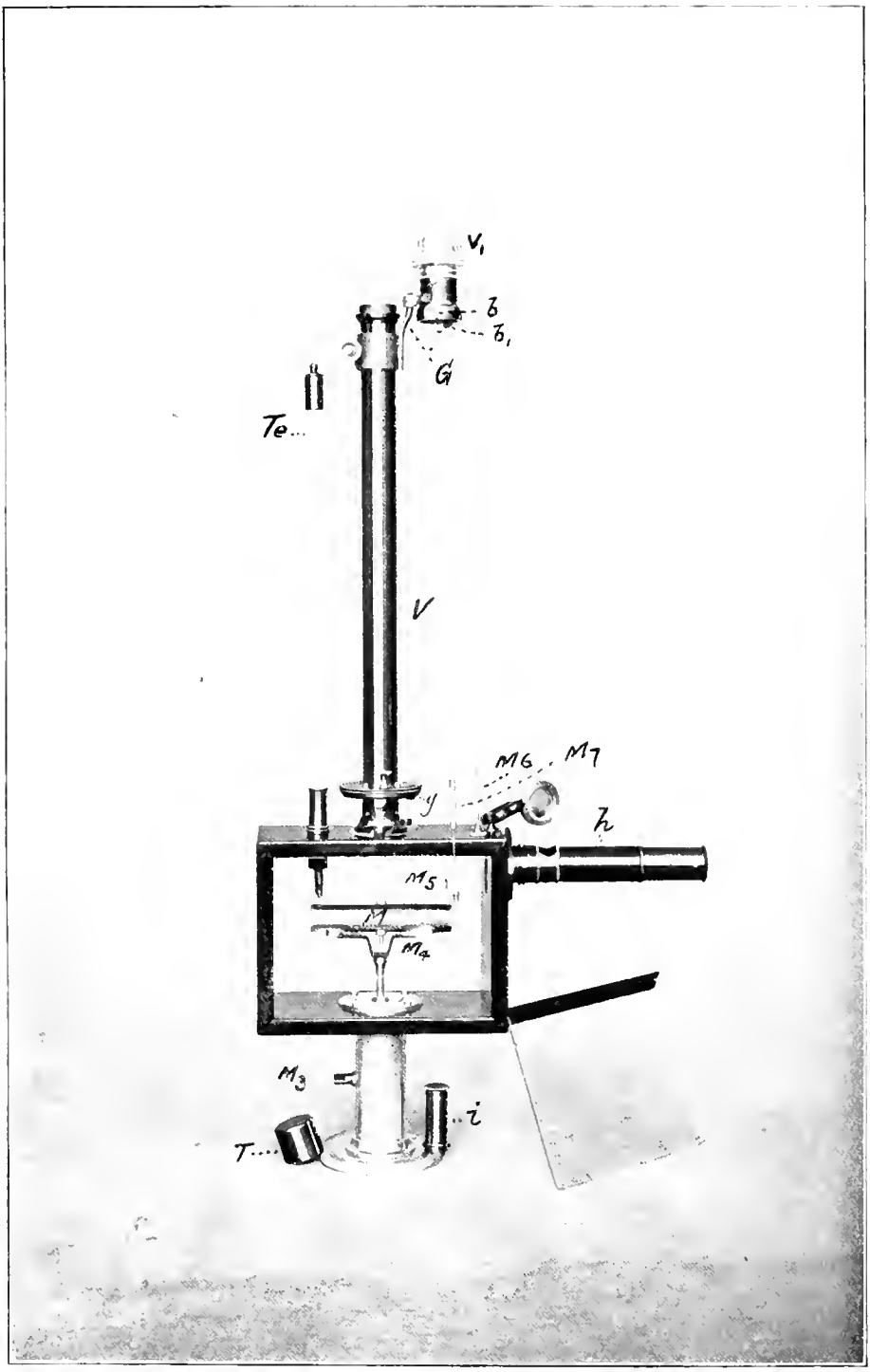


FIG. 3. Tesdorpf Theodolite Magnetometer.



25a—p. 462.

FIG. 4.—Magnetometer.

is to individual degrees and by estimation can be read to fifths or 12′. The compass serves as a rough check on the magnetic declinations.

The Observations.

After selecting a suitable station, and if possible one that may again be occupied at a future date, the first observation is generally for the determination of the astronomical meridian and obtaining the azimuth or true bearing of some prominent objects. The azimuth of a reference object is most readily obtained and with sufficient accuracy from the observed altitude of the sun, circle left and circle right. As 1′ is about the limit of accuracy of reading the direction of the magnet, on account of the continuous fluctuations, it is useless to attempt greater precision for the astronomic meridian. For the purposes of computing the spherical triangle for azimuth the latitude can generally be taken with sufficient accuracy from a map, otherwise a few meridian altitudes of the sun, circle left and circle right, at noon will supply the data. The difference between the astronomic bearing of the reference object and its magnetic bearing gives the magnetic declination. It is west or + declination when the magnetic north lies to the west of the astronomic north; and east or − declination when it lies to the east. As the Tesdorpf 1977 is not supplied with a mounting having a vertical circle, it is necessary to carry along another instrument wherewith the astronomic observations can be made, as well as any survey to connect the magnetic station with some permanent reference point.

All the magnetic observations were made in a specially made tent, ventilated, and all parts, of whatsoever nature, were non-magnetic.

The observations with the pivot-declinometer are simple, but great caution must be exercised not to damage either the fine needle pivot or the finely ground agate cup or support.

The magnetic theodolite is first accurately leveled. Before mounting the magnet chamber on the alidade, the skeleton carrier is withdrawn, first removing, however, the glass front which locks into the carrier frame, and making sure that the pivot is lowered. The magnet is then placed with the south end towards that end of the chamber having the plane-parallel glass front within the open jaws of the clamp, the movable milled-head is turned from A to Z with reference to the index mark; the A on the head signifying 'open' (auf), and Z 'closed' (zu). The carrier is then carefully put into the chamber with an upward tilt, to avoid any possibility of touching the lowered pivot, snapped into place by the small spring at the carrier-head end of the chamber. The glass front is replaced, and the chamber is now placed on the instrument and clamped in position. The telescope is turned so as to point approximately north. The magnet is released by moving A into co-incidence with the index mark when it will rest at each end within the copper blocks. The pivot is then raised to its full height, and the magnet will now swing freely. Looking into the telescope, we see directly in the lower half of the field the lines of the diaphragm, while the reflected image by the mirror of the magnet will move to and fro across the field, providing the setting is fairly near the meridian, which if not is readily made so by turning the upper plate of the theodolite on which the telescope is mounted in the proper direction. There may be a little difficulty at first in seeing the image at all; however, by tilting the telescope slightly, when its pointing is near the magnetic meridian, a moving 'half moon' will be seen, whereupon accurate adjustment can be made, so that the direct and reflected images cover each other. For seeing the lines well, the small mirror on the telescope requires careful setting. Dependent upon the setting of the mirror, a small change may cause the lines to appear dark on a light background, or light on a dark background. The pointing for the magnetic meridian is made by observing small symmetrical oscillations of the reflected image of the middle lines about the direct image, instead of co-incidence, as the magnet is never at rest, using the tangent screw of the upper plate of the transit for fine adjustment.

The two microscopes are then read, which gives a reading for the magnetic meridian. The operation is repeated after first lowering and then raising again the pivot. The magnet is then inverted, lowering the pivot, however, first, and after inversion raising it again. Another duplicate set of readings is taken as before. The mean local or standard time should always be noted for the observations.

It is desirable when observing for declination that the daily or solar-diurnal variation be determined. The north end of the magnet reaches its most easterly deflection or elongation shortly after sunrise and its most westerly deflection or elongation about an hour after noon. The average time for the year for eastern elongation is about 7h 30m a.m.; for western elongation about 1h 30m p.m. In its daily movement the direction of the magnet crosses the magnetic meridian twice, once at about 10.30 a.m., and again at about 7.30 p.m. In summer, the times are a little earlier and in winter a little later than those above given. The observations for eastern elongation are commenced a little before 7 a.m., and readings are noted every 15 minutes until the maximum deviation is reached and passed. Similarly for western elongation, readings are begun about 12h 30m p.m. and continued until the western maximum has been reached and passed. The difference between the east and west maxima gives the daily range, or more precisely the range for the day of observation, for the daily range is subject to an annual inequality, which is greater in summer than in winter, the difference being between 3′ and 4′. The observations for elongation are taken in the same position of the magnet, so that the mean of the east and west readings for the magnetic meridian must be corrected for the position of the magnetic axis, obtained from the readings of the magnet direct and inverted, or N up and N down. Beside the observation for elongations, another and direct observation for the magnetic declination is made, generally about 6 p.m., when the direction of the magnet is approaching the magnetic meridian, and with the magnet direct for the one set of readings, and inverted for the other set. From this latter observation the position of the magnetic axis of the magnet is obtained, necessary for the reduction of the observations at elongation.

The observations with the fibre declinometer are similar to those of the pivot declinometer, with the addition, however, of elimination of the torsion of the fibre. The torsion is removed by suspending from the fibre a small brass weight already referred to, of the same mass as the declination magnet. When it comes to rest the torsion is removed; by means of the torsion head the line of detorsion is placed in the magnetic meridian, in which position it is parallel to the sides of the chamber or in line with the telescope. Several trials may be necessary to effect this. It is desirable at every station to suspend the weight to test the accuracy of the position of the line of detorsion. In case the fibre should break, it is necessary after inserting a new fibre to remove the pin passing through the stirrup to allow the fibre to untwist, when the pin is again put in place. For the determination of the magnet inclination by means of the dip-circle, the following observations are necessary: The inclination is measured in the plane of the magnetic meridian. When the north end of the needle dips below the horizon the inclination is considered +, when above the horizon —. The needle may be placed in the magnetic meridian, i.e., the direction of the axis of needle east and west, either from the known direction of the magnetic meridian, or by means of the needle itself. Observations for the determination of magnetic declination generally precede those for inclination, when the direction of the magnetic meridian has been obtained, and the dip-circle can then be readily placed in the proper position. If the direction of the magnetic meridian is not thus known, we obtain it from four readings of the inclination needle when pointing vertically, which it does when in the magnetic prime vertical. The four readings on the azimuth circle are taken in the positions: Face of circle south with face of needle successively south and north; and next face of circle north with face of needle successively north and south. The mean of the four readings on the

azimuth circle ± 90° will then define the direction of the magnetic meridian in which the observations for dip are made. These latter are similarly made in four positions as above, only that the face of the circle and the face of the needle are alternately east and west. Another set is taken with the polarity of the needle reversed, so that for a complete determination of the magnetic inclination we have eight individual observations. The object of the reversals is for the elimination of errors. By reversing the dip-circle its index error is eliminated as well as any small error in the level or the verticality of axis; by reversal of the face of the needle on the agates the error arising from imperfection in its transverse balance and from non-coincidence of its geometrical and magnetic axes is eliminated; and by reversal of polarity the effect of the unsymmetrical distribution of the mass with reference to the axis of rotation of the needle is eliminated.

For reversing the polarity of the needle it is placed in the block, *F*, provided therefor and secured in position by a spring clamp through which the one end of the axis passes. The two bar magnets, one in each hand, are then brought with opposite poles against the clamp, and held at an angle of about 30° to the horizon. They are then drawn slowly and simultaneously over the needle and along the ledge of the block to maintain uniformity of direction. The end of the needle having north polarity has the north end of the bar magnet passed over it to change it to south polarity, and similarly the end of the needle having south polarity has the south end of the other bar magnet passed over it to change it to north polarity. These strokes are repeated four times, each one passing completely over the needle and returning a few inches above the needle by a uniform motion of both hands to the clamp for repetition. The needle is then turned over and the operation is repeated. To correct for any inequality in the intensity of the two bar magnets, one-half of the operation of reversal of polarity of the needle may be made with the north and south poles of the bar magnets held in one position, then exchanging the magnets in the hands inverting them and applying the other two poles to the other side of the needle.

The Determination of Horizontal Intensity.

The principle involved in the determination of the horizontal intensity is very simple. We observe in the one case the time of oscillation of the horizontally suspended intensity magnet. Here we have the combined effect, usually designated by $m\ H$, of the magnetic moment of the oscillating magnet and of the earth's magnetic energy, acting as a couple upon the magnet. In the other case, that of deflection, we observe the differential effect, usually designated by m/H, of the same two forces. The value of the quantities entering into the two equations for $m\ H$ and m/H respectively being known, either from direct observation or as constants, m and H can be eliminated. The total intensity F follows then directly from the relationship $F = H$ Sec I, where I is the inclination or dip. For observing oscillations the intensity magnet is suspended from the fibre in the magnetometer. When the magnet is at rest the reflected image of the centre of the scale, by the small mirror above the stirrup, should be coincident or nearly so with the vertical thread. The oscillations should be in a horizontal plane and up and down motion avoided. It is customary to observe every fifth transit of the image, counting transits both to the right and the left. Before beginning recording, however, we observe a number of transits, noting the time of the first and last transit by a mean time chronometer, for getting the approximate interval for five transits, so that one need not keep the eye constantly at the telescope, nor keep up the consecutive counting of transits one, two, three and so on, but instead, knows in advance within a second or so when the respective, fifth tenth, fifteenth,.....transit will take place, and be ready to note by 'eye and ear,' the time being given by the half-seconds beat of either a pocket or box mean time chronometer, and estimated to a tenth of a second. If the first transit, say to

the right, be denoted by 0, the following transits to be noted to the right will be 10, 20, 30 and so on, while those noted to the left will be 15, 25, 35 and so on. By noting the transits to the right and to the left, the effect of any change in declination during the observation is eliminated. In order to obtain an accurate value of the time of one oscillation, we compare the times between two transits in the same direction separated by an interval of many oscillations, generally a hundred; and from the mean of a group of about 10 such intervals, an equal number of which are to the right and to the left, we get the time of one oscillation. In connection with the observations for oscillation the temperature of the magnet is noted by the thermometer, the bulb of which projects within the oscillation box; and the value of the torsion co-efficient is obtained from the change of horizontal circle reading by turning the torsion head three divisions (90°) to the right and then to the left from its position during the oscillations.

In observing for deflections, we obtain the ratio of the magnetic force of the deflecting magnet, being the one used for oscillations, and the horizontal force of the earth's magnetism. The declination magnet is suspended in its chamber as when observing for declinations, the line of detorsion being in the plane of the magnetic meridian. Before placing the deflecting magnet in position, pairs of blocks in the deflecting arms are fixed at equal distances from the centre of the instrument by means of the graduations on the arms, as well as the distance between them by the millimetre-scale brass rod. The deflecting magnet is then placed in position against the block and the declination magnet is suspended at the same height as the deflecting magnet. The horizontal plate of the theodolite with telescope is then turned until the reflected image of the diaphragm by the mirror in the declination magnet coincides with the direct image. Then the deflecting magnet is at right angles to the deflected or declination magnet and the horizontal circle reading is noted. The deflection angle is the difference between this latter reading and the reading of the horizontal circle for the magnetic meridian. Another reading is now taken at the same distance, but with the position of the poles reversed, *i.e.*, if the first position was with north end of magnet east, the next will be with north end west. Then the magnet is placed into the other arm and at the same distance as with the former, and readings similarly obtained for north end east and north end west. The whole of these four readings are now repeated, but at another distance equally set off by the movable blocks in the arms; the shorter distance should be about or a little less than four times the length of the deflecting magnet. In each of these two sets, theoretically the mean of two readings for two symmetrical positions of the deflecting magnet with reference to the declination magnet should give the horizontal circle reading for the magnetic meridian, and the difference between the two readings twice the angle of deflection of the deflecting magnet against the directive force of the earth. So, too, should the mean and difference of the two readings for one distance on one arm, but with magnet north end east and north end west, give respectively the magnetic meridian and double the angle of deflection. The time of beginning and ending of the observations is noted and also the temperature of the deflecting magnet by inserting the thermometer into the arm and magnet.

The following quantities enter into the computation for the reduction of the observations of oscillations and deflection for obtaining the value of the horizontal component of the earth's magnetic force:—

T_o = Observed time of one oscillation.

T_1 = Observed time of one oscillation corrected for rate of chronometer, and arc of vibration. For small arcs the latter correction is very small and may be neglected.

T = Time of time of oscillation, corrected for rate.

$\frac{h}{f}$ = Ratio of the force of torsion of the suspending fibre to the magnetic directive force.

q = Correction for the decrease of the magnetic moment of the magnet produced by an increase of temperature of 1°.

K = Moment of inertia of the magnet, inclusive of stirrup and other appendages. (This is constant for the same magnet and suspension, but varies slightly with temperature, owing to the expansion of the materials.)

μ = Increase in the magnetic moment, m, of the magnet produced by the inducing action of a magnetic force equal to unity of the system of absolute measurement.

m = Magnetic moment of the oscillating or deflecting magnet.

H = Horizontal component of the earth's magnetic force.

u = Observed angle of deflections.

$a\,a_1$ = Semi-arcs of oscillation at the beginning and end of observation. The correction to T_0 for arc is $\left(1 - \frac{a\,a_1}{16}\right)$ where $a\,a_1$ are expressed in radians.

r = Distance, corrected for error of graduation and temperature, between the centres of the deflecting and deflected magnets.

P = Co-efficient depending upon the distribution of magnetism within the deflecting magnet, and is determined experimentally from a series of observations by means of deflections at two or three distances. To find P let A = value of $\frac{m}{H}$ for the shorter distance r, and A' = value of $\frac{m}{H}$ for the longer distance r_1, then $P = \frac{A - A'}{\frac{A}{r^2} - \frac{A'}{r_1^2}}$

We have then

$$T_1 = T_0\left(1 + \frac{s}{86400} - \frac{a\,a_1}{16}\right)$$

where s is the rate per day, + for losing and − for gaining rate.

$$T^2 = T_1^2\left(1 + \frac{h}{f}\right)\left(1 - (t' - t)\,q\right)\left(1 + \mu\,\frac{H}{m}\right); \quad m\,H = \frac{\pi^2 K}{T^2}$$

$$\frac{m}{H} = \tfrac{1}{2}\,r^3\left(1 - \frac{P}{r^2} - \ldots\right)\left(1 + \frac{2\,\mu}{r^3}\right)\operatorname{Sin} u$$

or

$$\frac{H}{m} = \left[\frac{2\left(1 + \frac{P}{r^2} + \ldots\right)}{r^3\left(1 + \frac{2\,\mu}{r^3}\right)}\right]\frac{1}{\operatorname{Sin} u} = \frac{C}{\operatorname{Sin} u}$$

hence

$$\log H = \tfrac{1}{2}\left(\log \frac{H}{m} + \log m\,H\right)$$

The value of q for 1° centigrade for deflecting magnet 46 Tesdorpf as determined by Mr. R. F. Stupart, director of the magnetic observatory at Agincourt is ·00045; of the induction co-efficient μ = ·0000072, and log $\pi^2 K$ at 0°C = 9·465511. The dimensions of the inertia cylinder used for the determination of K were:—

Length at 0°C = 94·49mm
Diameter 0°C = 10·11mm
Weight = 63·169 grammes

"The inertia cylinder used was that supplied with Kew magnetometer 48. In experiments it was suspended with silk thread below magnet and also for sake of comparison was placed inside No. 46 (Tesdorpf), the results being almost identical. $\frac{\triangle m}{m} = \mu \frac{H}{m}$ was determined by deflecting bifilar magnet, and from result the value of induction co-efficient = ·00000702 was obtained.'—(Stupart.)

In the accompanying table for Magnetic Results the following explanatory notes are added.—The stations are arranged in order of longitude. All the declination observations were made with the fibre declinometer. For eastern elongation of the magnet, observations were begun before 7 a.m. and readings taken every ten or fifteen minutes until the magnet had attained its most easterly position and begun its westerly movement. The maximum reading and its corresponding time were then taken for the easterly elongation; similarly it was done for the observations begun shortly after noon for westerly elongation, where the minimum reading and its corresponding time were taken. The position of the magnet was the same for both elongations. The mean of these two readings, corrected for axis of magnet, gives the horizontal circle reading for the magnetic meridian, and this reading, compared with the reading on the reference object, whose azimuth has been determined by observations, then gives the angle between the magnetic and astronomic meridians, *i.e.*, the declination, which is entered in the column 'Declination – Mean of Elongations.'

At nearly all the stations observations for declination were taken on two days.

The times recorded for the various observations were standard time for the respective place, and subsequently reduced to L. M. T., the local mean time for each place or station.

The accompanying map shows the position of the various stations given in the table, and the direction of the magnetic meridian at the respective stations or places.

Stations Occupied.

Following are the descriptions of the positions of the magnetic stations occupied during the past season. Besides these verbal descriptions there is on file a sketch for each station and photograph showing the position with reference to surrounding objects, lots, streets and natural features. The azimuth given is reckoned from the north through the east, from 0° to 360°.

Sydney, N.S.—Occupied October 29 to November 2, 1907. Latitude 46° 06′·6; longitude 60° 12′·0. This station is located in Victoria Park. Reference Object: Spire of Falmouth Street Presbyterian Church. Azimuth of Reference Object: 150° 02′·25. The surface is level and clear, with gradual slope to bay. Conditions apparently satisfactory.

Mulgrave, N.S.—Occupied November 4 to November 6, 1907. Latitude 60° 22′·5. Station located on clear spot east of I. C. R. station and one thousand feet distant therefrom. Reference Object: Spire of Methodist church. Azimuth of R. O. 71° 21′·55. The surface rises from water level at I. C. R. station to an elevation of about one hundred and ten feet at magnetic station. In the vicinity of the latter, it is much broken up, with many boulders and loose rock showing. The rock, however, did not, on trial, appear to affect the magnets in any way. The slope continued rising, being very uneven and covered with rough bush.

Antigonish, N.S.—Occupied November 7 to November 9, 1907. Latitude 45° 36′·6. Longitude 62° 43′·5. Station located in C. A. E. Tennis Court Grounds. Reference Object: Flag pole on post office. Azimuth of Reference Object: 123° 16′·3.

Pictou, N.S.—Occupied October 25 to October 28, 1907. Latitude 45° 37′·9. Longitude 62° 43′·5. Station located in C.A.E. Tennis Court Grounds. Reference Object: Spire of St. Andrew's church. There are two spires close together. The R. O.

is the lower one, and to the west of the higher. Azimuth of R. O., 180° 01′·65. Tennis Court is on level ground on the top of the somewhat rapid slope to the bay.

Truro, N.S.—Occupied October 21 to October 24, 1907. Latitude 45° 20′·2. Longitude 63° 15′·0. Station at entrance to Victoria Park. Reference Object: Spire of Presbyterian church. Azimuth of R. O. 139° 24′·4. Station on flat ground near river; the sides of the valley of which are distant two hundred feet to the west, about five hundred feet to the east, and rise to about two hundred and fifty feet. The valley narrows considerably in Victoria Park. The I. C. R. tracks are distant at least one thousand feet.

Pugwash, N.S.—Occupied October 18 to October 21, 1907. Latitude 45° 50′·2. Longitude 63° 40′·5. Station located in field belonging to Dr. Clay. Reference Object: The peak of the lighthouse roof. Azimuth of R. O. 334° 35′·0. Station at the mouth of the Pugwash river about fifteen feet above water level. Level and open ground.

Shediac, N.B.—Occupied November 16 to November 17, 1907. Latitude 46° 12′·1. Longitude 64° 31′·7. Station located in a field behind the Weldon House. Reference Object: Spire of Presbyterian church. Azimuth of R. O. 231° 33′·45. Ground level and clear, with gentle slope to bay.

Moncton, N.B.—Occupied October 14 to October 16, 1907. Latitude 46° 06′·8. Longitude 64° 42′·7. Station located in field below Minto Hotel. Reference Object: Spire of St. John's Presbyterian church. Azimuth of R. O. 34° 36′·6. Ground quite flat, no near buildings, river embankment one hundred and fifty feet distant.

Richibucto, N.B.—Occupied November 11 to November 13, 1907. Latitude 46° 40′·6. Longitude 64° 51′·7. Station located in post office grounds. R. O., flag pole of post office. Azimuth of R. O., 112° 56′·5. This station is favourably located, about ten feet above sea level. Surface level and clear.

Newcastle, N.B.—Occupied November 14 to November 16, 1907. Latitude 46° 58′·2. Longitude 65° 33′·0. Station located in field near I. C. R. station. R. O., spire of Presbyterian church. Azimuth of R. O., 21° 46′·0. All conditions apparently favourable. Surface level and clear. I. C. R. at least one thousand feet distant.

Bathurst, N.B.—Occupied November 18 to November 20, 1907. Latitude 47° 37′·5. Longitude 65° 39′·0. Station located in field belonging to Mr. S. Leger. R. O., spire of Roman Catholic church across channel. Azimuth of R. O. 91° 31′. All conditions favourable. Surface level and clear. Point about ten feet above sea level. I. C. R. tracks at least one thousand feet distant.

St. John, N.B.—Occupied October 1 to October 4, 1907. Latitude 45° 16′·7. Longitude 66° 00′·7. Station located on Gilbert property, facing Gilbert's lane to the north of the city. Reference Object, spire of Leinster Baptist church to left of hospital. Azimuth of Reference Object, 179° 16′·9. This station is situated in a field about 250 yards from the I. C. R. tracks and about one hundred and ten feet above them. To the north and west the surface rises abruptly in rocky hills, forming the right slope of the valley of Marshy creek, covered with rough brush. The station itself is on a knoll, with a rapid fall to the level of the tracks, which are about twenty-five feet above high tide level.

Mispec, N.B.—Occupied October 9 to October 11, 1907. Latitude 45° 13′·3. Longitude 66° 05′·7. Station located in neighbourhood of pulp mill. Reference Object, tower of pulp mill. Azimuth of Reference Object, 114° 12′·05. The surface is very broken and rough in this neighbourhood, with much rock and rough bush. To the northwest from magnetic station it rises rapidly to rocky elevation, probably

eight hundred feet above sea level. To the south and east it falls equally rapidly to a stream which falls into the bay about half a mile away. The station itself being probably three hundred and fifty feet above the sea level.

Matapedia, Que.—Occupied November 21 to November 24, 1907. Latitude 47° 56′·5. Longitude 66° 56′. Station located on the bank of the Restigouche river, on the field belonging to the Hunting Club, to the south of the I. C. R. Reference Object, cross on Roman Catholic church. Azimuth of R. O. 281° 21′·0. Conditions apparently favourable. Surface level and clear. Tracks six hundred and fifty feet distant. Certain amount of loose rock which, however, on trial did not affect the needle.

Megantic, Que.—Occupied September 20 to September 24, 1907. Latitude 45° 34′·4. Longitude 70° 53′·2. Station located in the southeast corner of field. Reference Object, flag staff of school house in Megantic. Azimuth of R. O., 329° 01′·95. The station is strictly not in Megantic, but in the village of Agnes across the Chaudière river. The surface is open, being cleared of bush, but large stumps left in situ, gently sloping towards the river and lake. No rock showing. At least one thousand feet from C. P. R. tracks.

Tring Junction, Que.—Occupied September 25 to September 27, 1907. Latitude 46° 15′·5. Longitude 71° 09′·7. Station located in field to west of Q. C. station. Reference Object, higher spire of Roman Catholic church at St. Frederick, two miles away. Azimuth of Reference Object, 29° 58′·33. The surface is level and open, no outcroppings, nor near bush. Station distant about two hundred and fifty yards from the Q. C. tracks and on a level with them.

Sherbrooke, Que.—Occupied September 13 to September 18, 1907. Latitude 45° 23′·9. Longitude 71° 56′·2. Station located on Pembroke avenue. Reference Object, spire of new Catholic church. Azimuth of Reference Object, 92° 56′·4. This station is on the public highway, at the intersection of Pembroke ave. and Victoria street. The former here terminates, and there is little prospect of the town extending in this direction. The ground is level and open and quite elevated above the valley of the Yamaska river. There were no outcroppings of rock in the vicinity.

Farnham, Que.—Occupied September 7 to September 11, 1907. Latitude 45° 16′·1. Longitude 73° 01′·5. Station located in field belonging to McCorguil Estate, south of C. P. R. tracks. Reference Object, spire of Methodist church. Azimuth of Reference Object, 36° 22′·46. This station is at least one thousand feet from C. P. Ry. tracks. The surface level, clear and open, no rock or bush.

Brockville, Ont.—Occupied August 31 to September 4, 1907. Latitude 44° 35′·9. Longitude 75° 33′·0. Station located in field belonging to Mr. C. S. Cossitt, near G. T. R. station and schoolhouse. Reference Object, spire of First Presbyterian church. Azimuth of Reference Object, 74° 13′·3. Surface level and open, no rock, no near buildings. Tracks three hundred yards distant.

Kingston, R.M.C., Ont.—Occupied August 19 to August 21, 1907. Latitude 44° 13′·8. Longitude 76° 28′·20. (R.M.C. observers.) Station located in playing field of R.M.C. Reference Object, spire of Brock St. Methodist church. Azimuth of Reference Object, 259° 18′·45. The surface conditions are apparently satisfactory. Ground level and open. The College is six hundred and twenty-five feet distant. The weather during the observations satisfactory. The declination, however, is so very much greater than might be predicted from the declination at Sharbot Lake to the northwest, and Brockville to the east, as to show some local influence, more or less constant. This deduction is strengthened by the fact that the east and west elongations observed independently on successive days corroborate each other very closely, with a range of about 15′, and the declinations taken at 5.30 p.m. on these successive days give an

average declination agreeing with the mean of the elongations within 1′. It is well known that some local influence renders the mariner's compass useless in that neighbourhood, and Capt. Russell-Brown, Instructor in Geodesy and Surveying at the R.M.C. stated that a compass survey there would not nearly close, and that he could get many varying declinations across the field.

Kingston, Old Artillery Barracks.—Occupied August 23 to August 25, 1907. Latitude 44° 15′·2. Longitude 76° 29′·2. Station a relocation of Capt. Lefroy's, in 1849. Reference Object, the north side of the western cross on 'House of Providence.' Azimuth of Reference Object, 155° 02′·26. The station is probably a correct relocation of Capt. Lefroy's within ten feet. The results obtained are probably not very reliable, as the Old Barracks (now used as a store) is within one hundred feet. The artillery stables (now in use) are within eighty feet. The armoury of the Kingston regiments within three hundred feet, and the Kingston Electric Railway runs to the southeast within two hundred feet and to the northwest within six hundred feet. All observations, however, were taken on Sunday, when the electric railway does not operate. The observations, however, for declination and dip (horizontal force was not observed) seem quite accordant. The range between elongations was 17′; the declination taken at 5.45 p.m. agrees within 1′ with the mean of the elongations and the dips agree with a range of 3′.

Kingston Junction, Ont.—Occupied August 27 to August 28, 1907. Latitude 44° 15′·2. Longitude 76° 28′·0. Station located in field belonging to Mr. Elliott. Reference Object, cross on St. Mary's cathedral in Kingston. Azimuth of Reference Object, 181° 37′·8. This station is proximate relocation of that occupied in 1906 by the Carnegie Institution, and which was described as being a given distance from two trees, and azimuth of the Reference Object 182° 26′·8. Where there are many trees it is a matter of uncertainty to select any particular two. The visible surface conditions appear favourable and although it appears likely that the same local disturbance that affects what might be calculated to be the three magnetic elements at Kingston city, would have some influence here, still the individual observations taken are closely accordant.

Sharbot Lake, Ont.—Occupied August 12 to August 16, 1907. Latitude 44° 46′·4. Longitude 76° 41′·2. Station selected in a field lying to the north of the railway station between the K. & P. track and an arm of the lake. Reference Object, pole of railway watering tank. Azimuth of Reference Object, 225° 56′·0. This station is situated on the top of the bank sloping rapidly to the lake, and about sixty feet above the water level. It is about eight hundred feet from the nearest point on the K. & P. tracks and about fifty feet above them. The surface surrounding the station is open and clear, with no apparent disturbing conditions.

Pembroke, Ont.—Occupied July 26 to July 28, 1907. Latitude 45° 49′·3; Longitude 77° 07′·5. Station selected in field belonging to Mr. Peter White, jr. Reference Object, spire of Presbyterian church. Azimuth of Reference Object 288° 56′·0. Surface clear and open, level. Apparently favourable conditions. Station about one hundred and ten feet above railway tracks and quite distant therefrom.

Barry Bay, Ont.—Occupied August 8 to August 9, 1907. Latitude 45° 28′.77. Longitude 77° 24′·6. Station selected in open ground near the school house. Reference Object, spire of Roman Catholic church. Azimuth of Reference Object 78° 10′·14. The surface is level and open, a low rocky knoll is situated about five hundred feet to the west, but in the near vicinity there is no outcropping. All conditions apparently favourable.

Mattawa, Ont.—Occupied July 23 to July 24, 1907. Latitude 46° 19′·7. Longitude 78° 41′·0. Station selected on Hudson's Bay Co.'s reserve. Reference Object, the flag-pole on the school house across the river. Azimuth of Reference Object, 138° 24′·9. Conditions apparently quite favourable, surface clear and sloping gradually to the water level at confluence of Mattawa and Ottawa rivers, on the point between which the Hudson's Bay Co.'s reserve is situated. From the water it slopes gradually up, culminating in the low rocky sides of the valley. No disturbing conditions apparent.

Joe Lake, Ont.—Occupied August 5 to August 7, 1907. Latitude 45° 35′·2. Longitude, 78° 46′·5. Station selected on 'Algonquin Hotel Reserve,' about three hundred and fifty feet south of the hotel. Reference Object, the peak of the south gable of the hotel. Azimuth of Reference Object, 310° 26′·0. It was difficult to find a convenient and favourable spot for a magnetic station. The surface is much broken up, covered with a dense bush, and much rock, which however, did not on trial appear to affect the needle. The station is distant about eight hundred and fifty feet from the Canada Atlantic Railway tracks and about forty-five feet above them.

North Bay, Ont.—Occupied July 18 to July 20, 1907. Latitude 46° 18′·3. Longitude 79° 24′·7. Station selected on waste ground at east extension of Sherbrooke street. Reference Object, spire of English church (on Sherbrooke street). Azimuth of Reference Object, 235° 50′·45. All this district is subject to the comment that rock is never very deep below the surface. On trial, however, bits of boulders did not apparently affect the needle. The surrounding surface is fairly level and clear and open.

Rose Point, Ont.—Occupied July 31 to August 4, 1907. Latitude 45° 19′·1. Longitude 80° 15′·0. Station selected on small island known as 'Sloop Island.' Reference Object, the pole surmounting the cupola on the northeast side of the Canada Atlantic Railway station. Azimuth of Reference Object 177° 38′·8. Sloop Island is not more than one-quarter acre in extent, and is on the west side of the narrow channel used by the boats plying between Rose Point and Parry Sound. It is a mere rock; the entire district is no better, being covered with only a few spruce and shrubs. The broken boulders scattered about affected the needle very greatly when brought to within five or six feet, and care was taken to remove all possible to a considerable distance. At the same time, the independent observations of the east and west elongations of declination, taken on three successive days, corroborate each other very closely, although the range is only 9′.

Sudbury, Ont.—Occupied July 15 to July 17, 1907. Latitude 46° 29′·0. Longitude 81° 00′·0. Station selected on waste ground on east extension of Minto street. Reference Object, small pole on top of water tower. Azimuth of Reference Object 13° 58′·6. Surface in immediate vicinity level and open. A small creek flows through a valley, the sides of which rise about one hundred and fifty feet above the water. Although there is not much rock showing in the valley bottom, still the entire district has rock foundation, never very deep below the surface. The rock, however, did not appear to affect the needle.

Chapleau, Ont.—Occupied July 9 to July 13, 1907. Latitude 47° 49′·6. Longitude 83° 27′·0 (from data supplied). Station a relocation of the Carnegie Institution station, occupied October 10, 1906. Reference Object, flag pole on Algoma hotel. Azimuth of Reference Object 252° 33′·9 (from data supplied). The surface con-

ditions at this station are apparently quite favourable, subject to the general comment that the entire district is underlaid by rock, never deep below the surface. On trial, however, portions of this rock did not affect the needle.

On the afternoon and evening of the 10th and the morning of the 11th, the declination needle behaved rather unsteadily, which may be accounted for by the fact that a brilliant display of aurora took place on the evening of the 10th.

Station.	Longitude	Latitude.	Date.	L.M.T.	Declination mean of elongation.	Difference E and W elongation.	Date.	L.M.T.	Dip.	Date.	L.M.T.	Hor. intensity C. G. S. Units.	Total intensity C. G. S. Units.
	° ′	° ′	1907	a.m. h. m. p.m. h. m.	° ′	′	1907	h. m.	° ′	1907	h. m.		
*Sydney	60 12·0	46 06·7	Oct. 31	7 45, 1 00	25 27·7	08·5	Oct. 30	10 46	74 16·8	Nov. 1	10 13	0·1563	0·5768
			Nov. 1	7 40, 1 05	25 29·3	10·8							
			" 2	7 45, 2 00	25 26·8	09·1							
Mulgrave	61 22·5	45 35·1	Nov. 5	8 00, 1 40	24 13·0	15·4	Nov. 5	10 00	73 53·6	Nov. 6	10 14	0·1611	0·5807
			" 6	7 40, 12 55	24 13·4	09·2							
Antigonish	61 59·2	45 35·6	Nov. 8	7 40, 1 10	23 25·4	14·0	Nov. 9	9 56	74 17·9	Nov. 8	10 25	0·1596	0·5899
Pictou	62 43·5	45 38·0	Oct. 25-26	7 10, 1 05	23 01·9	11·4	Oct. 25	10 35	74 31·2	Oct. 26	11 11	0·1577	0·5910
			" 26-28	7 40, 1 00	23 01·8	11·8							
Truro	63 15·0	45 20·2	Oct. 23	7 25, 1 00	21 49·4	16·6	Oct. 23	11 22	73 52·5	Oct. 22	10 41	0·1618	0·5827
			" 24	7 55, 12 55	21 52·0	12·5							
Pugwash	63 40·5	45 50·2	Oct. 19	7 35, 1 10	22 39·5	07·9	Oct. 20	11 33	74 48·8	Oct. 19	12 31	0·1544	0·5895
			" 21	7 10, 1 05	22 38·5	14·1							
Shediac	64 31·7	46 12·1	Oct. 17	7 00, 1 30	22 45·8	13·4	Oct. 17	9 26	75 03·5	Oct. 17	10 56	0·1520	0·5894
Moncton	64 47·0	46 06·9	Oct. 14-15	7 10, 1 10	22 14·9	21·1	" 14	3 12	75 07·8	Oct. 15	10 34	0·1515	0·5903
			" 15-16	7 30, 1 05	22 15·0	19·5							
Richibucto	64 51·7	46 40·6	Nov. 13	7 25, 1 05	22 36·3	12·4	Nov. 13	2 30	75 37·1	Nov. 13	11 24	0·1478	0·5960
Newcastle	65 33·0	46 58·2	Nov. 15	7 05, 1 40	22 47·5	42·9	Nov. 16	10 06	75 36·2	Nov. 15	10 20	0·1465	0·5892
			" 16	7 10, 1 10	22 47·3	07·2							
Bathurst	65 39·0	47 37·5	Nov. 18-19	6 55, 1 25	23 41·15	11·4	Nov. 19	9 42	76 04·8	Nov. 20	10 35	0·1431	0·5944
			" 19-20	7 15, 1 05	23 37·7	7·2	" 19	3 00	76 03·1				
Mispec	65 59·0	45 13·3	Oct. 10	6 50, 1 35	20 03·3	11·2	Oct. 10	2 31	75 06·4				
			" 11	6 15, 1 00	20 04·3	13·6							
St. John	66 00·7	45 16·8	Oct. 2	8 50, 12 35	20 11·0	07·9	Oct. 2	10 26	74 25·1	Oct. 4	10 36	0·1592	0·5926
			" 3	8 10, 1 35	20 10·6	07·9	" 3	9 46	74 24·5				
Matapedia	66 55·8	47 56·5	Nov. 21-22	7 25, 12 35	22 53·1	02·9	Nov. 22	9 52	76 36·4	Nov. 23	11 41	0·1387	0·5981
			" 22-23	6 30, 12 20	22 53·6	14·8	" 23	9 42	76 35·8				
							" 24	9 39	76 33·8				
Megantic	70 53·2	45 34·4	Sept. 20	7 35, 12 25	16 34·4	16 3	Sept. 20	10 04	75 40·6	Sept. 24	11 47	0·1498	0·6056
			" 21	7 46, 12 56	16 34·3	13·7							
			" 23	7 41, 12 16	16 31·0	13·3							
Tring Jct	71 00·0	46 15·5	Sept. 26	7 05, 1 35	17 21·3	21·1	Sept. 26	3 03	76 06·2	Sept. 27	3 24	0·1462	0·6094
			" 27	7 30, 1 30	17 23·1	21·9	" 27	10 03	76 07·3				
Sherbrooke	71 56·2	45 23·9	Sept. 14	7 32, 1 22	15 55·4	29·6	Sept. 14	10 26	75 27·3	Sept. 18	1 05	0·1512	0·6018
			" 16	7 22, 12 47	16 02·8	24·6	" 16	10 34	75 26·1				
			" 17	8 02, 12 47	16 01·2	43·0							
			" 18	7 27, 12 02	16 00·4	19·0							

Farnham	73	01·5	45	16·1	Sept. 9	7 00, 12 55	15	13·0	22·0	Sept. 9	2	28	75	19·0						
					" 11	7 50, 12 50	15	11·8	22·6	" 10	10	10	75	21·2	Sept. 12	2	51	0·1540	0·6095
Brockville	75	40·7	44	35·9	Sept. 2	7 00, 1 35	10	34·1	16·9	Sept. 3	9	43	75	03·6	Sept. 4	1	08	0·1577	0·6118
					" 3	6 45, 1 45	10	34·2	17·1										
Ottawa	75	42·9	45	23·6	June 3	7 05, 1 20	12	36·5		June 3	10	25	75	41·2	June 7	12	46	0·1505	0·6086
Kingston, R.M.C	76	28·2	44	13·8	Aug. 20	8 10, 2 25	36	44·5	11·1	Aug. 20	10	10	73	27·3	Aug. 21	1	11	0·1708	0·5998
					" 21	7 35, 1 25	36	48·4	18·4										
Kingston Jct	76	28·0	44	15·2	Aug. 27	7 40, 12 55	14	17·4	29·9	Aug. 27	10	31	74	57·8	Aug. 28	12	39	0·1613	0·6219
					" 28	7 05, 1 10	14	16·4	13·7										
Kingston Barracks	76	29·2	44	13·0	Aug. 25	7 45, 1 10	30	07·4	16·2	Aug. 25	3	00	74	37·3					
Sharbot Lake	76	41·2	44	46·4	Aug. 16	8 25, 12 40	11	28·7	07·4	Aug. 13	2	48	74	51·5	Aug. 16	4	05	0·1608	0·6173
										" 14	2	22	74	53·1					
										" 16	9	55	74	55·2					
										" 16	2	16	74	54·1					
Pembroke	77	07·5	45	49·3	July 27	7 22, 1 37	10	22·2	24·2	July 26	3	45	76	13·0	July 27	1	10	0·1476	0·6182
					" 28	6 52, 1 32	10	11·2	11·8	" 28	10	17	76	12·7					
										" 28	3	50	76	07·8					
Barry Bay	77	40·3	45	28·8	Aug. 9	7 00, 2 00	08	46·3	07·8	Aug. 9	9	53	75	57·5	Aug. 9	4	15	0·1501	0·6197
										" 9	2	55	75	54·2					
Mattawa	78	41·0	46	19·7	July 23	7 40, 1 35	08	43·3	17·2	July 23	9	37	76	42·1	July 23	2	58	0·1429	0·6205
					" 24	7 15, 1 10	08	45·4	21·4	" 24	10	47	76	40·4					
Joe Lake	78	46·5	45	35·2	Aug. 6	7 15, 1 00	07	32·5	17·1	Aug. 6	10	00	75	57·6	Aug. 6	1	17	0·1525	0·6281
					" 7	7 40, 12 45	07	28·8	14·0	" 6	3	59	75	56·5					
North Bay	79	24·7	46	18·3	July 19	7 30, 1 00	08	57·2	13·6	July 18	4	35	76	35·7	July 19	12	44	0·1433	0·6182
					" 20	7 15, 12 35	08	54·0	20·2										
Rose Point	80	02·3	45	19·1	Aug. 2	8 10, 2 25	06	47·8	12·6	July 31	2	36	75	39·7	Aug. 3	2	20	0·1525	0·6588
					" 3	6 50, 1 15	06	49·7	08·1	Aug. 1	9	40	75	32·5					
					" 4	6 30, 1 45	06	49·9	06·2	" 2	9	30	75	38·8					
										" 2	3	50	75	33·4					
										" 4	10	22	75	36·3					
Sudbury	81	00·0	46	29·0	July 16	7 40, 2 20	06	57·1	18·2	July 15	10	14	76	35·4	July 17	1	35	0·1451	0·6254
					" 17	7 00, 1 25	06	52·8	21·6	" 15	2	48	76	35·1					
Chapleau	83	27·0	47	49·6	July 13	7 40, 1 55	03	47·0	32·8	July 11	9	07	77	57·9	July 12	11	32	0·1321	0·6304
										" 11	5	27	77	50·4					

[*] Tesdorpf Magnetometer, No. 1977.

Station.	Longitude	Latitude	Date	Declination	Dip	Hor. Intensity	Total Intensity
	° ′	° ′	1907	° ′	° ′		
*Sydney	60 12·0	46 06·7	Oct. 30-31, Nov. 1-2..	25 27·9	74 16·8	0·1563	0·5768
Mulgrave	61 22·5	45 35·1	Nov. 5-6	24 13·2	73 53·6	0·1611	0·5807
Antigonish	61 59·2	45 35·6	Nov. 8-9	23 25·4	74 17·9	0·1596	0·5899
Pictou	62 43·5	45 38·0	Oct. 25-26-28	23 01·9	74 31·2	0·1577	0·5910
Truro	63 15·0	45 20·2	Oct. 22-23-24	21 50·7	73 52·5	0·1618	0·5827
Pugwash	63 40·5	45 50·2	Oct. 19-20-21	22 39·0	74 48·8	0·1544	0·5895
Shediac	64 31·7	46 12·1	Oct. 17..	22 45·8	75 03·5	0·1520	0·5894
Moncton	64 47·0	46 06·9	Oct. 14-15-16	22 15·0	75 07·8	0·1515	0·5903
Richibucto	64 51·7	46 40·6	Nov. 13	22 36·3	75 37·1	0·1478	0·5960
Newcastle	65 33·0	46 58·2	Nov. 15-16	22 47·4	75 36·2	0·1465	0·5892
Bathurst	65 39·0	47 37·5	Nov. 18-19-20	23 39·4	76 03·9	0·1431	0·5944
Mispec	65 59·0	45 13·3	Oct. 10-11	20 03·8	75 06·4		
St. John	66 00·7	45 16·8	Oct. 2-3-4	20 10·8	74 24·8	0·1592	0·5926
Matapedia	66 55·8	47 56·5	Nov. 21-22-23-24	22 53·3	76 35·3	0·1387	0·5981
Megantic	70 53·2	45 34·4	Sept. 20-21-23-24	16 33·2	75 40·6	0·1498	0·6056
Tring Jct	71 00·0	46 15·5	Sept. 26-27	17 22·2	76 06·7	0·1462	0·6094
Sherbrooke	71 56·2	45 23·9	Sept. 14 16-17-18	15 59·9	75 26·7	0·1512	0·6018
Farnham	73 01·5	45 16·1	Sept. 9-10-11	15 12·4	75 20·1	0·1540	0·6095
Brockville	75 40·7	44 35·9	Sept. 2-3-4	10 34·2	75 03·6	0·1577	0·6118
Ottawa	75 42·9	45 23·6	June 3	12 36·5	75 41·2	0·1505	0·6086
Kingston R.M.C.	76 28·2	44 13·8	Aug. 20-21	36 46·4	73 27·3	0·1708	0·5998
Kingston, Jct	76 28·0	44 15·2	Aug. 27-28	14 16·9	74 57·8	0·1613	0·6219
Kingston Barracks	76 29·2	44 13·0	Aug. 25	30 07·4	74 37·3		
Sharbot Lake	76 41·2	44 46·4	Aug. 13-16	11 28·7	74 54·6	0·1608	0·6173
Pembroke	77 07·5	45 49·3	July 26-27-28	10 16·7	76 11·2	0·1476	0·6182
Barry Bay	77 40·3	45 28·8	Aug. 9	08 46·3	75 53·9	0·1501	0·6197
Mattawa	78 41·0	46 19·7	July 23-24	08 44·3	76 41·2	0·1429	0·6205
Joe Lake	78 46·5	45 35·2	Aug. 6-7	07 30·6	75 56·0	0·1525	0·6281
North Bay	79 24·7	46 18·3	July 18-19-20	08 55·6	76 35·7	0·1433	0·6182
Rose Point	80 02·3	45 19·1	July 31, Aug. 1-2-3-4	06 49·1	75 36·1	0·1525	0·6588
Sudbury	81 00·0	46 29·0	July 15-16-17	06 54·9	76 35.2	0·1451	0·6254
Chapleau	83 27·0	47 49·6	July 11-12-13	03 47·0	77 54·1	0·1321	0·6304

*Tesdorpf Magnetometer, No. 1977.

GRAVITY.

Unfortunately the new sidereal chronometers ordered were not received in time for undertaking gravity work during the past season. The chronometers of the observatory heretofore available were required for urgent longitude determinations in various parts of the Dominion.

I have the honour to be, sir,

Your obedient servant,

OTTO KLOTZ.

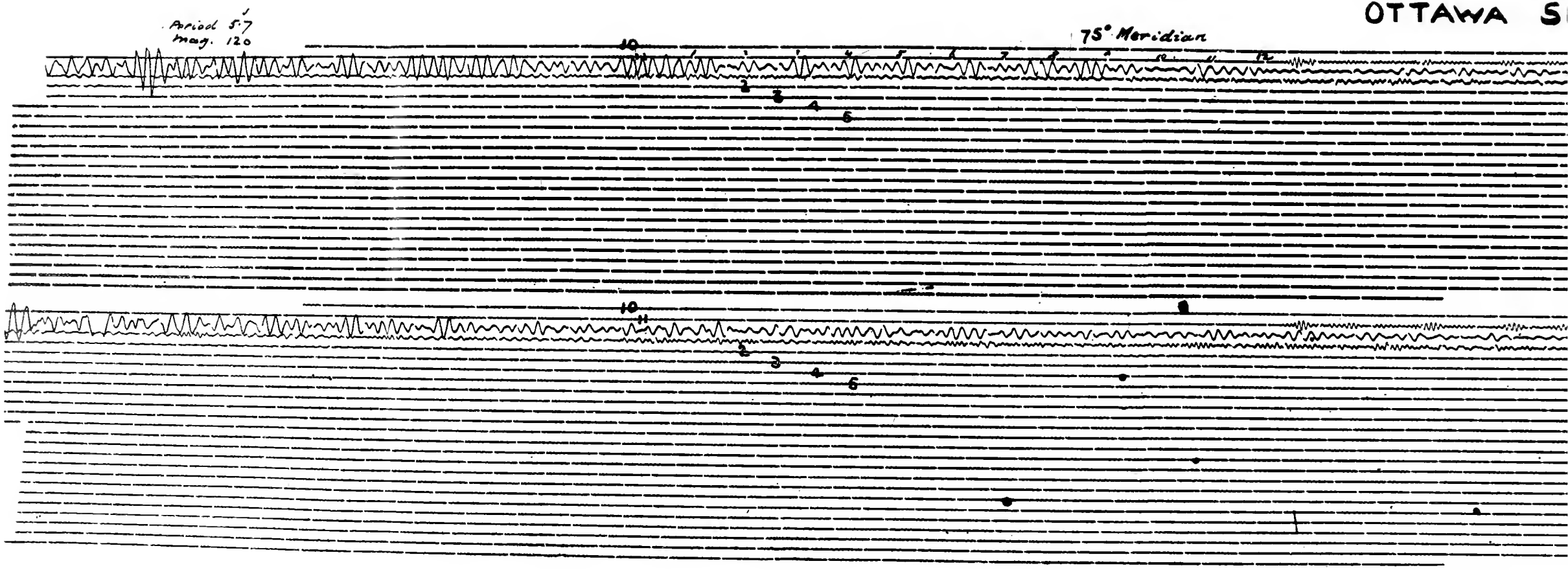


Fig. 5—SEISMOGR

SEPT. 2 1907

E-W Pendulum

N-S Pendulum

OGRAM AT OTTAWA

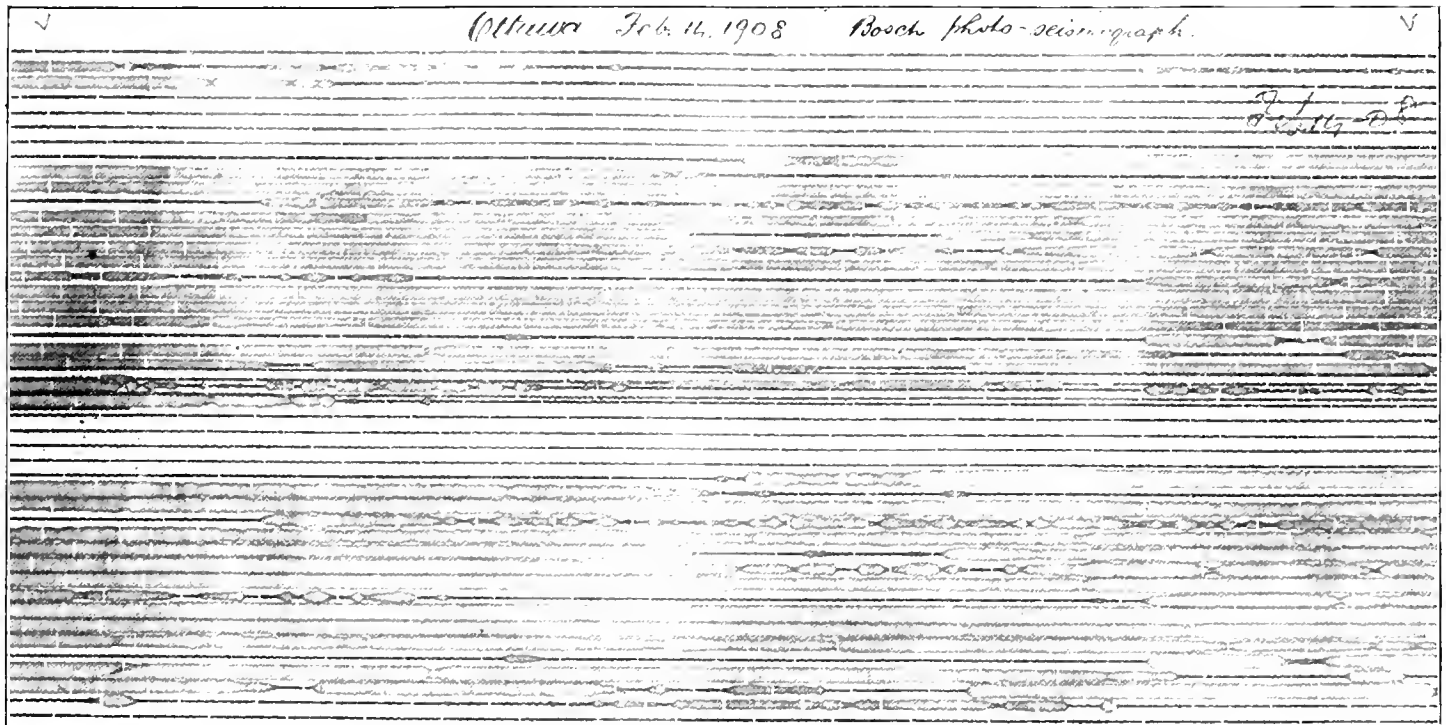


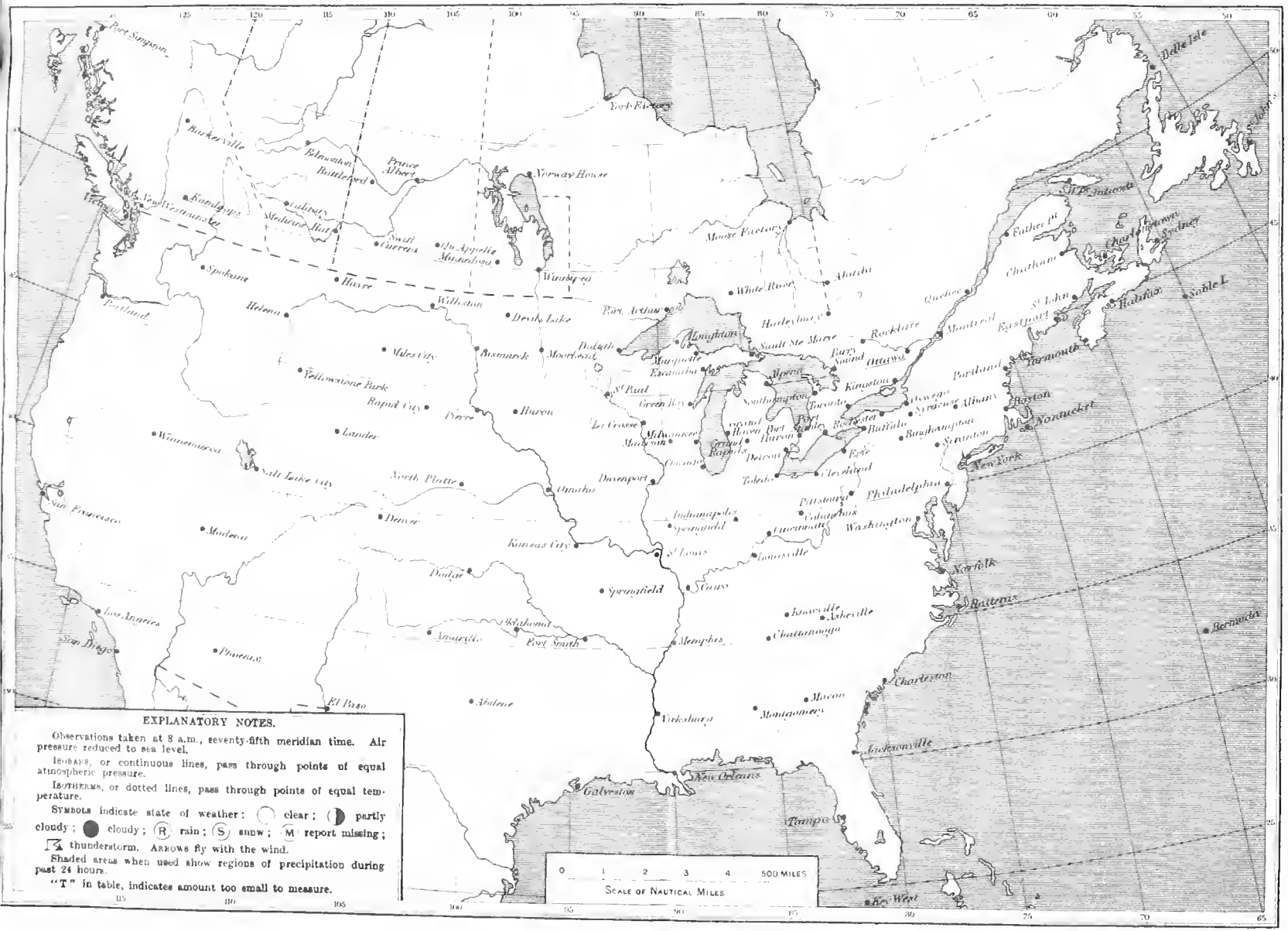
FIG. 1.—Peculiar phenomenon showing vibrations of new 23 Cm. filament light. Alternating current.

WEATHER MAP

METEOROLOGICAL SERVICE, DOMINION OF CANADA.

R. F. STUPART, Director.

Published by authority of the Department of Marine and Fisheries



EXPLANATORY NOTES.

Observations taken at 8 a.m., seventy-fifth meridian time. Air pressure reduced to sea level.

ISOBARS, or continuous lines, pass through points of equal atmospheric pressure.

ISOTHERMS, or dotted lines, pass through points of equal temperature.

SYMBOLS indicate state of weather: ○ clear; ◑ partly cloudy; ● cloudy; (R) rain; (S) snow; (M) report missing; ↯ thunderstorm. ARROWS fly with the wind.

Shaded areas when used show regions of precipitation during past 24 hours.

"T" in table, indicates amount too small to measure.

To accompany Report of Dr Klotz, 1908.

APPENDIX 2.

REPORT OF THE CHIEF ASTRONOMER, 1908.

ASTROPHYSICAL WORK

BY

J. S. PLASKETT, B.A.

CONTENTS.

Appendix C.—R. M. Motherwell.

Appendix D.—Ralph E. DeLury.

Appendix E.—W. M. Tobey.

ILLUSTRATIONS.

SESSIONAL PAPER No. 25a

APPENDIX 2.

ASTROPHYSICAL WORK BY J. S. PLASKETT, B.A.

OTTAWA, ONT., March 31, 1908.

W. F. KING, Esq., B.A., LL.D.,
Chief Astronomer,
Department of the Interior,
Ottawa.

SIR,—I have the honour to submit the following report of the work carried on by me and under my direction during the past year.

Owing to the change in the date of presenting the report, it deals with only seven or eight months' work and consequently will not be found to cover so much ground as formerly. I think, however, it will indicate satisfactory progress in every department under my charge. Some of them are as yet only in the organization stage, and not much actual work accomplished can yet be reported, although very satisfactory progress in the preparatory stages has been made.

I wish particularly to draw to your attention the very efficient work that has been accomplished by my three assistants, Messrs. Harper, DeLury and Motherwell, in their various lines. I can speak in the very highest terms, not only of their ability and energy, but also of their conscientious attention to their duties.

I propose to present to you here a short summary of the principal pieces of work carried on, each being presented below in detail, and where possible over the signature of the officer responsible for it.

The principal work, as previously, has been the determination of the line of sight velocities of stars by the spectroscope, chiefly of spectroscopic binaries for the determination of their orbits. The new combined three prism and single prism spectrograph, which was fully described in last year's report, has performed very satisfactorily. Some minor improvements, altogether outside the spectrograph proper, however, have been added and it is doing and has done excellent work. Our experience has shown, however, that separate instruments would be much more useful, and a new single prism spectrograph has been designed, the optical parts have been ordered by you, and the mechanical parts will be constructed in the workshop as soon as possible.

Of the dozen spectroscopic binaries under observation two, ι Orionis and ψ Orionis have been completed, and two, θ Aquilæ and η Virginis, have had provisional elements determined. Work on several others is well under way, and it is hoped that some of them will shortly be completed. It may be stated in this connection that considerable work may be done on spectroscopic binaries without it being found possible in some cases to obtain any definite result. This is due to a small range of velocity combined with a poor quality of spectrum for measurement, so that the periodic effect is masked by the large accidental errors of observation. If the period could be obtained in such a case it is possible, after observations over several periods had been combined into phases, exactly as has been done in ι Orionis, described below, that approximate elements could be determined; but unless the period can be obtained no such combination of observations is possible. For the above reasons observations and measurements on one binary o Andromedae have been discontinued.

It gives me pleasure in connection with the work on radial velocities to make especial mention of the very efficient manner in which Mr. Harper has assisted in this

work. Besides doing the lion's share of the measuring and reduction of spectrograms, he has equally divided with myself the work of observation. Moreover, it is not only the quantity of the work, but the quality that deserves mention. His measures are very careful and accurate, and his work throughout thoroughly dependable. He has presented a report of his work on two spectroscopic binaries, θ Aquilæ and η Virginis, in appendices A and B below. His measures on other uncompleted binaries and on ι Orionis, which is discussed by myself, have probably occupied considerably more time than the work reported.

Mr. Westland, who since November has efficiently assisted Mr. Harper and myself in the work of measuring and reducing star spectra, will be leaving for the field in a short time. In order to have the measuring and reduction keep pace with the observing, two capable assistants are required. It is desirable to obtain assistants who will be permanently engaged in this work, as considerable training and experience is required before reliable measurements can be obtained. As soon as suitable men can be obtained I would respectfully urge their appointment.

The Hartmann-Zeiss Spectro-Comparator, which you ordered upon my representation a year ago, has only quite recently arrived. It is a very workmanlike instrument and, so far as our tests have gone, gives every promise of doing very accurate and satisfactory work. It is evident, however, that its special use will be in spectra of the solar and related types. Spectra of the early hydrogen and helium types will preferably, I believe, be measured as previously.

I am gratified to report that, although the new correcting lens when first received did not give much better images than the old, a refiguring of its surface enabled it to produce practically perfect results. Not only is the image free from aberration, ensuring uniform illumination of camera and collimator lenses and consequent freedom from chance of systematic displacement of the lines, but its smallness and perfection ensure the greatest possible slit transmission, and result in a considerable diminution in the required exposure time, estimated as at least 30 per cent. We may therefore consider the time and energy required to make this improvement to be well spent. A full report of the tests of the new corrector, both before and after refiguring, with a description of a number of experiments on the actual dimensions of the star image and the conclusions derived therefrom is given below.

In my last report I gave an account of an investigation undertaken for determining the effect of increasing the slit width of a spectrograph on the accidental errors of measurement. This showed that the errors by no means increased proportionally with the increase of slit width, although scarcely sufficient data were obtained to give any definitive results. This investigation has been continued this year, using three different dispersions available with the new spectrograph, and some very interesting as well as useful results obtained. They show that with a single prism instrument on early type stars the slit may be opened to 0·051mm without any marked increase of accidental or systematic error, while with a three prism spectrograph this width may be increased to 0·076mm without much increasing the error of measurement. Details of the measurements and conclusions are given in full below.

My interest in camera lenses for spectrographs has not diminished, although I am unable to report much advance beyond what was accomplished last year. I there described the excellent performance of the Brashear single material for single prism and the Hartmann-Zeiss 'Chromat' for three-prism work. These are both however, of about 525mm focus and 45mm aperture. Lenses of shorter focus with the same aperture offer greater difficulties in the design and construction, and Zeiss, in reply to a request to construct such a lens, states that the 'Chromat' cannot be successfully made of larger angular aperture than already supplied. They suggest a trial of their Tessar photographic objective, and, by the kindness of Mr. De Courcey Topley, one was obtained for testing from the Bausch and Lomb Optical Co., of 12 inches focus and about 2 inches aperture. A preliminary test of this lens showed very promising

results. The definition is very good and the field very nearly flat. It looks as if it would make a satisfactory objective for spectrographic work. Brashear has made three new lenses of the 'Chromat' type of different materials which have just been received and await testing. They are of somewhat shorter focus than the Zeiss 'Chromat,' and the result of the test should prove interesting. The special Ross Homocentric lens of 10 inches focus, which, according to the makers claim, should have fulfilled the desired requirements, proved a disappointment as, although the definition was good, the field had such strong curvature as to render it quite useless for spectrographic work. At their request it has been returned to them for improvement and it is hoped that it may be made satisfactory.

A good start at micrometric work has been made by Mr. Motherwell, who has made a number of measures of the position angle and distance of some selected double stars. The occultations of stars by the moon visible at Ottawa have, whenever the weather permitted, also been observed and their times of immersion and emersion carefully determined. He has compiled a summary of these measurements and observations, which is given below in appendix C. He has spent considerable time in investigating the field of the Brashear photographic doublet of 8 inches aperture and 42 inches focus by the Hartmann method of extra-focal exposures. The investigation shows that the lens possesses very considerable over-correction for spherical aberration, more than sufficient to account for the large images given. The field, however, is flat and, if the aberration can be overcome without affecting the curvature of field, the lens will be unsurpassed.

I had hoped to be able to report that work with the coelostat telescope had been begun, but, owing to the delay in getting the building ready, this has not been possible and nothing more can now be done until spring. The opening between the tunnel and the laboratory in the basement was not completed in time, and, to prevent freezing up, both ends had to be blocked preventing the installation of the solar spectroscope. The mechanism for the telescope is completed and in place. Dr. DeLury will shortly be engaged in setting up, adjusting and testing the 23-foot plane grating spectroscope for use with the coelostat so that, as soon as possible, everything may be placed in working order and actual observation begun.

On every clear day photographs of the solar surface on a scale of about 7½ inches to the sun's diameter have been obtained for a record of the spots, but no plates have yet been measured. The concave grating spectroscope, at present installed on the midway floor, was very carefully adjusted by Dr. DeLury and has been used by him in obtaining photographs of the spark spectrum of the iron-vanadium alloy used by us as the comparison spectrum in stellar spectroscopy. This is a necessary piece of work as many of the lines used are blends of iron and vanadium and their wave lengths can only be accurately determined in this way. These plates have been measured and reduced to wave lengths in the hope of obtaining a consistent set of wave lengths of both elements for the above purpose. Owing, however, to the want of a suitable measuring machine the values obtained have not been entirely satisfactory and a remeasurement will be undertaken as soon as possible. A description of the work done and the results obtained by Dr. DeLury is given below in appendix D.

A small chemical laboratory which will be of service in astrophysical investigations, in silvering the mirrors of the coelostat and for numerous other purposes has been fitted up by Dr. DeLury in the room in the basement beside the solar research laboratory.

As mentioned in the last report, a polarizing photometer, modelled somewhat after the Zöllner form, was constructed in the workshop last summer, and Mr. Tobey has been using it in the measurement of the magnitudes of stars. Up to the present, most of his time has been spent in obtaining the scale of the instrument. The exceptionally bad weather during the past winter has prevented much astronomical work of any

nature being done and photometry has suffered as well as other lines. A short report by Mr. Tobey on his work is given in appendix E.

The workshop has, as last year, proved its indispensibility in the work of our observatory and in the Geodetic and other surveys under your direction. The mechanician, Mr. Mackey, has been kept very busy during the whole year. It has indeed been impossible for him to do all the work required. This work is growing so rapidly both in the Astronomical and Astrophysical divisions, and in the Boundary and Geodetic surveys, that the new construction and repairs necessary is entirely beyond the capacity of one man. As all the work can be done much better and cheaper in our own workshop, and as much of the experimental work, which requires supervision by the designer and user, can not be done elsewhere, the need of an assistant was strongly felt. I have to express my obligation to you for your readiness in recognizing this need and taking steps to supply it.

Since my last report the workshop has been removed to the southwest corner of the basement. The light in this room is much better and its larger size has allowed the machines to be arranged to much better advantage, enabling both the quantity and quality of the output to be enhanced. Much of the time of Mr. Mackey has been spent in small repairs, but besides these the travelling wire micrometer for Cooke 1 has been completed, the polarizing photometer has been made and several attachments for convenience in using the spectrograph have been applied.

With your approval the charge of the instruments, so far as the bookkeeping is concerned, has been entrusted to Mr. Motherwell who has carefully kept account of them, leaving only the general supervision and the question of repairs in my care. The number of field instruments in store and in use has rapidly increased of late and their proper looking after requires considerable time.

The interest of the public, as shown by their attendance at the Saturday evening open nights, has continued unabated and our effort to increase and specialize this interest by the formation of an astronomical society in Ottawa has met with a gratifying response. Such a society is a useful adjunct to our work, not only by increasing the interest of the people in astronomical matters, but also in giving them correct ideas of the value and work of our observatory. The papers read at the meetings, especially the afternoon or 'technical' meetings, have been of a high class, while the matter presented in several of them has been the product of original investigation and research of value and has formed distinct contributions to science. To say nothing of the encouragement to original work such papers are of general educative value giving each of us a better knowledge of the work being carried on by our colleagues, while they are of special service to those who prepare them, necessarily entailing a thorough mastery of main principles and details not likely otherwise to be obtained.

The following papers bearing on the work of the Astrophysical division have been published since the date of the last report:—

1. The Star Image in Spectrographic Work, by J. S. Plaskett, Journal of the Royal Astronomical Society of Canada, Vol. 1, No. 5, p. 297.

2. Preliminary Orbit of θ Aquilæ by W. E. Harper, Journal of the Royal Astronomical Society of Canada, Vol. 1, No. 6, p. 357.

3. The Star Image in Spectrographic Work, II., by J. S. Plaskett, Astrophysical Journal, Vol. XXVII., p. 139, March, 1908.

4. Orbit of η Virginis by W. E. Harper, Astrophysical Journal, Vol. XXVII., p. 160, March, 1908.

5. A Transportable Form of Standard Cell, by R. E. DeLury, Physical Review, Vol. XXV., p. 492, 1907.

6. Device for preventing bumping in Mercury Air Pumps, by R. E. DeLury, Physical Review, Vol. XXV., p. 495, 1907.

7. The Spectroscopic Binary ι Orionis, by J. S. Plaskett and W. E. Harper will appear in Astrophysical Journal in April.

8. The Aberrations of a Stellar Camera Objective, by R. M. Motherwell. Thesis presented for M.A. degree at University of Toronto, March 28, 1908.

The matter in the above papers treating on spectrographic work is presented in a somewhat different form in this report.

Before entering into the details of the work, however, I wish to express my deep appreciation of the hearty support and efficient help you have given me in the undertakings completed or in hand. Without such help and encouragement, so much progress would certainly not have been reported.

THE SPECTROGRAPH.

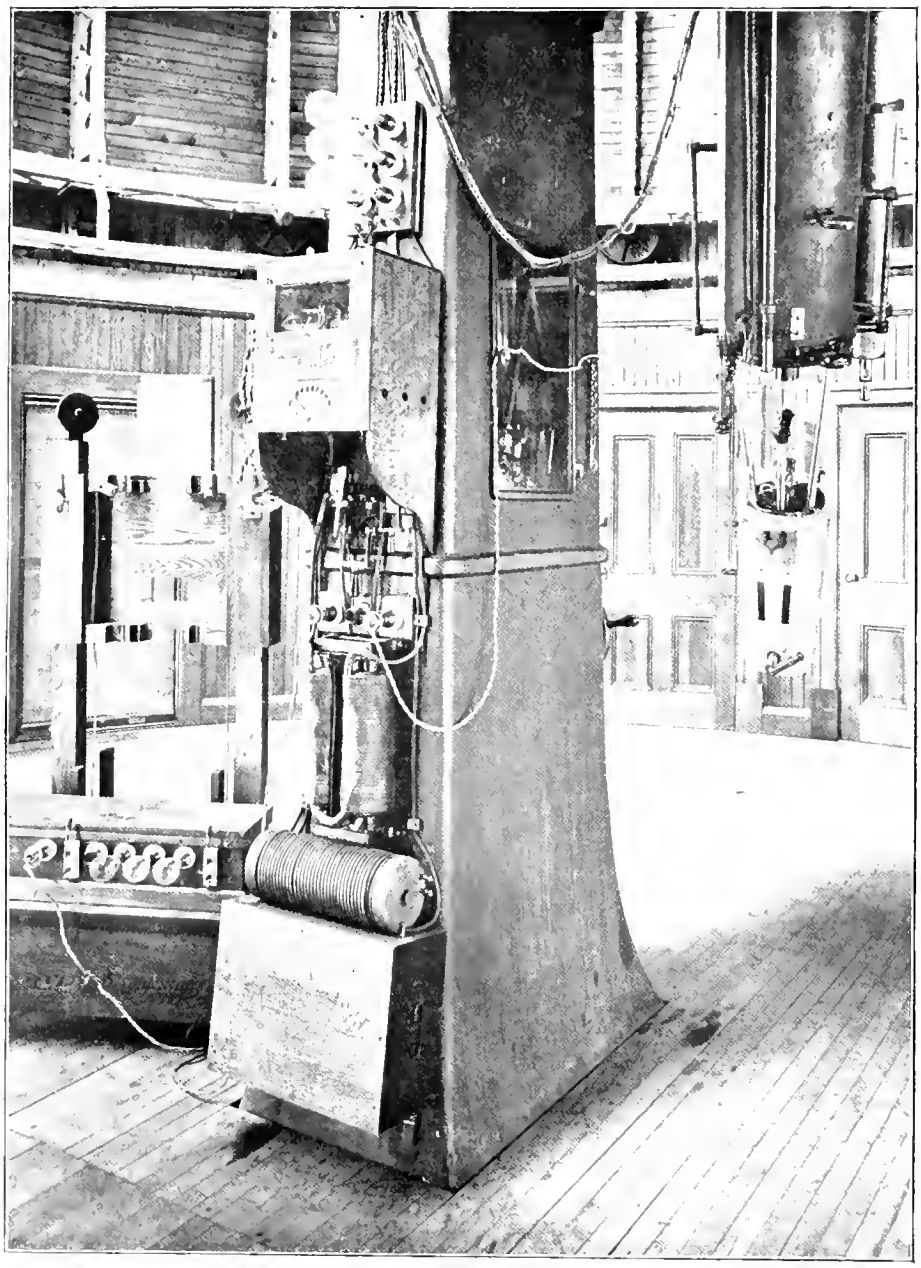
The new Ottawa spectrograph has been used exclusively in the determination of radial velocities since its completion last summer. This instrument was fully illustrated and described in last year's report, and I have little to add in this place. Further experience in its use has confirmed the good opinion formed of its performance, and no changes have been made in the spectrograph proper. Some difficulty was at first experienced in the temperature regulation, a gradual lowering of the temperature in the prism box of about 0·1°C. per hour occurring as the room temperature kept falling. The heating coils were at first placed only in the lower portion of the case as advocated by Hartmann and, although the temperature around the contact thermometers must have remained constant, the increased radiation, as the difference between inside and outside temperatures increased, would lower the temperature of the upper part of the case and this would be transmitted by conduction through the metal parts to the prism box. In consequence, additional heating coils were placed up the sides of the box so as to practically cover the whole inside surface of the case and the difficulty then disappeared. There is, naturally enough, if the temperature of the case is set only slightly above the outside temperature, a slight drop in the prism box temperature if the room temperature falls two or three degrees; but, if the dome be opened about half an hour before sunset, this drop takes place considerably before observing begins and is not likely to produce any error in observations made an hour after it occurs. The only possible difficulty or cause of error that may arise is due to the proximity of the coils on the sides of the case to parts of the tubular truss frame, especially to the diagonal tubular truss connecting the outer end of prism box to the upper ring casting. Any long continuance of the heating current would probably raise their temperature and displace slightly the position of the spectral lines. Any error from this cause is however, fairly well guarded against by, first the intermittent action of the automatic heat regulation, the heat being turned on and off generally two or three times a minute and consequently not having time to affect such a mass of metal, and secondly by covering the tubes with a non-conducting layer of felt which must so smooth down the irregularities of the regulation as to ensure constant temperature in the truss. As soon as opportunity offers, however, this possible source of error will be guarded against either by some means of air stirring or by increasing the distance between the coils and the tubes.

The 10,000 volt transformer ordered for producing the comparison spark was received in the fall and, as soon as possible, the connections were altered to allow its use instead of the induction coil. The secondary wires from the induction coil already ran up the column across to the tube of the telescope and then down it to the comparison apparatus, thus avoiding any wires across the floor. But it was necessary

when putting on the comparison spark to move from the guiding eye-piece to the switch of the induction coil. When the transformer was substituted for the coil, the connections were so arranged that the spark could be turned on and off by a switch on the telescope tube directly above the eye-piece. The alternating current lighting circuit is led to three receptacles attached to the south side of the telescope column. Two of these are used for movable lights with long attaching cords while the third feeds the transformer and the heating coils of the temperature case. Wires lead from the two sides of this receptacle to a double-pole knife-edge switch below the relay box. From the other sides of this switch, one proceeds direct to one terminal of the transformer primary while the other runs up the telescope column through a variable resistance of six 32 c.p. lamps, situated just above the relay box, of which one only or two or more in multiple as required may be placed in the circuit. This wire then proceeds, beside the heating and secondary wires, down the tube to one terminal of a single pole switch near the eye end, while a wire from the other terminal follows the same course past the bank of lamps direct to the other primary terminal of the transformer. A variable capacity is placed in multiple across the secondary terminals, and a variable self-induction in series between one of the secondary and the spark terminals. The intensity and character of the spark may be varied between wide limits by changing the intensity of current through the primary by means of the lamp resistance, or by changing the capacity or self induction or both in the secondary circuit. Moreover, when once set, the spark remains nearly constant, much more so than is the case with an induction coil. Transformer, capacity, and self induction are permanently attached to the column as shown in fig. 1, which shows the spectrograph ready for use, and are always out of the way. After throwing in the double pole switch the spark can be controlled by the single pole on the tube. The ease of applying the comparison enables it to be used much more frequently during the exposure on the star, thus lessening the chance of systematic error.

Besides the change in the heating coils and in the production of the comparison spark, knurled thumb screws have been substituted for the ordinary machine screws first used in attaching the temperature case. Similarly where, before, wires had to be attached to binding posts at the lower part of the case whenever change was made from single to three prism form or vice versa, now all are attached to plugs which simply shove into jacks. Moreover, as in three prism work the Hartmann-Zeiss Chromat camera objective is used, and in single prism the Hastings-Brashear single material, a separate camera was made for each to prevent dismemberment and change of adjustment when changing from high to low dispersion or vice versa. The purpose of these improvements was to shorten the time required to make the change from one form to another, which frequently requires to be performed, often both single and three prisms being required on the same night. This change can now be entirely made in 15 minutes and if this time were the only consideration it would not amount to very much in a night's work. Unfortunately temperature difficulties arise in such a case and, although they are much diminished by the provision of an automatically controlled constant temperature box for holding the prism train or single prism with attached camera, which is seen on the stand to the left of fig. 1, there is still some uncertainty in regard to the temperature of the prisms. This consideration led to the decision, to which you readily agreed, to make a separate single prism spectrograph with temperature case and attaching stand complete, provide a separate relay box and have both instruments always maintained at constant temperature ready for instant change. In such a case the change would not occupy five minutes and the temperature need not be disturbed in the slightest, as the set of plugs on the telescope could be substituted for those belonging to the separate relay box in a few seconds.

The information gained in regard to the character of the star image from the experiments carried on after the new correcting lens had been installed, which are described below, showed that the effective star disc is practically never less than



25a—p. 70 FIG. 1.—Transformer, Capacity and Self-induction.

2 secs. of arc in diameter, equivalent to 0·055mm at the focus of our 15 inch, and generally much greater, frequently 0·075mm. In order to make use of the greater part of the starlight collected by the objective, we must be able to use a slit at least 0·05mm wide in our spectrograph, and, in order to use this width without too much loss of purity or loss of definition of the lines, it is necessary to use a longer collimator, consequently of larger aperture, with a larger prism. In the present spectrograph, used with single prism, the practical limit of slit width appears to be about 0·040mm. If the slit is made wider than this, the lines both star and comparison appear wide and diffuse. However, in the case of early type stars, the experiments on the relative accuracy of different slit widths show that the slit can be made 0·05mm without much loss of accuracy, but the spectra look poor, the lines, especially comparison, appearing diffuse. The camera is of the same focal length as the collimator, 525mm, so that the minimum width of lines is the width of slit. If the length of collimator were increased or the length of camera decreased, leaving all questions of resolution and purity, which have little bearing on early type spectra with single lines, aside, then the minimum width of line would be decreased in like ratio and consequently the slit width could be correspondingly increased without making the lines more diffuse. Decrease in camera length means decrease of linear dispersion, while increase in collimator length means a larger prism with difficulties in homogeneity and the covering power of the camera objectives. Prof. Frost's experience with large prisms shows the possibility of obtaining good results with 51mm aperture and, as the methods of annealing are certainly no worse now, the chances of homogeneous glass in a prism of that size seem good. It is proposed therefore to make the aperture of the collimator of the new single prism instrument 2 inches (51mms) which makes the focal length 30 inches (762mm). The camera is to be of focal length 18 inches (457mm) and for the same minimum width of line, as is given by slit 0·040 with the present instrument, the slit width may be increased to $^{3}/_{5}s + 0·40 = 0·067$mm, nearly 70 per cent. While the purity of spectrum thereby produced would be only 5 per cent less than with the present instrument.

The experiments on the dimensions of the star image detailed below show that at least 60 per cent more starlight will be transmitted by a slit 0·067 than by a slit 0·040mm. Against this, however, is to be placed the increased absorption of the larger prism. Considering the transmission along the axis of the pencil, the paths through the glass will be about 57 and 39mm respectively. The percentages of $H\gamma$ light transmitted, using Vogel's data* are 70 per cent and 78 per cent, respectively. Thus we obtain, after transmission through the prism, a beam of $H\gamma$ light 44 per cent more intense with the large prism for the same character of spectrum for measurement and only 5 per cent less purity. The linear dispersion is, of course, only $^{6}/_{7}$ths of the original and the measures will consequently be that much less accurate. If we were to make the camera of the same focal length, 21 inches (525 mm.), as in the present spectrograph, the slit could be increased to 0·057 mm., giving the same character of spectrum with an increased transmission of star light of nearly 40 per cent. Considering the increased loss by absorption, the beam of $H\gamma$ light after transmission through the large prism would be 25 per cent more intense, while the purity of the resulting spectrum would be nearly 5 per cent greater and the linear dispersion the same.

There is thus considerable gain in the use of the larger prism, sufficient to compensate for the increased size and weight of the spectrograph. The design of the new spectrograph is a somewhat radical departure from that of the previous single prism attachment. As stated in last year's report, flexure was considerable in the single prism instrument owing to the extended form of the truss and its support from one end only. It is proposed in the present design to make the spectrograph proper of

* Astrophysical Journal, V. p. 75.

triangular box form of two triangular steel plates fastened together by cross webs about 3 inches wide. The slit will be at one acute (30°) angle of this triangle, the camera at the other and the prism at the obtuse (120°) angle. This box will be self-contained and be supported in a cradle of angle iron at three points, the pressures on these being equalized by counterbalancing levers. By this means flexure, it is hoped, will be entirely overcome and, as the box will be of compact and symmetrical form, accurate temperature control will offer fewer difficulties than in the present type. I am indebted to a design by Dr. Ralph H. Curtiss for the box form of instrument, but the three point support system is new.

When this new instrument is constructed, the gain in convenience and saving in time will be considerable, and one can then, if desired, change from high to low dispersion or vice versa if only for one star without loss of time or fear of temperature difficulties. There will be a saving in exposure time over the present form of probably 25 per cent and the spectra will undoubtedly be free from displacements of the lines due to flexure, while any temperature effects will be minimized.

The three prism form at present in use gives very satisfactory results, and there does not seem to be any change required in the spectrograph itself. Some improvement in the temperature regulation might be effected by applying a fan or some such device for stirring the air within the case to equalize the temperature throughout and prevent stratification, but such will be difficult to adapt on account of the extra weight and possible vibration.

The Hartmann-Zeiss 'Chromat' camera objective gives an almost absolutely flat field over the whole range of spectrum on the plate $H\beta$ to $H\delta$, or about 8°, which is about three times that usually obtained in spectrographs. Its focus is 525 mm. aperture 45 mm., giving a linear dispersion of 10·1 tenth-metres per mm. at $H\gamma$. With this dispersion, the exposure time required for stars fainter than the fourth magnitude becomes rather long and a shorter focus camera would be very useful. As stated in last year's report, lenses of 375 and 250 mm. focus and 45 mm. aperture were ordered from the John A. Brashear Co., but so far they have not been supplied. One of 375 mm. focus of similar type to the 'Chromat' is completed but it has not yet reached here. A Ross 'Homocentric' lens, which had been kindly loaned by Mr. Topley, gave promising results in the preliminary test and consequently one of 10 ins. focus f5·6, of special construction was ordered from Ross. The lens reached here and was tested some time ago, but the result was disappointing. The definition at the centre of the field was excellent, showing a good correction for spherical aberration, but the field was too strongly curved, falling away from the tangent plane upwards of a millimetre at 4° from the axis. The curvature allowable would not be much more than a tenth of a millimetre, and this is what Ross claimed for the lens. Further tests of the lens showed that if the separation of the two elements was increased by 2⅝ inches, or if the separating mount was made 4⅞ inches long instead of 2¼ inches, the field became very nearly flat. This increased separation, however, increased the focal length about 15 per cent and, what was worse, destroyed the crispness of definition. The lines, especially the intense ones, developed wings to the red side and consequently the value for spectrographic work was lost. The lens was therefore returned to the makers to see if anything could be done in the way of improvement.

An application to Zeiss to supply a 'Chromat' of shorter focus than 525 mm. resulted in the reply that they could not be successfully made of larger angular aperture than the one supplied. They advised the trial of their Tessar lenses of the required focal length.

The loan of a Bausch & Lomb-Zeiss Tessar, Series IIb f6·3 of 12 inches focus was kindly effected for me by the Topley studio and a preliminary trial of this lens has recently been made. Failing a suitable mounting, the lens and the plate holder end of the camera were held in temporary supports to enable the test to be made. The lens gives excellent definition, no sign of the wings shown by the separated Ross being evident. The field, although not so flat as that given by the 'Chromat,' has still at

the margins not more than about a quarter of millimetre curvature. This may possibly be removed by a slight change in the separation of the elements, which will be determined by a further test, but in any case the lens is quite usable over the range required.

This question of suitable camera lenses for spectrographs, lenses which will give accurately measurable spectra over the whole range ordinarily available, $H\beta$ to K in single prism work, and $H\beta$ to $H\delta$ in three prism work, is a very important one, especially in the application of the new method of measurement by the Hartmann Spectro-Comparator. Up to the present the camera lenses ordinarily employed have given a usable field of only about $2\frac{1}{2}°$ or in the three prism spectrographs of about 200 tenth-metres, in single prism instruments of about 600 tenth-metres. The Hartmann-Zeiss 'Chromat' was a marked advance over previous objectives for three prism work, giving a flat field over the whole range of photographic spectrum and consequently quadrupling the amount of available material for measurement with the same exposure. The Hastings-Brashear Single Material, which was designed and constructed at my suggestion gives equally good results for single prism work, the field being almost absolutely flat over the whole range of visible spectrum, an actual test having been made from below D to about λ 3800, without any sign of curvature, and consequently allowing accurate measurements to be made over the whole range of star spectrum that may be photographed in one exposure. Both of these objectives, however, have an aperture ratio of about $f/13$ and the former at any rate can not be made of a much greater aperture. It remains to be seen what success will attend the efforts of Messrs. Hastings & Brashear to make shorter focus lenses for three-prism work. Failing these the only hope seems to lie in a photographic or adapted photographic objective for the purpose, and I propose to test every type available.

THE NEW CORRECTING LENS.

In appendix B to my report of last year is given an account of some experiments and measurements determining the aberrations of the original correcting lens and the size and character of the star image given by the system of visual objective with auxiliary photographic corrector. In that appendix I showed that the correcting lens, designed to render our 15-inch visual objective suitable for photographing the spectra of stars, did not give as good an image as it should, that the combination of objective and correcting lens had negative aberration, in other words, that the focus for light coming from the edge of the objective was longer than the focus for light coming from the centre. It was further shown that this was due to the failure of the correcting lens to compensate for the chromatic differences of spherical aberration inherent in the objective. This chromatic difference is a property or defect of all two part objectives of the ordinary glasses and can not be avoided by any combination of curves. Although the objective may be perfectly corrected for spherical aberration with visual light, that is, every zone may bring light to the same focal point, nevertheless, when the same objective is used with blue and violet, or photographic light, it has negative aberration, the edge rays have a longer focus than the central rays, and this is the chromatic difference. Besides changing the form of the colour curve of the objective, bringing the centre of the range of photographically active light, about $H\gamma$, to a minimum focus instead of λ 5600, the correcting lens should also overcome this chromatic difference, so that the resulting combination would be free from aberration at $H\gamma$. As my experiments clearly showed, however, the correcting lens instead of diminishing had slightly increased this aberration and, as a result, the edge rays focussed about 2·5 mm. farther from the objective than the central rays. The diameter of the minimum circle of confusion thereby produced was upwards of 0·04 mm., nearly twice as wide as the normal slit and three times the theoretical diameter of the central diffraction disc. As a result not only is a large percentage of the star light intercepted by the slit jaws and the exposure consequently increased, but, what is in one sense much more serious, the aberration in the star image renders

it almost impossible to obtain uniform illumination of the collimator and camera lenses by the star light, and introduces a condition which may lead to a systematic displacement of the lines and a consequent error in the resulting velocity.

It was furthermore shown, by a comparison of the exposure times required here with those of other installations, that a similar defect probably existed in other spectrographic equipments and that an improvement in the Ottawa corrector would point the way to a similar improvement elsewhere.

The matter was deemed of sufficient consequence to justify an energetic attempt at the improvement of existing conditions, and, with your hearty co-operation, a new correcting lens was ordered from the J. A. Brashear Co. The results of the investigation of the original corrector had previously been communicated to the Brashear Co. and to Prof. Hastings, who had designed it, and they were urged to do the best they possibly could.

Considerable delay ensued before Prof. Hastings completed the computations of the new corrector, partly on account of other duties and partly on account of the care and thought expended to secure the most efficient form. As the difficulty with the original corrector had been ascribed as partly due to its small aperture, about 2·25 inches, the new corrector was enlarged to 4 inches free aperture, effective aperture 3·8 inches, and consequently its position, as the ratio of focal length to aperture of the telescope is 15 to 1, was 15 × 3·8 or 57 inches within the focus. The lens could not be tested during the figuring in the same way as an ordinary lens on account of its requiring to have a stipulated amount of positive aberration to overcome the negative aberration due to the chromatic difference; moreover, it acts almost like a plate and cannot form any image by itself. Owing to the difficulties and delays involved, the objective could not be sent to the opticians to enable the combined system to be made free from aberration. Consequently Prof. Hastings devised an ingenious method of obtaining the correct figure without using the ordinary methods of testing. The radii of the surfaces and the thicknesses of the two elements were so computed that, assuming truly spherical surfaces, the system of objective and corrector would be free from aberration at the desired region. Such surfaces can be accurately figured and tested, the concave surfaces at the centre of curvature by the Foucault or knife edge test, and the convex, which are of the same radius as one of the concave, by interference fringes.

Although the Brashear Co. did not receive the data from Prof. Hastings until July, they completed the new lens in a very short time, and it was promptly sent to us, being received in the early part of August. Owing to its larger aperture and greater distance from the focus, the old form of mounting would not answer. This consisted of about 20 inches of 3-inch tube, the cell of the correcting lens being screwed in one end and the other sliding in a flanged casting which screwed in the end plate of the telescope. Such a tube for the new corrector would need to be about four feet long, and flexure would be certain to throw it out of collimation. A guide ring, into which this tube would easily slide, was consequently placed about three feet up the telescope tube, held in place there by three radial bolts passing through the latter and screwing into the ring, whose position was adjusted and maintained central by nuts on the outside of the telescope tube. This central position was determined and the exact collimation of the spectrograph tested in the following way: The correcting lens was removed from its cell and replaced by a thin circular metal plate with a hole about $\frac{1}{8}$ inch in diameter exactly central. A similar plate was placed at each end of the central tube of the spectrograph in which the collimator tube slides, the latter being removed for the purpose. Finally the main objective was removed and a board with a minute central hole through which fine piano wire was threaded was inserted in its place. When the telescope was pointed to the zenith, the wire threaded through these metal plates, and a heavy weight hung on the lower end, it was very easy to obtain the correcting lens cell and the optical axis of the spectrograph exactly collimated. The eye can readily judge whether the wire is

exactly central in holes of small diameter, those in the ends of the central tube being observed direct, while that in the end of the corrector mounting was observed by the bent guiding telescope. The central position was obtained by adjusting the guiding ring before mentioned and, when once obtained, the adjustment would be permanent. Furthermore the spectrograph itself was exactly collimated by filing one or more of the attaching lugs, so that, when the telescope is pointed at the zenith, the collimation is correct. When pointed at any other hour angle or declination, however, flexure of the telescope tube will slightly affect this adjustment. This cannot be avoided, and, as the flexure and consequent departure from collimation will depend on the hour angle and zenith distance, it is evident that adjustment for the zenith is the best mean value obtainable.

Having thus ensured that all conditions of mounting were as perfect as possible, I was naturally anxious to determine whether the new lens would fulfil the purpose for which it had been designed, and to this end it was necessary to repeat the tests previously made with the original corrector. I had become so familiarized with the illumination pattern on the collimator lens, as observed through the camera of the spectrograph, that it was felt, as soon as the telescope was pointed at a bright star, it could be at once decided whether the corrector gave a good image. The appearance was, however, disappointing for, although there was a slight improvement over the old lens, the illumination pattern was still very far from being as uniform as it should be, if the image were free from aberration.

As soon as possible the actual form of the image was determined, exactly as in the former paper, by Hartmann's method of extra-focal measurements. The mean of a number of such measurements is used and the zonal differences of focus are plotted in curve B, Fig. 2. For comparison the curve for the original

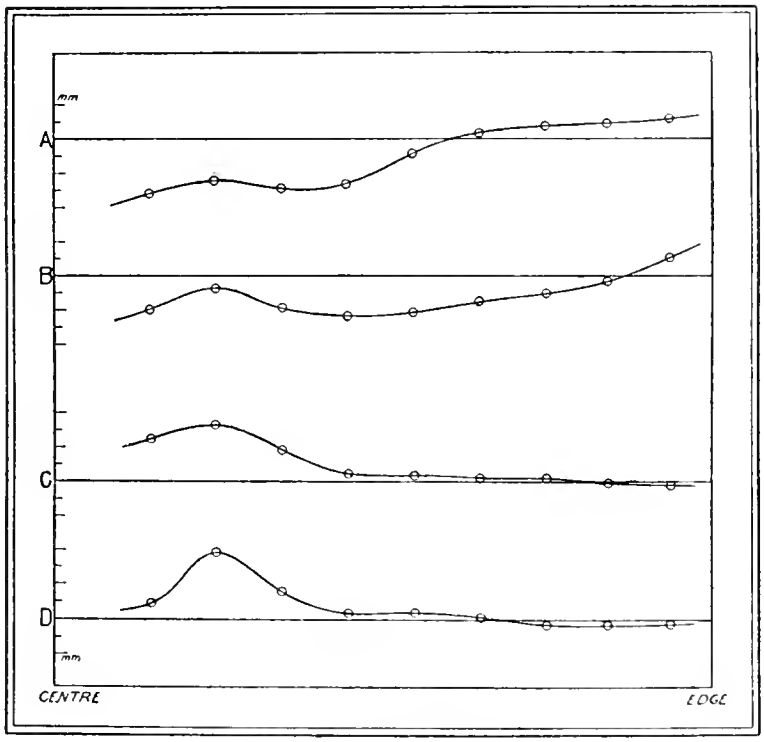


FIG. 2—Zonal Differences of Focus.

corrector is reproduced in A, while D gives the differences of focus for the objective used visually.

It is evident from a comparison of the curves for the two correcting lenses, that the same trouble exists in the new lens as in the old, for, although there is some slight improvement, it does not yet compensate for the chromatic differences. Its curve, however, is more regular and nearly similar to the visual curve, and this, taken in conjunction with its larger aperture, should allow it to be more readily corrected by refiguring. In actual use, however, it is doubtful whether much improvement would be noticed on account of the greater inclination of the curve at the outer zones, which have the greatest effect in determining the character of the image. This disappointing failure to fulfil the computed results must doubtless be ascribed to the small unavoidable departures of the actual from the computed radii of curvature, thickness, &c., of the elements, which may easily account for the small remaining aberration. Apparently the only chance of improvement is to be sought in refiguring the surfaces to introduce the required amount of positive aberration. A reference to Fig. 2 curve B, shows that if the focus for the edge with respect to the centre be shortened by 1·5 mm. and if the shortening be gradually decreased until a median zone is reached, the image will be as good as desired.

As soon as the actual form of image given by the combination was determined, I communicated the data to the J. A. Brashear Co., and asked them the best means of obtaining a better figure. Three methods could have been followed. 1st. To send objective and corrector to Allegheny; 2nd. To have an optician come to Ottawa and do the necessary figuring and testing here; 3rd. To send or take the corrector to Allegheny and have the edge focus shortened by the required amount. The first method is practically barred, on account of the difficulties and delays involved and the loss of the use of the objective for probably a month. Of the other two, Mr. McDowell informed me that he was certain he could readily introduce the required positive aberration, and thought the last method preferable. Therefore, by your kindness I took the corrector to Allegheny, being prepared to make there the Hartmann tests in addition to the visual tests of Mr. McDowell.

On reaching Allegheny on Wednesday, September 18, and talking over with Dr. Brashear and Mr. McDowell the best methods of testing the figure, it was at first proposed to use a spherical mirror with the source of light at the centre of curvature, to insert the corrector 57 inches, the computed distance, within the focus and test the aberration before and after refiguring. By this means, as will be readily seen, the light will pass twice through the lens, once in each direction, thus complicating matters. Moreover, no test could be made by the Hartmann method, as the plate would intercept the light. Further discussion of the matter resulted in an alternative method in which the lens would be tested under nearly the same conditions as those under which it was used.

A beam of parallel light was produced by placing an artificial star at the focus of a 6-inch objective. Centrally in this beam a 4-inch objective of 60 inches focus was placed, and 3 inches behind this, and consequently 57 inches from the focus, the corrector was inserted, thus intercepting a pencil of the same diameter and convergency and at the same distance from the focus as when used in its computed position at Ottawa. The image could then be examined at the focus either visually by the Foucault method or photographically by the Hartmann method.

A preliminary Foucault or knife-edge test with red monochromatic light, which was used in this test on account of the difficulty of obtaining monochromatic blue, showed that the edge focus of the system of 4-inch objective and corrector was about 0·7 mm. shorter than the focus at the centre. This is an indication, since presumably the 4-inch objective is free from aberration for light of this wave length, that positive aberration to the extent of about 0·7 mm. was present in the corrector. The chromatic difference of the 15-inch objective is about 2 mm., and hence this test

showed that the corrector required an increased amount, previously estimated at about 1·5 mm., of positive aberration. A Hartmann test, using photographic light, showed the difference between centre and edge to be about 0·2 mm. The difference between this and the visual test of 0·7 mm. is almost exactly that due to the chromatic difference of the 4-inch objective. Thus all the tests were in accord with one another and gave increased confidence in the reliability of each.

After a few minutes figuring of the outer concave surface, a visual test showed a difference between centre and edge of about 4 mm., which was considerably too great. However, Mr. McDowell's skill in figuring enabled him at the second trial to get the surface so nearly right that repeated tests by different observers showed the difference from the required amount 2·2 mm., to be indeterminable. A confirmatory Hartmann test showed the positive aberration present to be about 1·8 mm., 1·6 mm. greater than before figuring.

The corrector was therefore considered completed and the short time required to polish, less than five minutes if the time spent in carrying it too far and bringing it back be deducted, is an indication that its failure to fulfil its computed purpose is probably due, as was stated above, to slight deviations of the actual from the computed figures unavoidable in practice.

In this connection I wish to express my appreciation of the generous manner in which the John A. Brashear Co. have treated us in this as well as in all other matters, and my admiration of their skill in producing perfect optical surfaces.

Immediately upon my return from Allegheny, a Hartmann test was made of the performance of the refigured corrector. Using lantern plates and Capella as in the previous paper, the mean of a number of measures is plotted graphically in curve C, Fig. 2. A comparison of curves C and D shows that the deviations from the mean focus are less with objective and corrector than with objective alone, although this advantage is probably counterbalanced by the greater astigmatism of the former system in the other zone. If Hartmann's criterion 'T' is computed for objective and corrector, as was done in the previous paper for objective alone with a value of 0·141, it is found to be 0·118, showing the system to be almost perfect so far as zonal aberration is concerned. The small deviation near the centre is of no practical importance owing to the relatively small area and to the narrow convergency of the pencils, and probably arises, as the visual curve shows, in the objective itself.

Determinations of the colour curve of objective and corrector for a median zone were made by Hartmann's method and the results are given in Table II and are plotted in Fig. 3.

TABLE II.

COLOUR CURVES NEW CORRECTOR.

Wave Length.	Normal Position.	76 mm below Normal Position.	48 mm above Normal Position.	Old Corrector.
3,900	.....	79·87	74·42	50·85
3,933	75·29	79·36	73·82	49·97
3,970	74 80	78·49	73·05	49·34
4,035	73·91	76·94	72 48	48 29
4,102	73·06	75·95	71·87	47·32
4,175	72·65	75·78	71·61	46·42
4,250	72·24	74 55	71·40	46 11
4,342	72·26	74·26	71·65	45·62
4,415	72·38	74 04	72·04	45·47
4,501	72 71	73·92	72·52	45·36
4,590	73 15	74·24	73·26	45·69
4,680	73·68	74 68	74·05	46·04
4,765	74·55	75·23	74 77	46·50
4,861	75·22	76 02	75·85	46·99
5,050	76·35	77·56	77·93	48·85

Curve A is for the corrector in its computed position 57 inches above the focus, curve B 59 inches, and curve C 54 inches above the focus, while curve D is for the old corrector. These curves show that the point of minimum focus can be shifted to the red by lowering, and to the violet by raising the correcting lens, and this

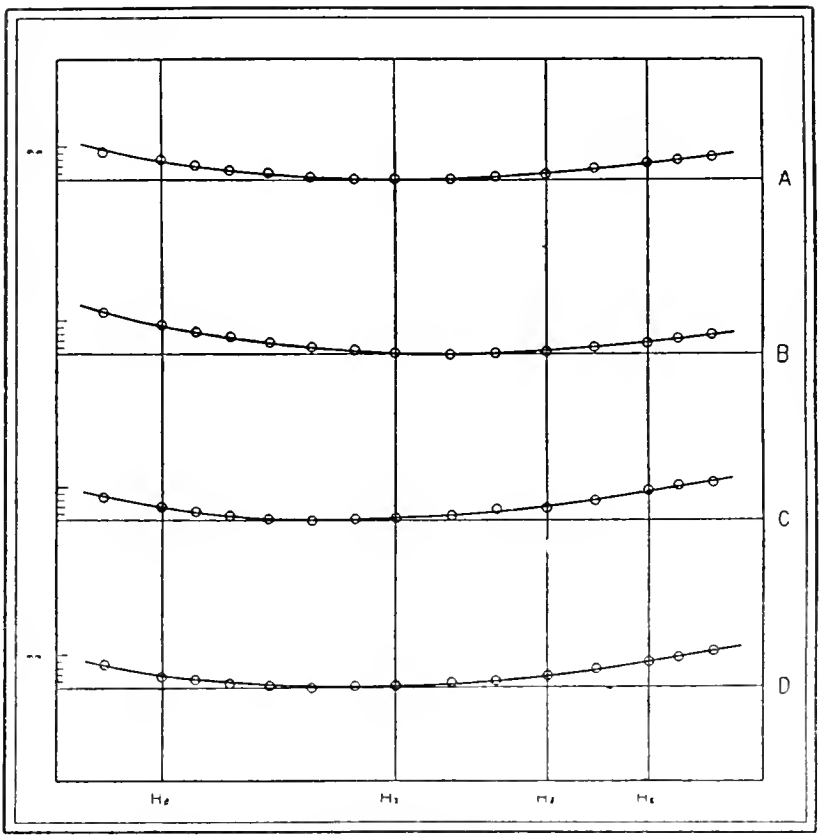


FIG. 3 Color Curves.

knowledge may be of value if, for any cause, the portion of spectrum under observation were changed. As is to be expected, the colour curves for new and old corrector do not differ appreciably in form.

It may be of interest to give some figures showing the exposures required to obtain measurable spectra with the new correcting lens. In the three prism plates, which have been confined to solar type stars, the region measured lies between λ 4340 and λ 4580 and the exposure was sufficient to give good intensity over the range. In the single prism plates, the region measured lies between H_β and K, and the exposure was sufficient to allow K to be accurately measured and to shorten up the diffuse H lines, which is, I should estimate, more than twice that required in a solar type star of the same magnitude, around λ 4500. In single prism work, in order to render the spectrum more uniform in intensity, the slit is placed about 2 mm. below the minimum focus, so that star light of wave lengths about λ4000 and λ4800 is in focus on the slit.

Three Prism Spectrograph.

Linear Dispersion 10·0 tenth-metres per mm. at $H\gamma$

Star.	Photc. Madge. Draper Cat.	Slit Width.	Exposure.
η Piscium	5·0	·038 mm.	70 mins.
ϵ Cygni	3·85	·030 "	40 "

Single Prism Spectrograph.

Linear Dispersion 30 tenth-metres per mm. at $H\gamma$

Star.	Photc. Madge.	Slit Width.	Exposure.
ι Orionis	3·4	·030 mm.	10 mins.
o Andromedæ	3·9	·030 "	25 "
ψ Orionis	4·6	·035 "	40 "

As these figures show, the exposure times required, considering the size of the telescope, are short and compare favourably with those of any installation, although enough data have not yet been secured with the three prism spectrograph to make accurate comparisons possible. If the magnitude of η Piscium, which is assigned as 5·02 in the Draper Catalogue, is reliable then a star of the 5th photographic magnitude could be photographed in two hours with a slit ·025 mm. wide and linear dispersion of 10 tenth-metres per millimetre, a very efficient performance for a 15-inch objective especially in the generally unfavourable conditions at Ottawa. Again, if the exposures given with the single prism spectrograph be reduced by 50 per cent or more, as would occur were the slit set at the focus for λ4400, and the spectrum made accurately measurable around this region, they would indicate similarly a very efficient condensing system. So far as the data at hand go, they indicate a decrease in the required exposure time with the new corrector of upwards of 30 per cent, and if Table V* of Appendix B of last year's report be reconstructed under these new conditions it would show the relative efficiency of the Ottawa installation to be equal if not superior to that of any other. The successful issue of the attempt to improve the photographic image given by the Ottawa objective and corrector is of value, not only on account of the increase in range and efficiency of the equipment, but also because of the greater freedom from chance of systematic displacement of the lines due to the more uniform illumination of the collimator ensured by an image free from aberration. It is also of value as showing the possibility of obtaining a practically perfect corrector without sending the objective to the optician.

Another advantage, so far as this investigation is concerned, is the assurance of having a star image free from aberration as a starting point for a trustworthy investigation into the actual effect of atmospheric disturbances on such an image. Some experiments were made, as recounted in the previous paper, on the effective diameter of the star image, but, owing to the aberrations present in the old corrector, the results obtained only gave the combined effect of aberration and atmospheric tremor. Since the former has been removed, a repetition of the experiments should give an accurate knowledge of the effect of the latter. Newall has already given†, principally from theoretical considerations, a very valuable discussion of the effect of such an enlarged image on the design of spectrographs, and it seemed to me that a description of some experiments bearing on the same point, with the conclusions reached, would also be of value. Newall considers the effective star image to be composed of a central 'core,' as he calls it, surrounded by a more diffuse 'tremor

*Since the Table referred to was published, Mr. V. M. Slipher has informed me that the exposure times assigned to the Lowell equipment were too large. They were taken from his paper on Standard Velocity Stars, but Mr. Slipher states that the early plates were not only overexposed but that the spectrum was made much wider than necessary. Under such conditions the Lowell equipment would make a much more favourable showing.

†M. N. LXV., p. 608.

disc' and calculates on such an assumption the quantity of light transmitted by slits of different widths for different diameters of core and tremor disc. I shall attempt to show how the percentage of light transmitted may be determined experimentally, and obtain from that and other experiments some conception of the form and dimensions of the star image.

If one examines the visual star image in a telescope by an eye-piece of moderate power, it cannot escape notice that the image is not stationary, that it is displaced in all directions from its mean position and moreover that the central diffraction disc is frequently expanded in a greater or less degree. The light in the bright rings surrounding the central disc together with these two phenomena due entirely to atmospheric effects may be assigned as the cause for the enlargement over theoretical dimensions of the star image on a negative. The effects are all summed up in the resultant image, very much increasing its diameter over that due to the central disc alone.

As a test of this hypothesis, stars of different magnitudes were photographed, a number of different exposures being given to each star. The diameter of the images varied from 0·050 mm. equivalent to 1″·8 for a faint star with short exposure to 0·130 mm. or 4″·7 for a bright star with medium exposure. A number of these images of moderate exposure had a central nucleus of about 2″ diameter, surrounded by an outlying penumbral portion some 3″ or 4″ in diameter. The diameter and intensity of this penumbra increased with increase of exposure, until in the longer exposures on bright stars its intensity became equal to the nucleus, resulting in the largely increased diameter noticed. Photographs of Capella on lantern plates with exposures from 10 to 40 secs. gave images of diameters from 0·13 to 0·17 mm., or from 4″·5 to 6″, and these images differed from those of shorter exposure on fainter stars by being more sharply defined at the margins and of uniform intensity throughout. The minimum effective diameter of star image seems, therefore, to be in the neighbourhood of 2″, though this will evidently vary with the conditions of seeing. The diameter remains nearly the same for a considerable range of exposure, and then begins to increase until it reaches about 6″, although part of this may be due to the spreading of the light in the film or to halation.

If the star be allowed to trail on the plate, the width of trail will give us a measure of the effective diameter of the image, and its appearance some idea of its character. The trails in every case, even in good seeing, were broken and jagged, showing the dancing of the image previously referred to. The enlargement or blurring is shown by the widths of the trails, which, for a third magnitude star on a lantern plate, ranged, even in the narrowest short parts, from 0·035 to 0·048 mm., or from 1″·25 to 1″·7 upwards of twice the diameter of the central disc. For Capella the widths were from 0·050 to 0·065 mm., 1″·8 to 2″·3. If the microscope wires were set tangent to a longer strip of the trail, the above figures were increased about 30 per cent. For the old corrector the widths ranged from 0·070 to 0·110 mm., practically twice as great as with the refigured lens.

The widths of star spectra made under different conditions of exposure and focus were also measured and ranged from 0·048 to 0·110 mm. In order to prevent any widening due to drift in right ascension, the spectrograph was turned in position until the slit was parallel to an hour circle. As the focal lengths of collimator and camera are equal, the widths obtained give a measure of the effective diameter of the star image. The star used was Vega, which was chosen for two reasons, the shortness of exposure required ensuring freedom from possibility of drift, and the type of spectrum rendering it certain that the full width was obtained. Similar experiments with solar type stars showed that the discontinuous nature of the spectrum rendered it apparently much narrower.

It will be of interest here to give a table showing the increase of width with increase of exposure.

TABLE III.

Exposure. secs.	Width. mm.	Diameter in Secs.
5	0·048	1·7
10	0·049	1·7
15	0·060	2·2
20	0·075	2·7
30	0·086	3·1
45	0·095	3·5
90	0·110	4·0

The above figures show how the outlying parts of the 'tremor disc,' which has a 'core' of about 1″·7 diameter, increase the width of the spectrum when the exposure is sufficiently prolonged to allow them to act on the plate.

With the old corrector the widths ranged from 0·085 to 0·115 mm., considerably wider than those given above.

The above experiments indicate that Newall's hypothesis in regard to the character and dimensions of the star image is in close agreement with the observed facts. The dimensions seem to point to a tremor disc about 5″ diameter, with a core 2″. If the proportions of the light, transmitted by slits of different widths on which such an image is incident, be computed, and if we obtain, exactly as was done before, the proportional exposures required to obtain spectra of equal intensity over the same range of slit-width, a comparison of the two should show whether the assumption made is justified. In any case the experiment will show the actual loss at the slit, and this will be of value as indicating the direction in which improvement may be reached.

Three stars were used in this test, Vega, Capella and γ Cygni, and the spectra were made of the usual width, the greatest possible care being taken to ensure uniform exposure over that width in order that they could be accurately compared. The exposures were so regulated as to obtain as nearly as possible equal intensity. Thus, neglecting plate factors which, within the limits of exposure time and intensity used, will not appreciably affect the result, a direct estimate of the percentage of light transmitted is obtained. The mean of a number of tests gives figures according to the following table; the seeing during these tests being slightly above the average.

TABLE IV.

SLIT TRANSMISSION.

Slit Width.			Comparative times for equal of spectrum intensity.		
Divs.	Mm.	Secs.	Observed.	Eliminating diffraction.	Computed $\tau=5''\gamma=2''$
1	·025	0·91	100	100	100
2	·050	1·82	40	50	54
3	·075	2·73	27	35	39
4	·100	3·64	25	32	34
5	·125	4·55	23	29	31
6	·150	5·45	23	29	31
8	·200	7·27	23	29	31

In the above table the fourth column gives the observed times for equal intensities of spectrum, while the fifth is the same with a correction for diffractional losses in the collimator with the narrower slit widths. The sixth column is computed on the basis of Newall's hypothesis for a tremor disc 5″ diameter with a core of 2″. The computed percentages are slightly higher than the observed, indicating that the actual image is probably somewhat larger than the dimensions chosen for the computed one. It must be remembered, however, that these figures are approximate only, the nature of the test not permitting determinations closer than 5 per cent. Moreover, a change in the steadiness of the air would change the observed figures very considerably, the effect of poorer seeing being to increase the diameter of the tremor disc and core, and consequently diminish the silt transmission.

All the experiments on the diameter of images, widths of trails and spectra, and loss of light at the slit, indicate a form of star image which is of about the same dimensions and character as that supposed by Newall, and we may, with confidence, consider that the actual effective image of a star given on the slit plate is very much larger than has generally been supposed. Moreover, as the zonal tests have shown that the condensing system is free from aberration and the image almost perfect, the enlargement must be due to atmospheric disturbance of the wave fronts and can not be overcome by any optical system. As a result, with a slit of normal width ·025 mm., only 30 per cent or less of the light collected by a 15-inch objective can be transmitted. This difficulty is much more serious with objectives of longer focus, as the image is probably enlarged proportionally. Indeed, Wright's tests* show that the Mills spectrograph only makes use of about 12 per cent of the light collected by the 36-inch telescope, and this in the unequalled atmospheric conditions of Mt. Hamilton. Part of the advantage of increase of aperture is thus lost by the consequent increase in the effective diameter of the image. The only means of diminishing this loss lies in using wider slits in our spectrographs. For example, a slit ·05 mm. wide with the 15-inch objective would transmit about 55 per cent of the incident light, while a slit ·075 mm. wide nearly 80 per cent. Unfortunately wider slits mean diminished purity and loss of accuracy, although, as is shown in the investigation below, the probable error of radial velocity determinations in early type stars by no means increases proportionately with the increase of slit width. These results also indicate the importance of using as large a collimator aperture as is consistent with homogeneous prisms, the consequent longer focus allowing increased slit width with equal purity. The question of spectrograph design, however, has been shortly discussed under the sub-heading 'The Spectrograph,' and nothing further need be added here.

MEASUREMENT AND REDUCTION OF STELLAR SPECTRA.

Measuring Machines.

All the spectra made here, with the exception of a few for which the Zeiss Scale Comparator was employed, have been measured on the Toepfer Measuring Microscope Model II. Continued use of this machine has confirmed the good opinion previously formed of its accuracy and convenience. Besides obtaining an extra objective of medium power over a year ago, two oculars of longer focus than the one originally supplied have recently been obtained and one of these is now constantly in use. The cross wires in the field are thereby made apparently narrower and, when a higher power objective is used (the power of the whole microscope not necessarily being changed) they do not cover up so much of the finer star or comparison lines so that more accurate settings can be made. A second improvement, which will be applied as soon as Mr. Mackey has time to make it, is an additional slide for adjusting and setting the negatives without running the main carriage backwards and forwards by

*Publications of Lick Observatory, Vol. IX., Part 3.

means of the screw. This will be more convenient, will allow any line of the negative to be set at any desired micrometer reading, and will prevent unnecessary wear of the screw.

Special stands with covers for the instruments when not in use are being made both for the Toepfer machine and for the Hartmann-Zeiss Spectro-Comparator which has just arrived. An ordinary table is somewhat too high, and the stands are being made of suitable height and of such dimensions as will conveniently hold the machine and a pad for entering the readings. Besides being more convenient in use and avoiding replacing the machine in the box when the measurement is completed, considerable space will be saved.

The Spectro-Comparator, in which the radial velocities are determined by directly comparing the displacement of the star lines with the corresponding lines of a standard or fundamental spectrum and in which consequently no knowledge of wave length is required, seems a very workmanlike and accurate instrument, but has not yet been placed in regular use. Consequently, a description of the instrument and of the method of measurement may preferably be deferred to the next report. Undoubtedly this machine will be of special value in the measurements of spectra rich in lines (of the solar and allied types) whether taken with high or low dispersion, and for these a marked saving in time as well as increase in accuracy will be obtained by its use. For spectra with few lines, especially where these are diffuse, the method usually followed of making linear measurements of the star and comparison lines and reducing to wave lengths by an interpolation formula, or obtaining the displacement directly by the use of suitable tables as is now done here will be found preferable. Consequently, each machine will have its own field for which it is best adapted, and the measurement may be suitably divided between them.

Method of Measurement.

In measuring a spectrogram by the Toepfer microscope, the method first adopted has since been followed almost without change, and may be again shortly described. The carriage having been moved to the middle of its range, micrometer reading 50·0, the negative is fastened on the plate glass top by spring clips with the red end of the spectrum to the left and the Fe line λ 4415, which is at minimum deviation, centrally under the wire. By moving the carriage back and forward, the spectrum may be oriented by the tangent screw provided until it is parallel to the direction of motion. The carriage is then moved to the right until the part of the spectrum where measurement is to begin is reached. This is, in the single prism plates, usually the comparison line λ 4864. The micrometer readings therefore diminish with the wave lengths, thus avoiding negative signs in the interpolation formula. On each star line 4 settings are made, 2 with forward, 2 with backward rotation of the screw. On each comparison line similarly 4 settings are made, one forward and one backward on each of the portions above and below the star spectrum. When this half of the measurement is completed, the plate is reversed so that the red end is to the right and the process repeated. Each measure in the second position is subtracted from a suitable number, (generally about the sum of the two measures of a line) and the final micrometer reading determined from the mean of the eight settings. This reversal of the plate is always necessary to overcome the difference in the settings on the dark comparison and light star lines in the two positions. With myself this difference, especially in the case of diffuse star lines is considerable, while with Mr. Harper the differences are always small. Comparisons show, however, that, after reversal, the final values obtained are practically the same for both observers.

The probable error of a single setting on a good comparison line will certainly not exceed ·002 revolution or ·001 mm., and on a good star line will be somewhat less than this, while the probable error of the mean in each position of the plate will only be half the above. The probable errors, as deduced from the final velocity values for

the star lines, will be considerably greater than above, the ratio depending on the character of the spectrum and on the dispersion of the spectrograph as affecting the resolution of blends whose effective wave length is uncertain.

Reduction of Stellar Spectra.

So far as the spectra produced by the single prism spectrograph are concerned, the method of reduction described in last year's report based upon that devised by Hartmann* has been followed exclusively. It has been found very satisfactory, both the time and labour required being reduced to a minimum. There has since appeared [1] a method by Dr. Schlesinger on a somewhat similar plan, but without any apparent advantage over the former. Indeed, after the tables of micrometer readings for star and comparison lines have once been computed the reduction by the former method is slightly simpler and equally accurate.

The Hartmann method has since been applied to plates made with the three prism spectrograph using the Hartmann-Zeiss 'Chromat' camera objective of 528 mm. focus giving a linear dispersion at $H\gamma$ of about 10 tenth-metres to the mm.

Measures were made as before of a number of comparison (Fe, V spark) spectra at 3 different temperatures (+15·9° +21·1° +26·8°C). From standard lines chosen at different places in these spectra, using the complete Hartmann formula $s_0 - s = \frac{c}{(\lambda - \lambda_0)^a}$, Mr. F. W. O. Werry, who has ably performed all the computation required in this work, determined sets of constants for values of a between 0·5 and 1·0 by steps of 0·1. Using these constants the residuals obtained by subtracting the observed from the computed micrometer readings of the lines measured were compared. It was found that the residuals were the smallest when $a = 0{\cdot}5$, and that they were on the whole the most satisfactory when the three chosen standards were near the middle of the range of spectrum measured. Thus the residuals for the standards λ4494·755, 4315·255, 4199·256 were more satisfactory than when the lines λ 4864·943, 4395·382, 4099·920 were used as standards. Consequently, constants for the three temperatures were computed, taking $a = 0{\cdot}5$ and using the lines λ 4494, 4315 and 4199 as standards. These are tabulated below with the corresponding micrometer readings.

TABLE OF CONSTANTS.

Temp. C	4494·755 s_1	4315·255 s_2	4199·256 s_3	s_0	log c	λ_0
15·9	163·4019	130·9354	104·8351	537·9128	4·1078875	3322·975
21·1	163·3790	130·8597	104·7295	539·2839	4·1099020	3320·806
26·8	163·3965	130·8390	104·6593	538·5569	4·1084358	3324·076

As in the similar work with the single prism, there is a general progression which is more clearly shown by some measurements later made at lower temperatures. These indicate that in the plate at 21·1° temperature there is some cause, possibly inaccurate camera focus (a change of 0·1 mm. would easily account for the difference), rendering its values discrepant, and it was therefore not considered in determining

* A. N. No. 3703.

[1] Publications Allegheny Observatory, Vol. 1, No. 2.

the arbitrary values of the s's and the ratios between them chosen for the six temperatures $-20°$, $-10°$, $0°$, $+10°$, $+20°$, $+30°$, for which tables were computed. The differences of the s's and the log $\frac{s_1 - s_2}{s_1 - s_3}$ are given below for four temperatures.

Temp. C	$s_1 - s_2$	$s_2 - s_3$	$s_1 - s_3$	Log $\frac{s_1 - s_2}{s_1 - s_3}$
9·9	32·4025	26·0247	58·4272	9·74396
15·9	32·4665	26·1003	58·5668	9·74378
21·1	32·5193	26·1302	58·6495	9·74387
26·8	32·5575	26·1797	58·7372	9·74373

From experience with the working of the single prism tables, where the change of the ratio of $s_1 - s_2$ to $s_1 - s_3$ was made a little too great, the increment to be added to the logarithm of this ratio for each 10° change of temperature was made 5 in the last place and the logarithm was taken as 9·74395 for 0°C. The value of $s_1 - s_3$, for 10° was chosen as 58·4500 and its change was made ·1800 for every 10°. In order to bring the line λ 4415·293, the line at minimum deviation, as close as possible to micrometer reading 150·0000 the values of s_1 were chosen as given below and the final tables show, by the close agreement of the computed micrometer reading for the line λ 4415·293 with 150, that these values were nearly correct.

ARBITRARY VALUES CHOSEN.

Temp. C.	$s_1 - s_3$	log $\frac{s_1 - s_2}{s_1 - s_3}$	$s_1 - s_2$	$s_2 - s_3$	s_1
−20	57·9100	9·74405	32·1221	25·7879	163·2480
−10	58·0900	9·74400	32·2182	25·8718	163·2860
0	58·2700	9·74395	32·3143	25·9557	163·3240
+10	58·4500	9·74390	32·4104	26·0396	163·3620
+20	58·6300	9·74385	32·5065	26·1235	163·4000
+30	58·8100	9·74380	32·6025	26·2075	163·4380

From the above table the values of s_2 and s_3 were readily obtained by subtraction, and the values of the constants as computed by Mr. Werry are given in the next table.

CONSTANTS.

Temp. C.	4494·755 4315·255 4194·256.					
	s_1	s_2	s_3	s_0	Log c.	λ_0
−20	163·2480	131·1259	105·3380	536·0670	4·1070976	3316·609
−10	163·2860	131·0678	105·1960	536·7883	4·1076707	3317·813
0	163·3240	131·0097	105·0540	537·5152	4·1082533	3318·993
+10	163·3620	130·9516	104·9120	538·2138	4·1087884	3320·242
+20	163·4000	130·8935	104·7700	538·9429	4·1093742	3321·400
+30	163·4380	130·8355	104·6280	539·6538	4·1099295	3322·600

Using these constants the micrometer readings corresponding to all the wave lengths used, both star and comparison, were computed for each temperature and

tables formed as in single prism work. The velocity values of one revolution of the micrometer screw are also required and these are readily obtained by differentiating the interpolation formula and applying Doppler's principle.

$$s_0 - s = \frac{c}{(\lambda - \lambda_0)^{0.5}}$$

$$ds = \tfrac{1}{2} \cdot \frac{c\,d\lambda}{(\lambda - \lambda_0)^{1.5}}$$

and $$v = 299860 \cdot \frac{d\lambda}{\lambda}$$

$$v = 299860 \cdot \frac{2(\lambda - \lambda_0)^{1.5} \cdot ds}{\lambda \qquad c}$$

The tables formed as described are used in reducing the three prism plates in exactly the same way as described in the last report for the single prism plates and effect an equal saving of time and labour with the former.

The corrections for curvature of the spectral lines and for the diurnal and annual motions of the earth are applied in the usual way and no description of them is necessary here.

EFFECT OF SLIT WIDTH.

The experiments on the effective dimensions of the star image, given under 'New Correcting Lens' above, showed the importance of using as wide a slit as is consistent with accuracy in velocity determinations. Every spectroscopist has observed how wide and diffuse the lines of both emission and sharp absorption spectra become when the slit is made say ·075 mm. wide, and indeed the gradual increase in diffuseness is noticeable as the slit is widened from say ·02 mm. This increase is not so marked when the focal length of the collimator is considerably greater than that of the camera, as the width of the image of the slit is evidently reduced in proportion to the ratio of camera to collimator. When camera and collimator are of the same focal length, the image of the slit is of the same width as the slit, whereas if, for example, the camera is only half the focal length of the collimator the image of the slit is only half as wide as the slit itself. Consequently, in the latter case, the diffuseness of the lines is not so obtrusive.

It becomes a question of much interest to what extent the accuracy of velocity determinations is diminished by an increase in slit width. This can only be determined by actual experiment, by making exposures on suitable stars at the different slit widths and measuring and reducing the spectra. In order to obtain results of value, there must be a sufficient number of measurements at each slit width to prevent accidental discrepancies of some lines or plates from appreciably affecting the final result or influencing the conclusions drawn from these results. As the labour involved in measuring and reducing spectra is considerable this number at each slit width was limited to six, although it was felt that double the number would be preferable.

Evidently the loss of accuracy occurring as the slit is widened may be due to two causes: 1. The diffuseness of the lines of a spectrum will diminish the accuracy of setting on the individual lines, will increase the accidental errors and the residuals from the separate lines, and consequently also the probable error of the mean. 2. A systematic displacement of the star lines with respect to the comparison lines, resulting in an error in the velocity, may occur when the slit becomes wider than the diameter of the image owing to its unsymmetrical position with respect to the slit jaws.

These two sources of error are in one sense entirely independent of each other. The former may easily be evaluated independently of the latter by treating the residuals from a sufficient number of measurements of star lines on a number of

plates, these residuals being obtained for each plate from the mean velocity for that plate. The effect of the latter can only be obtained from such a number of complete velocity determinations that the systematic displacements may be considered accidental.

In considering errors from the first cause, it is necessary to limit the conditions so that only errors of setting will occur, and no error due to lack of resolution will be a factor. This is, of course, easy enough to do by limiting the stars observed to those of the early types, where all the lines are single and no question of the wave lengths of blends will occur. This presupposes the method of measurement to be that usually followed, linear measures of the positions of star and comparison lines along the spectrum and reduction to wave lengths by an interpolation formula. However, if two similar spectra of the same resolution even if rich in lines and blends are compared by the spectro-comparator, questions of wave length are eliminated and only, as before, the accidental errors of setting of the groups of lines remain. It was felt, however, that the comparison would be more direct, that only errors of setting due to increase in diffuseness and width would occur if the experiments were limited to stars of one type containing only a limited number of single lines so separated that, in no case, could adjacent lines merge into one another as the slit widened. Furthermore, in early type stars the lines are frequently diffuse and difficult to set upon, rendering the velocity determination uncertain to a considerably greater extent than with second type stars. Where very accurate determinations are not possible in any case, a slightly increased probable error may be permitted more readily than where, with ordinary observing conditions, reliable and accurate velocities can be obtained. To further shorten the labour involved the experiments were confined to one star and β Orionis was chosen as being on the whole the most suitable. The character of its spectrum, containing a number of single lines only moderately sharp, is such as to make the test as general as possible, combining, so far as may be, both sharp and diffuse lines. Its brightness renders only short exposures necessary, although, as will be seen later, this may not be advantageous so far as systematic displacements are concerned.

As mentioned above, six spectra were obtained and measured for each slit width tested, at three different dispersions of the new spectrograph, making in all 66 measures. Of these measures 18 were made by Mr. Harper, the balance by myself. As about 15 lines, star and comparison, were measured in each spectrum and eight settings were made on each line, this means nearly 8,000 settings of the micrometer screw.

The three dispersions used were as follows. Collimator focus in all cases 525 mm.

(*a*) Single prism spectrograph, Brashear single material camera objective, 525 mm. focus. Linear dispersion at $H\gamma$ 30·2 tenth-metres per millimetre.

(*b*) Three prism spectrograph, Hartmann-Zeiss 'Chromat' camera objective, 525 mm. focus. Linear dispersion at $H\gamma$ 10·2 tenth-metres per millimetre.

(*c*) Three prism spectrograph, Ross special 'Homocentric' camera objective, about 275 mm. focus. Linear dispersion at $H\gamma$ 18·2 tenth-metres per millimetre.

With dispersions *a* and *b* four different slit widths 0·025, 0·038, 0·051 and 0·076 mm. were tested, while with dispersion *c*, only three 0·025, 0·051 and 0·076 mm. The Ross lens was not free from curvature of field and aberration and moreover, as only a temporary mounting was used, no temperature control could be applied. However, care was taken to make the exposures only when the temperature in the dome had reached a steady state, and, as the exposures were short, only five minutes for slit ·025 mm. and the comparison applied three times, the danger of systematic displacement due to changes of temperature is probably not great. Nevertheless this, along with possible discrepancies due to the aberration of the lens, causes somewhat less confidence to be placed in the results from dispersion *c* than from the others, and also led to the omission of plates for slit width 0·038 mm. from this set.

The desire to test the effect of increased slit width, when the ratio of collimator to camera focus was, as in this case, nearly two to one (in dispersions *a* and *b* the focal lengths of collimator and camera are equal) led to the use of this imperfect lens. The test will be repeated when a better one can be obtained.

The spectra given with dispersion *c* for wide slits 0·051 and 0·076 mm. certainly look to the eye much sharper than those obtained with the same slit with dispersions *a* and *b*, but the measures and comparison of the measures must be the final test, making allowance for the character of the short focus lens and the lack of temperature control.

The time of exposure required is much diminished as the slit is widened, indeed it is nearly inversely proportional to the width. The table below gives the mean times required to give equal intensity of spectrum.

	Exposure Times for Slit.			
Camera	·025	·038	·051	·076 mm.
I L	150″	90″	60″	45″
III S	5′	...	3′	2′
III L	14′	10′	8′	5′

This indicates how much saving of time would be effected could the slit be opened to a greater width than usually employed.

In the measurement of these 66 plates, the same lines both star and comparison were used in all plates of the same dispersion, although the star lines employed changed as the dispersion changed. This was due to a longer range of spectrum in the single prism spectrograph, and to differences in the best lines available with the different dispersions. The lines H_β, λ 4861·527, *Mg* λ 4481·400, *He* λ 4471·676 and H_γ λ 4340·634 were measured in all the spectra. In addition in the single prism plates the lines H_δ λ 4102·000, *He* λ 4026·352 and *Ca* 3933·825 were also measured. In the three prism plates with Ross Camera Objective (short focus) the lines *Si* λ 4131·047, *Si* λ 4128·211 and H_δ were measured. In some of the three prism plates with Zeiss 'Chromat' Camera Objective the same lines also including *He* λ 4388·100 were measured, while in others only the first four mentioned and *He* λ 4388·100.

All the measurements were reduced to velocities by Hartmann's method already described. As mentioned previously, tables have been constructed for dispersions (*a*) and (*b*) and these were used direct. For dispersion (*c*) constants of an interpolation formula were computed for one plate, and from these were calculated the micrometer readings corresponding to the wave lengths of the comparison and star lines used with, for the latter, the velocities in kilometres per second per revolution of the micrometer screw. Hence, as all the plates were taken at the same temperature, the others were readily reduced from the one first used. It has not seemed necessary to give the detailed measures of each plate in this case, but only to tabulate the velocities corresponding to each star line measured. The six plates for each slit width with each dispersion are grouped together making 11 sets of six plates each. Each line has been weighted according to its quality, and the weighted mean in every case is used. Below the separate measures is given the weighted mean of the plate for the different grouping of lines employed in obtaining residuals and probable errors. In this way one can much more readily compare the results from each line and each plate, also the results from sets of plates, than if the measure of each plate was tabulated by itself. The residuals from the lines can also be readily obtained and tabulated or treated in any desired way.

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SINGLE PRISM, CAMERA 525 MM. FOCUS.

Slit 0·025 mm.

Plate No.		1241a.		1241b.		1241c.		1242a.		1242b.		1242c.	
Wave-Length.		Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.
4861·527 H_β		1	34·54	1	12·48	1	30·04	1	40·20	1½	38·02	1	17·99
4481·400 Mg		3	40·28	3	40·28	2	51·56	3	40·74	2½	43·76	3	33·61
4471·676 He		2	53·40	1	38·54	1	52·83	3	47·00	1½	50·75	2	54·55
4340·634 H_γ		3	35·17	3	38·41	3	35·49	2	36·53	3	41·34	2	27·97
4102·000 H_δ		1	34·37	1½	31·33	1½	36·10	1	31·33	2	26·99	1½	31·94
4026·352 He		1	49·72	1	41·76	1	40·69	1	50·86	1½	45·10	1	51·59
3933·825 Ca		2	39·40	2	45·09	1½	43·89	1	43·14	1½	59·40	1½	43·14
Wt'd. Mean.	All Lines		40·81		37·28		40·65		41·82		40·54		37·34
	Three Lines		41·64		39·23		43·74		42·03		44·22		37·98

Slit 0·038 mm.

Plate No.		1243a.		1243b.		1243c.		1244a.		1244b.		1244c.	
Wave-Length.		Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.
4861·527		½	26·56	1	14·07	1	30·48	1	26·99	1	8·86	1	33·28
4481·400		3	42·12	2	46·04	2	34·76	3	41·20	3	33·61	2	45·11
4471·676		2	36·94	2	46·43	2	48·26	2	43·11	2	36·25	2	49·97
4340·634		3	38·93	3	35·80	3	45·19	3	44·25	3	35·07	3	41·02
4102·000		2	27·86	1½	28·21	2	30·03	2	32·55	2	23·08	2	35·84
4026·352		½	43·46	1	37·11	1	41·02	½	54·85	1	33·85	1	41·83
3933·825		1	42·39	1½	36·40	2	40·30	1	51·01	1	42·24	1	39·77
Wt'd. Mean.	All Lines		37·51		36·70		39·52		41·05		31·51		41·66
	Three Lines		39·63		41·76		43·09		42·82		34·82		44·75

SINGLE PRISM, CAMERA 525 mm. FOCUS.

Slit 0·051

Plate No.		1245a.		1245b.		1246c.		1249a.		1249b.		1249c.	
Wave-Length.		Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.
4861·527		1	32·22	½	4·93	1	24·96	1	29·61	½	46·00	1	22·06
4481·400		3	45·12	3	43·27	3	38·67	3	33·26	2	35·22	2	39·36
4471·676		2	46·54	2	38·53	2	41·97	2	33·96	2	39·11	2	51·57
4340·634		3	39·24	3	37·89	3	36·84	3	30·37	3	30·58	3	38·93
4102·000		2	31·50	2	20·57	2	26·07	2	31·33	2	26·56	2	23·35
4026·352		1	45·90	1	37·11	1	41·42	2	48·34	1	46·39	1	40·85
3933·825				½	40·15	1	43·14	2	43·89	1	37·15	1	42·02
Wt'd. Mean.	All Lines	40·61		35·11		36·32		35·10		34·79		37·52	
	Three Lines	43·27		40·07		38·81		32·35		34·34		42·66	

Slit 0·076

Plate No.		1247a.		1247b.		1247c.		1248a.		1248b.		1248c.	
Wave-Length.		Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt	Vel.	Wt.	Vel.	Wt.	Vel.
4861·527		1	20·61	1	33·67	1	16·25	½	49·78	1	12·63	1	33·09
4481·400		3	50·64	3	50·29	3	40·28	2	24·28	1	8·17	2	58·12
4471·676		2	37·40	2	61·06	2	41·51	1	22·53	1	27·10	2	53·75
4340·634		2	34·13	3	41·43	3	31·83	3	36·32	3	28·49	3	52·60
4102·000		1½	33·07	2	20·74	2½	42·44	2	29·16	2	26·12	2	30·32
4026·352		½	60·38	½	27·99	1	25·96	2	45·08	½	33·12	1	49·56
3933·825		1	48·24	1	53·25	1	53·48	1	59·99	1	50·63	1	54·37
Wt'd. Mean.	All Lines	40·34		43·17		37·12		35·95		26·61		49·77	
	Three Lines	42·14		49·66		37·42		30·01		24·15		54·51	

THREE PRISM, CAMERA 525 mm. FOCUS.

Slit 0·025.

Plate No.		1405.		1406.		1407.		1408.		1409.		1410.	
Wave-Length.		Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.
4861·527		1	35·59	1	39·55	1	39·55	1	37·52	1	34·02	1	35·36
4481·400		2	52·05	2	53·33	3	46·96	2	47·17	2	51·39	2	49·81
4471·676		1½	52·00	1½	47·33	1½	52·98	1½	54·70	1½	58·30	1½	47·91
4388·100		1	54·44	1	50·53	1	41·04	1	54·99	1	54·89	½	45·13
4340·634		2	44·48	1½	46·76	2	41·66	1½	49·58	2	51·33	2	47·82
4131·047		¼	51·52	¼	37·91	1	47·05	¼	52·15	½	49·09	¼	44·56
4128·211		½	41·67	¼	50·97	½	57·23	½	47·85	½	47·85	¼	53·58
4102·000		1	30·55	1	32·73	½	42·65	½	36·15	½	39·61	¼	35·08
Wt'd. Mean.	Four Lines		50·08		49·72		45·96		51·16		53·50		48·28
	Three Lines		49·28		49·58		46·72		50·15		53·25		48·57

Slit 0·038.

Plate No.		1411.		1412.		1413.		1414.		1420.		1432.	
Wave-Length.		Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.
4861·527		1	25·63	½	54·17	1	32·15	½	35·53	1	44·56	1	65·19
4481·400		3	48·95	3	49·60	3	52·83	3	50·02	3	47·75	3	43·94
4471·676		1½	52·94	2	55·18	1½	50·73	2	53·38	2	45·20	2	38·25
4388·100		½	49·16	1	39·44	½	44·24	½	34·03	½	43·27	1	39·92
4340·634		2	45·64	2	46·06	2	54·50	2	54·40	1½	44·02	2	52·56
Wt'd. Mean.	Four Lines		48·87		48·84		52·24		51·02		45·90		44·17
	Three Lines		48·85		50·18		52·86		52·23		46·10		44·78

THREE PRISM, CAMERA 525 mm. FOCUS.

Slit 0·051.

Plate No.		1426.		1427.		1428.		1429.		1430.		1431.	
Wave-Length.		Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.
4861·527		1	45·15	1	49·46	1	58·14	1	40·14	1	45·96	1	47·36
4481·400		2	40·35	2	41·09	2	40·01	2	42·21	2	41·17	2	40·14
4471·676		1½	43·98	1	46·35	1½	44·80	1½	48·89	1½	45·41	1½	37·84
4388·100		½	33·96	½	33·20	½	38·62	1	46·25	½	33·52	½	33·22
4340·634		1½	49·05	2	50·45	2	47·47	2	46·06	1½	45·18	2	50·81
Wt'd. Mean.	Four Lines	43·14		44·73		43·58		45·56		42·72		42·54	
	Three Lines	44·05		45·89		44·03		45·43		43·64		43·39	

Slit 0·076.

Plate No.		1433.		1434.		1435.		1436.		1437.		1438.	
Wave-Length.		Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.
4861·527		1	48·30	1	36·76	1	47·60	1	42·17	1	33·03	1	40·37
4481·400		2	41·84	2	40·76	2	38·15	2	39·60	1½	41·17	1½	40·54
4471·676		1½	43·16	1	51·30	1	43·32	1½	37·68	1	44·39	1	47·46
4388·100		½	39·92	½	45·32	½	29·79	½	23·90	½	47·63	½	26·10
4340·634		2	42·23	1	45·88	1½	42·93	1½	49·40	2	44·83	1½	44·48
Wt'd. Mean.	Four Lines	42·14		44·75		39·78		40·32		43·92		41·80	
	Three Lines	42·34		44·68		40·89		41·96		43·51		43·75	

THREE PRISM, CAMERA 275 mm. FOCUS.

Slit 0·025.

Plate No.		1285a.		1285b.		1285c.		1286a.		1286b.		1286c.	
Wave-Length.		Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel	Wt.	Vel.
4861·527		½	12·30	1	13·74	1	43 11	1	40·89	½	14·41	1	15·84
4481·400		2	35·17	2	31 88	2	31·43	2	42·73	2	41·16	2	44·90
4471·676		1½	39·88	1	51·53	2	44 62	2	43 36	1½	39 21	2	46·68
4340·634		1½	32·61	1½	42·20	1½	42·83	1½	38·69	1½	36·50	2	43·02
4131·047		1	33·79	½	47 52	1	39 32	1	35·63	1	36·87	1½	43·50
4128·211		1	38·41	½	40 68	1	40 41	½	38·68	1	36·29	1	38·57
4102·000		1	28·87	1	32·26	1½	19 25	1	33·31	1½	25·85	1	19·52
	All Lines		33·68		35·83		36 79		39·93		35·00		38 89
Wt'd. Mean.	Five Lines		35·90		40·49		39·48		40·74		38·43		43 88
	Three Lines		35 82		39 69		39·34		41 76		39·19		44·87

THREE PRISM, CAMERA 275 mm. F CUS.

Slit 0·051.

Plate No.		1289a.		1289b.		1289c.		1290a.		1290b.		1290c.	
Wave-Length.		Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.
4861·527		½	5·32	1	20·17	1	55·41	1	45·21	½	26·60	1	36·79
4481·400		2	46·92	3	36·07	3	45·05	3	37·56	3	48·04	3	38·31
4471·676		1½	35·07	2	45·21	2	48·54	...	.....	2	39·21	1½	43·65
4340·634		3	34·99	3	41·70	3	51·11	2	34·24	2	36·37	3	31·54
4131·047		1	29·09	½	28·35	1	37·11	½	46·41	½	46·60	¼	44·52
4128·211		1½	37·97	½	34·08	½	36·28	½	37·19	¼	48·66	½	38·48
4102·000		1½	28·68	1	32·55	½	21·11	½	22·95	½	30·86	1	25·14
Wt'd Mean.	All Lines		34·83		37·06		46·07		37·29		41·08		35·83
	Five Lines		37·49		39·47		46·40		37·16		42·67		37·02
	Three Lines		38·68		40·47		48·19		36·23		42·18		36·67

Slit 0·076.

Plate No.		1291a.		1291b.		1291c.		1292a.		1292b.		1292c.	
Wave-Length		Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.
4861·527		1	32·03	½	46·32	½	42·67	1	5·54	1	71·81	1	57·18
4481·400		2	38·16	2	36·66	1½	24·09	2	35·17	2	45·79	2	39·06
4471·676		1½	39·29	1½	38·55	1½	38·18	1½	43·77	1½	40·03	1½	49·65
4340·634		2	42·96	1½	36·18	1½	25·46	1½	28·34	1½	29·91	1½	27·34
4131·047		½	46·74	½	39·18	½	37·61	¾	36·65	½	43·05	1	48·90
4128·211		½	33·53	½	33·66	1	32·70	¼	55·55	¼	46·55	1	45·22
4102·00		½	23·12	1	28·66	1½	29·89	1	18·06	1	26·94	1	29·98
Wt'd. Mean.	All Lines		38·11		36·49		31·16		30·43		42·37		41·65
	Five Lines		40·20		36·97		30·52		36·64		39·91		41·10
	Three Lines		40·21		37·08		29·25		35·70		39·30		38·72

As previously mentioned, in order to get the probable error of the velocity determination from a single line when, as in this case, six plates are used, it appears preferable to use the weighted residuals from the mean velocity for each plate rather than the residuals from the mean velocity of all six plates. The former method frees the determination from any chance of disturbance by systematic displacement of the star lines with respect to the comparison lines on any of the plates. Some idea of the magnitude of the latter error may be obtained by combining the residuals obtained by subtracting the velocity value of each plate from the mean of the six. But this will be affected also by the accidental errors of the separate plates and, moreover, there are not enough measures to give any definite result. However, this will also be obtained and, as will be seen, may be used in a comparative way for the different slit widths.

The probable errors of setting on a single line are obtained from two or three groupings of the lines in each dispersion. In dispersion (*a*) 1st from all seven lines. 2nd from the three lines. *Mg* 4481, *He* 4471 and $H\gamma$ 4340; in dispersion (*b*), 1st from the four lines 4481, 4471, 4388 and 4340. 2nd from the three 4481, 4471, 4340; in dispersion (*c*) 1st from all the lines measured. 2nd from the five lines 4481, 4471, 4340, 4131, 4128. 3rd from the three lines 4481, 4471, 4340. The three lines 4481, 4471, 4340 are by far the best on the plates and their measures deserve much higher weight, not only on account of their quality, but also because they are near the position of minimum deviation λ 4415, the axis of the camera lens, and the minimum focus of the colour curve of objective and corrector. As will be seen below, the probable errors are considerably smaller when these three lines only are used than when some of the poorer lines are combined with them.

The probable errors obtained by these different groupings are tabulated below:—

DISPERSION (*a*).

SINGLE PRISM.—CAMERA 525 MM. FOCUS.

Probable Error of Setting on a Single Line.

Slit-Width in mm.	Probable Error. 7 Lines, 42 Residuals.	Probable Error. 3 Lines, 18 Residuals.
0·025	± 5·3 km.	± 4·5 km.
0·038	4·8	2·4
0·051	5·2	2·3
0·076	7·5	4·3

PROBABLE ERROR, SINGLE PLATE.

Residuals from Six Plates.

Slit-Width in mm.	Probable Error. Velocities from 7 Lines.	Probable Error. Velocities from 3 Lines.
0·025	± 1·3 km.	± 1·7 km.
0·038	2·5	2·7
0·051	1·5	3·0
0·076	5·2	7·7

DISPERSION (*a*)—*Continued.*

MEAN VELOCITIES—REDUCED TO SUN.

Slit-Width.	Velocities from 7 Lines.	Velocities from 3 Lines.
0·025	+ 21·4 ± 0·5	+23·2 ± 0·7
0·038	19·7 ± 1·1	22·8 ± 1·0
0·051	18·2 ± 0·6	20·2 ± 1·2
0·076	20·4 ± 2·1	21·2 ± 3·2

DISPERSION (*b*).

THREE PRISMS — CAMERA 525 MM. FOCUS.

Probable Error of Setting on a Single Line.

Slit-Width in mm.	Probable Error. 4 Lines, 24 Residuals.	Probable Error. 3 Lines, 18 Residuals.
0·025	± 2·3 km.	± 2·3 km.
0·038	2·8	2·1
0·051	3·0	2·5
0·076	3·1	2·1

PROBABLE ERROR, SINGLE PLATE.

Residuals from 6 Plates.

Slit-Width in mm.	Probable Error. Velocities from 4 lines.	Probable Error. Velocities from 3 lines.
0·025	± 1·7 km.	± 1·5 km.
0·038 — 4 plates.	1·2	1·3
0·038 — 6 plates.	2·1	2·2
0·051	0·8	0·7
0·076	1·4	0·9

MEAN VELOCITIES — REDUCED TO SUN.

Date.	Slit-Width in mm.	Velocities from 4 lines.	Velocities from 3 lines.
Mar. 20	0·025	+ 24·5 ± 0·7	+ 24·3 ± 0·6
" 20	0·038—4 plates.	24·9 ± 0·5	25·7 ± 0·5
" 21	0·038—1 plate.	20·8	21·0
" 24	0·038—1 plate.	+ 19·4	19·9
" 24	0·051	18·9 ± 0·3	19·6 ± 0·3
" 24	0·076	16·1 ± 0·6	18·0 ± 0·4

DISPERSION (*c*).

THREE PRISMS — CAMERA 275 mm. FOCUS.

Probable Error of Setting on a Single Line.

Slit-Width in mm.	Probable Error. 7 Lines, 42 Residuals.	Probable Error. 5 Lines, 30 Residuals.	Probable Error. 3 Lines, 18 Residuals.
0·025	±5·6 km.	± 2·8 km.	± 2·9 km.
0·051	4·8	3·2	2·9
0·076	6.4	4·0	3·8

PROBABLE ERROR, SINGLE PLATE.

Residuals from 6 plates.

Slit-Width in mm.	Probable Error. Velocities from 7 Lines.	Probable Error. Velocities from 5 Lines.	Probable Error. Velocities from 3 Lines.
0·025	± 2·4	±3·2	± 2·1
0·051	4·2	3·8	3·0
0·076	5·0	3·8	2·9

MEAN VELOCITIES — REDUCED TO SUN.

Slit-Width in mm.	Velocities from 7 Lines.	Velocities from 5 Lines.	Velocities from 3 Lines.
·025	+16·2 ± 1·0	+21·0 ± 1·3	+ 19·6 ± 0·9
·051	18·1 ± 1·7	19·4 ± 1·5	19·8 ± 1·2
·076	16·1 ± 2·1	16·9 ± 1·5	16·1 ± 1·2

The above summary of the measures and probable errors shows some curious and even unexpected results.

With the single prism spectrograph, the probable error of setting does not increase very markedly as the slit is increased in width from 0·025 to 0·051 mm., but a further increase to 0·076 mm. makes a marked increase of about 50 per cent in the accidental errors. The systematic errors show an even more marked increase, of about 3 times, when the slit is made 0·076 mm. wide. This is, in this case, undoubtedly caused by the fact that the centre of intensity of the star image was not symmetrically situated between the slit jaws and consequently the position of the lines was similarly displaced from the centre. The experiments detailed under the heading 'New Correcting Lens' showed that the star image had a minimum effective diameter of about 0·050 mm., which is, however, increased by increased exposure. In the present case, as the exposure was only about 30 seconds, it is probable that, during an exposure, the star image was not on the whole central causing the lines to be displaced and the measured velocity to vary. A non-central position of the image to the amount of ·004 mm. would cause an error of about 10 kms. in the velocity. Undoubtedly, if the exposure had been longer, the vagaries of seeing and guiding would ensure a mean position very nearly central, and the systematic displacement or error would be considerably reduced. This is well shown in dispersion (*c*) and (*b*)

where the exposures were about 2 and 5 minutes respectively. In (*b*) especially the results show no evidence whatever of systematic error, on the contrary the probable error of a single plate is smaller for slit 0·076 mm. than for slits 0·025 and 0·038 mm. In this connection, it may be of interest to point out the systematic differences between the mean velocities obtained with wide and narrow slits. They show, on the whole, a smaller positive value (leaving dispersion (*b*) out of account for a reason to be stated later on) of about 2 kms. for the wider slit widths. This may be due to a sort of personal error in guiding, caused either by habit or by some peculiarity in the optical path from the slit to the eye, which systematically causes the image to be placed to one side of the centre of the opening.

With the three prism spectrograph and the 525 mm. focus camera, the probable errors due both to systematic displacements and accidental errors of setting do not, on the whole, indicate any increase in error with increase in slit width, and so far as stars of this type are concerned one should, if these results can be depended on, get as accurate measures and as reliable results with a slit 0·076 mm. wide as with a slit 0·025 mm. As the exposure time required for the former width is only about one-third that for the latter, this means a very considerable increase in the output of the installation. The measures show that the residuals and probable errors from the single plates are smaller with slit 0·051 and 0·076 mm. than with slit 0·025 and 0·038 mm. I cannot assign any reason for this apparently improbable result.

In the table of velocities reduced to the sun for this dispersion it will be noticed there is a large systematic difference in the mean values between slit widths 0·025, 0·038 and slit widths 0·051 and 0·076. This difference may be partly assigned as above, but its amount seems too large, considering that each velocity given is the mean of six plates. As these plates were exposed on different dates, one explanation of the cause might be a variable radial velocity of the star, but no positive statement can be made without further proof. This explanation seems plausible when we look at the velocities for slit width 0·038 mm., which were made on three different dates. Four plates made on Mar. 20 give a mean velocity of 24·9 kms., with a total range between highest and lowest of 3·4 kms. One plate on March 21 at same slit width gave a velocity of 20·8 and one on March 24 of 19·4. These figures are for 4 lines: λ 4481, 4471, 4388, 4340. For the three principal lines the respective figures are 25·7, with total range of 4·0, 21·0 and 19·9, respectively. The mean of 10 plates on March 20 is 24·7 and 25·0 for 4 and 3 lines, respectively, and of 12 plates on March 24, 17·5 and 18·8 for 4 and 3 lines. The probable error of a single velocity deduced from these two means is nearly $\pm$ 1·3 kms. for each set. So that, considering plates either at the same or different slit widths, there appears to be a change in the velocity which, if there is no systematic cause for the change, must be real. The matter, however, will be investigated further, using, as nearly as possible, similar conditions of exposure slit width, &c.

With a dispersion of three prisms and the Ross Homocentric Camera lens of about 275 mm. focus, the increase in probable error of setting on a single line increases with the slit width, but not to any considerable extent, as the above summary of the probable errors shows. Also the change in the probable error of a single plate is not very great, indicating no decided systematic displacement with the wider slits. However, as mentioned above, the lens has some aberration and this, with the fact that no temperature regulation could be used, diminishes the value of the results.

Summarizing the whole investigation, we may conclude with confidence that a slit of at least 0·051 mm. wide may be used on early type stars without appreciably increasing the errors of setting on the lines or introducing any systematic displacement. In the case of the higher dispersions, the slit may be widened still further to 0·076 mm. without, in the case of β Orionis, at any rate, appreciably diminishing the accuracy of velocity determinations. This may also possibly be true in single prism work with faint stars where the exposure will be longer than a few minutes. It

must not, however, be forgotten, if the spectrum has faint metallic lines, as is the case with Sirius and Vega, that an increase in slit width will undoubtedly diminish the contrast, and with a slit as wide as 0·076 mm. cause the fainter lines to disappear.

Some other interesting and useful points may also be obtained from these measures and from a study of the residuals from the various lines. The wave length of H_δ, which had already been changed from Rowland's value of 4102·000 to 4101·890 by measures by Campbell & Wright,* was determined from the residuals obtained from 18 plates with the single prism and 12 with the three prism spectrograph. The mean residual, using wave length 4102·000, is for single prism plates +10·6 kms. and three prism plates with short focus camera +12·2 kms. The weighted mean of these two is +11·2 kms., which corresponds to a change in wave length of 0·152 tenth-metres, making the wave length as determined from β Orionis 4101·848. This, however, is not to be taken as a correction to 4101·890, but rather as an indication that the wave length as given by Rowland, when used in velocity determinations with first type stars, will give a positive residual of about 10 kms.

Another very useful point obtained from a study of the residuals of H_β in all the dispersions is that velocity values obtained from this line are not reliable and that it would be preferable to omit it in the measurement of all plates. The residuals are mostly positive, but there are also some high negative values and apparently no confidence can be placed in the results obtained from it. These discrepancies occur in all three dispersions, and a definite cause can undoubtedly be assigned for them. At H_β the star image is out of focus, owing to the form of colour curve of objective and corrector, to the extent of about 4 mms. when it is in focus at λ 4415, and in consequence the image is an expanded disc more than a quarter of a millimetre in diameter. Only part of the light from the objective can get through the slit, and the illumination on the collimator and camera lens is a comparatively narrow bar parallel to the slit which changes in position with change of guiding and which is rarely central. Even if it were central on the collimator, the vignetting of the pencil away from the centre of the field by the prisms would disturb this central position on the camera. Whenever the plate is not in exact focus at the region in question, a systematic shift of the star line with respect to the comparison lines whose illumination is always uniformly distributed would occur. The camera lenses employed give a field almost flat but it is quite possible for a deviation from focus of 0·1 or 0·2 mm. to occur. Supposing the centre of intensities of star and comparison light were distant from one another, say 10 mm., this would cause a relative displacement of $\frac{0·2}{525} \times 10 = ·004$ mm. equivalent with the single prism instrument to about 12 kms. In the case of dispersion *c* the deviation from focus owing to the aberrations of the lens is much greater and so also are the residuals, while in dispersion *b* the residuals are least, as a given linear displacement corresponds to a kilometre value only one-third as great.

In the case of lines to the violet end of the field, the residuals do not indicate any systematic difference, nor are they of a greater magnitude than is to be expected from their character. In this case, the star focus for the wave lengths in question H_δ to H_ϵ and K is, even in the extreme case of H_ϵ and K, only about 2 mm. beyond the focus for λ 4415, and the illumination in consequence is so much more uniform that, when the plate is in good focus, no systematic displacement is to be feared. Furthermore, a given linear displacement in this region would, owing to the change in dispersion, correspond to only one-half the kilometre value of the H_β region.

RADIAL VELOCITIES.

The work in determining radial velocities has been actively prosecuted during the period which this report covers. It may be of interest to give some numerical

* Astrophysical Journal IX, p. 50.

data in regard to the progress of the work. During the year ending March 11, 1908, 736 stellar spectrograms have been made on 138 nights. Of these 438 have been measured. Want of sufficient assistance is the principal cause for the non-measurement of the remainder, but other reasons apply in the case of some plates. Some of the spectra are too weak or otherwise unsuitable for measurement; some are of binary stars on which work has been abandoned because of too small range in velocity accompanied by poor quality of spectrum for measurement; some are experimental or test plates. Of the measured spectra upwards of three-fourths are of known spectroscopic binaries. Only about half of these have been used in the determination of the completed or provisional orbits discussed below, the remainder being measures of binaries of which sufficient observations have not yet been obtained to determine the orbits. Of the remaining measures (over 100) nearly 70 of β Orionis have been made for the purpose of determining the relative accuracy obtained by the use of different slit-widths. Some are of suspected binaries and some of early type stars not hitherto observed. Of the suspected binaries, special mention should be made of η Piscium of which a number of plates made by the Brashear Spectroscope have been measured. These showed that there was some little range in the star's velocity. However, poor temperature regulation led to systematic errors in some plates made by this instrument, and there was consequently some uncertainty as to the variability of its velocity. A number of plates made since with the new three prism spectrograph show a small change in the radial velocity, the variation so far observed being about 6 kms. from +12 to +18 kms. per second. Observations on this star will be continued when it has sufficiently passed conjunction to enable it to be readily observed.

Spectroscopic Binaries.

The spectroscopic binaries which have been under observation here during the above period are as follows:—

τ Tauri.	η Bootis.
ψ Orionis.	α Coronæ Borealis.
ι Orionis.	
B. D. − 1° 1004.	ϵ Herculis.
ν Orionis.	δ Aquilae.
γ Geminorum.	θ Aquilae.
ω Ursae Majoris.	
93 Leonis.	o Andromedae.
η Virginis.	

Of the above, ι Orionis and ψ Orionis have been completed and provisional orbits have been obtained for η Virginis and θ Aquilae. o Andromedae has been abandoned as the range is too small, considering the character of the spectrum, to allow its orbit to be determined. Only a few observations of ω Ursae Majoris, 93 Leonis and ϵ Herculis have yet been obtained. Of the others, a number have been obtained, but not sufficient to determine even preliminary elements. There is a great difference in the amount of observational material necessary to obtain the elements of the orbit in different stars. If the spectrum is of the solar or allied type, where accurate measures can be obtained, usually few, twenty or thirty, observations will suffice, while if it is of an early type, particularly if the lines are diffuse and the total range of velocity small many more are required. For example, 107 measures were used in the determination of the elements of ι Orionis, which is, however, perhaps an exceptional case, owing to the very diffuse lines and the high eccentricity of the orbit with the consequent difficulty in covering the rapidly descending branch and the maximum and minimum points of the curve.

In determining the elements of the binaries various methods have been used, but the quality of the spectra for measurement has never been good enough to allow of a better than rough determination by any of the usual methods, Lehmann-Filhés',

Russell's, Schwarzschild's or Zurhellen's. It has always consequently been necessary to correct the preliminary determinations by a species of trial and error. By constructing ephemerides and drawing the velocity curves for different sets of elements near those determined, we can obtain the curve most nearly agreeing with the observations. A little experience in the character of the changes produced in the velocity curve by changes in e and ω soon enables the labour to be shortened.

The method developed by you for obtaining the elements of the orbit, particularly its application in constructing an ephemeris, also much shortens the labour in such a process of trial and error. The time required to plot a velocity curve from any given elements is, by your method, less than half an hour, while any other method, even with the aid of suitable tables, will require two or three hours. The protractors necessary in the use of the method were carefully constructed by Mr. Gauthier, on thin transparent celluloid, the angles being computed by Mr. Motherwell from Astrand's tables. Protractors for every value of e between 0 and 1 by intervals of 0·05 were made and their accuracy with the fineness of the lines enables very accurate ephemerides to be constructed, with no computation whatever.

Of the four orbits given below the elements of ι Orionis and ψ Orionis were obtained by myself, while those of θ Aquilae and η Virginis were determined by Mr. Harper, who has written the description of his work, which appears below. Curiously enough, as will be seen in the detailed measures, most of the measurement on ι Orionis is by Mr. Harper and on η Virginis by myself.

ι Orionis.

This star – R. A. 5 h. 30·5 m., Decl. – 5° 59′, Photographic Magnitude 3·4 was announced by Frost & Adams* as a spectroscopic binary. It was placed under observation here for the determination of its orbit in December, 1906. Of the 107 plates used for this purpose 37 were made between December 11, 1906, and April 11, 1907, the remaining 70 between September 14, 1907, and January 25, 1908. The first series was made with the adapted Brashear spectroscope and the measures, along with a velocity curve for a period of 29·128 days were published in last year's report. The last series was made with the new single prism spectrograph and the detailed measures are given below.

The linear dispersion of the Brashear instrument is 18·6 and of the single prism spectrograph 30·2 tenth-metres per mm. at $H\gamma$. Notwithstanding the greater dispersion of the former instrument more confidence should be placed, in the case of this star, in the results obtained by the latter for two reasons. With the former instrument, owing to curvature of field of the camera lens, only two lines *He* 4471 and $H\gamma$ 4340 are accurately measurable, while with the latter all the lines, usually five or six from $H\beta$ to $H\epsilon$ inclusive are available. In the second place, on the broad and diffuse lines of this spectrum, the settings can be more accurately made when photographed with the smaller dispersion.

The spectrum is of the helium type, the lines used for determining the velocity being given in the table below.

Lines in Spectrum of ι Orionis.

Elements.	Wave Length.
$H\beta$	4861·527
He	4713·308
He	4471·676
He	4388·100
$H\gamma$	4340·634
$H\delta$	4102·000
He	4026·352
$H\epsilon$	3970·177
Ca	3933·825

* Astrophysical Journal XVIII., p. 386.

The lines λ 4713, 4388 and 3933 are rarely measurable or even visible on the plates, and consequently they have only been used a few times. The other six lines have been nearly always used in the single prism plates. Lines of wave lengths λ 4686, 4543, 4143 and 4089 have been seen on some plates but never used in the velocity determination. All the lines, as stated above, are very broad and diffuse, the widths varying between 2 and 4 tenth-metres. They are in many cases so faint as to be only with difficulty distinguished from the adjacent continuous spectrum. The difficulty of setting is further increased by the asymmetry of many of the lines, this asymmetry combined with their diffuse character, rendering the settings uncertain. A peculiarity about this asymmetry is that all the lines of a spectrum are not necessarily affected in the same way. Some may have the maximum intensity to the red and some to the violet side of the band, while other lines may be nearly uniform. Although in one or two cases some of the lines appear doubled, this is by no means a common characteristic, and this apparent doubling should not necessarily be assigned to the presence of a second spectrum, but possibly to some irregular arrangement of the silver grains in the naturally broad diffuse and asymmetric lines of the spectrum or to some physical effect in the star's atmosphere. No evidence of the triple superposed maxima observed by Frost and Adams has been found on any of the plates, but this may possibly be due to the lower dispersion used here.

In consequence of the poor quality of the lines for measurement, the radial velocities obtained may, in some cases, be in error to the extent of 15 or 20 kms. per sec. Occasionally in two plates made on the same night there has been a difference of upwards of 30 kms. in the measured velocity. That this difference is in great part due to the character of the lines is shown by the fact that measures of the same plates by different observers occasionally differ about 20 kms. in the velocity. The probable error of a single plate, obtained by the use of the residuals from the final curve of oscillation, is for the Brashear spectroscope plates ± 7·8 kms. per second, and for the single prism plates ± 6·6 kms. per second.

It is only when the range of velocity is large (in this case about 225 kms.) and where a large number of spectra have been secured, that a satisfactory orbit can be obtained for stars with this type of spectrum. The difficulty is, in the present instance, probably increased by the high eccentricity of the orbit and consequently abruptly changing form of the velocity curve, as well as by a probable secondary disturbance giving rise to a secondary curve superposed upon the primary.

The early observations with the Brashear spectroscope indicated a period of about 29 days. When use was made of Frost's and Adams' observations of 1903, the period was approximately determined as 29·128 days. When all the observations were brought into one period, it was at once seen that plates were required at the maximum and minimum points and along the rapidly descending branch of the curve, about 4 days out of the 29. Cloudy skies at every recurrence of this epoch prevented these being secured during the winter of 1906-7, and it almost seemed the same bad fortune was to prevail in 1907-8. Although partial success was obtained in October, 1907, it was not until January 24 and 25, 1908, that the final observations necessary were secured. The observations of October indicated a period of 29·134 days, but the later plates changed this to 29·136 days. This can hardly be in error more than the thousandth of a day, as it is determined by the coincidence of an observation of Frost's and Adams' on September 5, 1903, with the rapidly descending branch as finally defined on January 25, 1908, 55 periods distant.

Originally each single measurement was plotted on cross-section paper, but the confusion and overlapping resulting as the number increased rendered necessary the combining of those made on the same night (sometimes five in number at critical parts of the curve) into a mean, weighted according to the quality of the plates. The observations reduced according to this plan with the velocity curve finally chosen are shown in Fig. 4, where the single circles represent single observations and the double circles two or more observations on the same night. It will be noticed in this figure

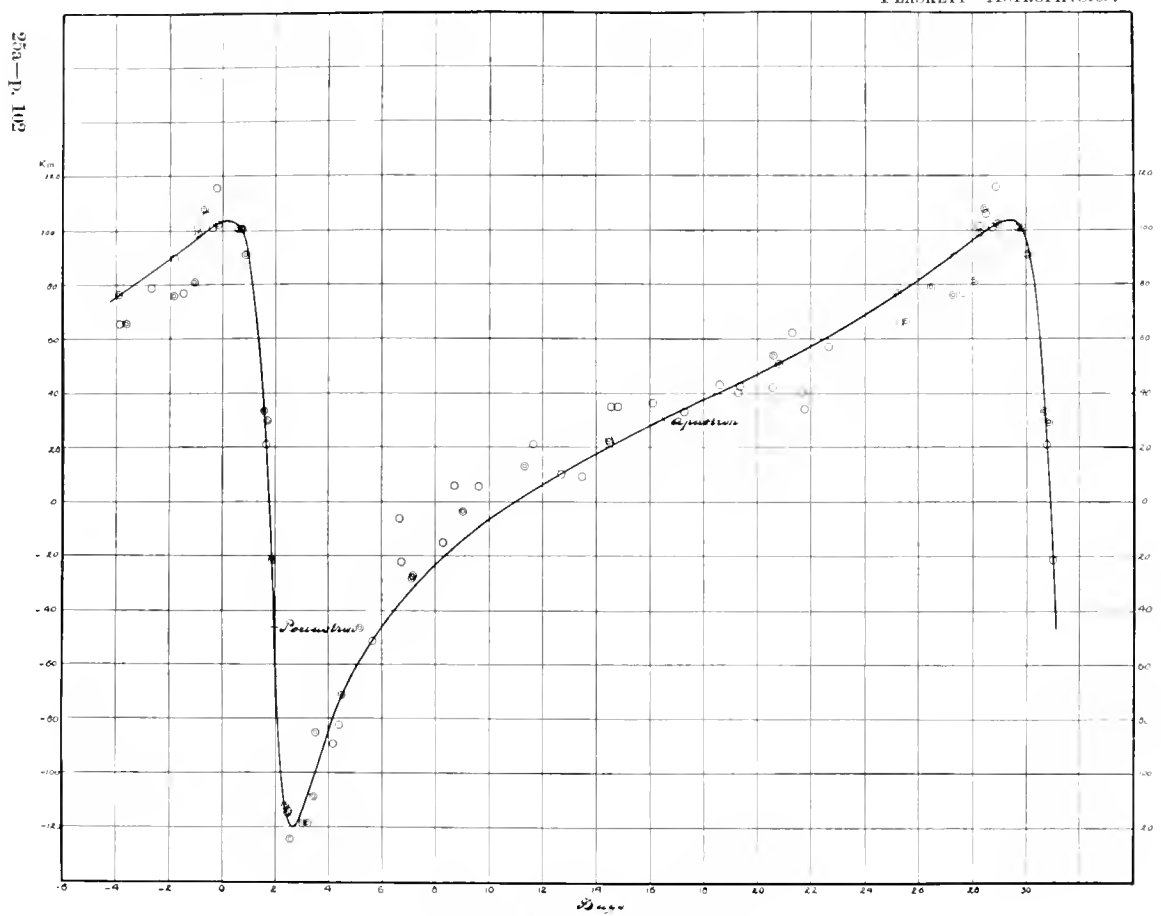

FIG. 4—Velocity Curve of ζ Orionis.

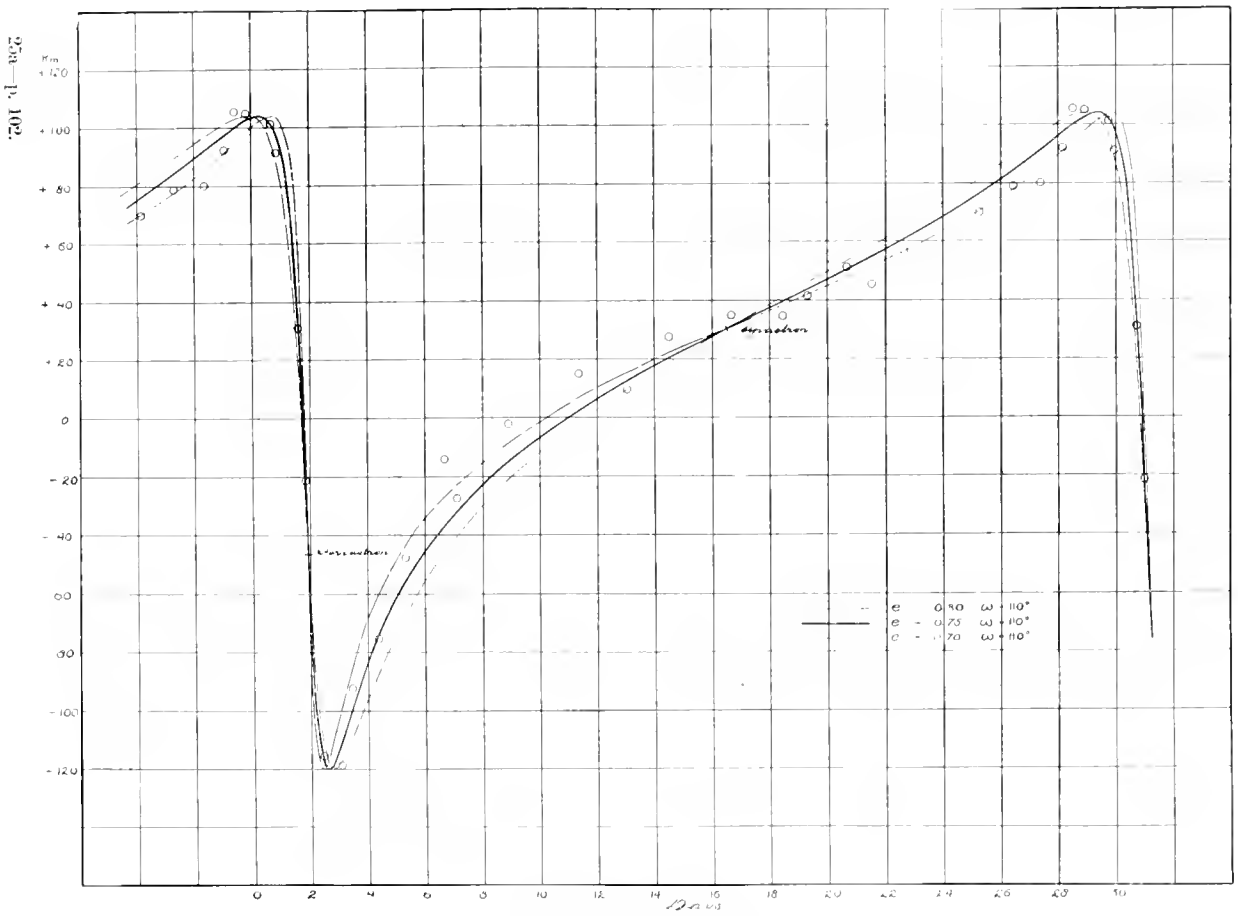

FIG. 5.—Velocity Curve of ζ Orionis.

that two or more single or grouped observations frequently occur at nearly the same phase, and it was felt that a further combining of the observations into those of nearly the same phase, after the period had been accurately determined, might be of advantage. The 107 observations made at Ottawa with the 6 made at the Yerkes Observatory were accordingly combined into 27 groups, with an average of slightly over 4 observations each. The effect of this grouping is shown in Fig. 5. The effect of large accidental errors in the velocity values of some of the plates is diminished and the drawing of the curve facilitated. In thus combining the observations, there are only two groups (near apastron where the change of velocity is slow) in which the difference of phase exceeds a day. The difference in the remainder is less than half a day, and in most of these (all around periastron) less than a quarter of a day.

It will be preferable before proceeding to determine the elements to give the measures of the last series of 70 plates, those of the first series being given last year. The journal or record of observations containing the data as to time, temperature, focus, &c., of the plates will first be given and this will be followed by the detailed measures. Several of the plates have been measured by two and some by three observers. All of these measures are given below and a comparison will enable some idea to be obtained of the uncertainty of the measures, and the difficulty in obtaining a satisfactory orbit. A table containing a summary of these with the earlier measures here and also of those previously made at the Yerkes Observatory is next given. In this table is contained the number of the plate, the date, the Julian day, the velocity, including all measures of the same plate, the measurer, the weighted mean of all measures of all plates on the same night, the phase, and the residual obtained by subtracting each measure from the value computed from the finally accepted elements. This table is followed by the one containing the observations grouped into phases, the velocity and phase of each group being the mean of the separate observations.

RECORD OF SPECTROGRAMS.

Star.	No. of Negative.	Camera.	Plate.	Date.	Middle of Exposure E. S. T.	Duration.	Hour Angle at end.	Comparison Spectrum.			Temperature Centigrade.					Slit Width.	Focal Positions.			Seeing.	Observer.	Remarks.
								Exposures in seconds.	Kind.		Room.		Prism		End.			Star Focus.	Collimator.	Camera.			
											Beginning.	End.	Beginning.	End.	Pos.							
				1907.	h. m.	m.	h. m.															
Orionis	1046	11	Seed 27	Sept. 14	3 35	20	2 15 E.	6–5–5	Fe. V.		19·1	19·0	20·8	20·8	20·8	·0011	73·0	10·8	18·6	Very unsteady.	P	
	1059			18	5 16	18	0 23 E.	6 9 6	Spark.		9·0	9·0	17·0	17·1		·0014	44 7	10 8	18·41	Fair to good.	O	
	1069			20	4 19	22	1 10 E.	11 11			18·7	17·0	22·5	22·5		·0013	41 7	10 8	18·4	Fair.	P	
	1070			20	4 41	22	0 45 E.	11–11			17·0	16·5	22·4	22·4		·0013	41 7	10 8	18·4	Good.	P	
	1076			20	4 18	21	0 32 E.	10 10			17·5	17·5	23·1	23·1		·0014	73 0	10 8	18 18	Fair.	P	
	1077			30	4 42	25	0 05 E.	10 10			17·5	17·5	13·1	13·1		·0014	73 0	10 8	18 18	"	P	
	1078			30	5 05	19	0 15 W.	10 10			17·0	17·0	13·1	13·1		·0014	73 0	10 8	18 18	"	P	
	1079			30	5 28	21	0 36 W.	10 10			17·0	17·0	13·1	13·1		·0014	73 0	10 8	18 18	"	P	Daylight.
	1097		111	Oct. 8	3 3	22	0 44 E.	17 17			18·0	18·1	9·8	9·8		·0016	72 5	10 8	5 45	Good	T	
	1098		11	25	5 33	33	0 39 W.	8 12			23·0	23·5	8·6	8·6		·0014	72 5	10 8	18 21	Fair.	T	
	1109			25	6 03	30	0 10 W.	8 8			24·5	24·0	8·6	8·6		·0014	72 5	10 8	18 21	Poor.	T	Made in daylight.
	1110			25	3 57	25	0 35 W.	8 8			17·0	17·0	4·5	4·5		·0013	72 5	10 8	18 08	Unsteady.	T	
	1111			25	3 56	26	1 05 W.	8 8			1·0	0·5	4·5	4·5		·0014	72 5	10 8	18 08	"	T	
	1112			25	4 26	31	1 35 W.	8 8			0·5	1·0	4·3	4·1		·0014	72 5	10 8	18 08	"	T	
	1113			25	4 58	33	2 10 W.	8 8			1·0	1·0	4·1	4·2		·0014	72 5	10 8	18 08	"	T	
	1114			25	5 43	30	2 53 W.	8 8			1·0	0·0	2·3	2·3		·0014	72 5	10 8	18 08	Good.	T	Daylight.
	1115			25	6 08	25	3 07 E.	8 8			0·0	0·0	2·3	2·3		·0014	72 5	10 8	18 08	"	T	
	1116			30	3 42	30	0 35 E.	3 3			0·0	0·0	2·3	2·3		·0014	72 5	10 8	18 08	"	T	
	1117			30	3 45	35	0 03 W.	3 3			0·0	0·0	2·3	2·3		·0013	72 5	10 8	18 08	"	T	
	1118			30	4 10	40	0 41 W.	3 3			0·0	0·0	2·3	2·3		·0014	72 5	10 8	18 08	"	T	
	1119			30	4 39	42	1 28 W.	3 3			0·0	0·0	2·3	2·3		·0011	72 5	10 8	18 08	"	T	
	1120			30	4 49	35	2 05 W.	3 3			0·0	−1·3	2·3	2·3		·0014	72 5	10 8	18 08	"	T	
	1121			31	1 47	40	0 05 E.	4 6 4			3·3	2·7	7·6	7·6		·0012	73 5	10 8	18 12	Hazy.	P	Unsteady.
	1122			31	2 45	40	0 06 W.	4 4 4			2·7	2·7	7·6	7·6		·0012	73 5	10 8	18 12	Poor.	P	
	1123			31	3 10	60	1 10 W.	4 4 4			2·7	1·3	7·6	7·6		·0012	73 5	10 8	18 16	"	P	
	1124			Nov. 1	3 35	40	1 00 E.	4 4 4			4·6	3·8	8·5	8·4		·0012	73 5	10 8	18 16	"	P	
	1125			"	2 20	40	0 15 E.	4 4 4			3·8	4·4	8·4	8·3		·0012	73 5	10 8	18 16	"	P	
	1126			"	3 40	30	0 29 W.	4 4 4			4·4	4·2	8·3	8·3		·0012	73 5	10 8	18 16	Better	P	
	1127			"	3 23	30	0 35 W.	3 4 3			.....	.....	.....	.....		.....	.....	.....	.....	.....	P	
	1135			"	1 28	46	0 24 E.	6 4 10			— 1·0	— 1·5	5·5	5·5		·0014	73 5	10 8	18 2	Hazy.	P	Clouded over.

" ..	1137	"	" ..	"	11	2	07	28	0 04 W.	6- 6-10	" ..	— 1·5	—2·0	5·5	5·5	·0014	73·5	10·8	18·2	Good.....	H	
" ..	1141	"	" ..	"	15	1	02	15	0 50 E.	4- 8- 4	" ..	— 1·0	—1·5	6·0	6·0	·0013	73·5	10·8	18·2	"	H	
" ..	1142	"	" ..	"	15	1	19	15	0 33 E.	4- 8- 4	" ..	— 1·5	—2·0	6·0	6·0	·0013	73·5	10·8	18·2	"	H	
" ..	1143	"	" ..	"	15	1	36	16	0 15 E.	4- 8- 4	" ..	— 2·0	—2·0	6·0	6·0	·0013	73·5	10·8	18·2	"	H	
" ..	1147	"	" ..	"	16	12	20	15	1 25 E.	7-10- 7	" ..	1·3	1·3	3·2	3·6	·0013	73·5	10·8	18·18	Fair......	P	
" ..	1148	"	" ..	"	16	12	40	15	1 05 E.	8-12- 8	" ..	1·3	1·3	3·6	3·6	·0013	73·5	10·8	18·18	"	P	
" ..	1161	"	" ..	"	28	4	08	16	3 05 W.	3- 6- 3	" ..	— 4·0	—4·1	— 1·8	—1·8	·0014	74·0	10·8	18·18	"	P	
" ..	1162	"	" ..	"	28	4	30	20	3 25 W.	3- 6- 3	" ..	— 4·1	—4·2	1·8	1·8	·0014	74·0	10·8	18·18	"	P	
" ..	1166	"	" ..	"	29	4	41	17	3 45 W.	3- 9- 5	" ..	— 5·0	—5·5	5·0	4·8	·0013	74·0	10·8	18·18	"	H	
" ..	1167	"	" ..	"	29	4	58	13	4 00 W.	3- 9	" ..	— 5·5	.....	4·8	4·4	·0013	74·0	10·8	18·18	Hazy.....	H	Stopped.
" ..	1168	"	" ..	Dec.	3	10	25	10	2 20 E.	8-15- 8	" ..	— 9·6	—9·7	— 2·9	—2·9	·0013	73·5	10·8	18·05	....	P	
" ..	1169	"	" ..	"	3	10	36	10	2 09 E.	8-15- 8	" ..	— 9·7	—9·9	— 2·9	—2·9	·0013	73·5	10·8	18·05	....	P	
" ..	1170	"	" ..	"	3	10	48	10	1 57 E.	8-15- 8	" ..	— 9·9	—10·1	— 2·9	—2·9	·0013	73·5	10·8	18·05	....	P	
" ..	1178	"	" ..	"	14	12	27	10	0 13 E.	7-10	" ..	—12·0	—12·0	0·7	0·8	·0015	72·0	10·8	18·1	Good.....	H	
" ..	1188	"	" ..	"	21	10	46	7	0 45 E.	5-10- 5	" ..	— 0·8	—0·8	0·0	0·0	·0012	74·0	10·8	18·08	Poor.....	P	Clouded over.
" ..	1189	"	" ..	"	21	1	10	15	1 40 W.	5-10- 5	" ..	0·0	0·0	— 0·2	—0·2	·0012	74·0	10·8	18·08	Fair......	P	Windy.
" ..	1190	"	" ..	"	24	10	40	8	0 30 E.	5-10- 5	" ..	— 1·0	—1·5	+ 2·0	+2·0	·0013	74·0	10·8	18·1	Good at beginning.	P	
" ..	1191	"	" ..	"	28	8	00	8	3 00 E.	5-10- 5	" ..	+ 2·6	+2·1	+ 3·8	+3·7	·0013	73·5	10·8	18·1	Poor.....	P	
" ..	1192	"	" ..	"	28	10	05	10	1 00 E.	5-10- 5	" ..	— 5·4	—5·0	+ 3·1	+3·1	·0013	73·5	10·8	18·1	Fair......	P	
" ..	1193	"	" ..	"	28	10	18	10	0 45 E.	6-12- 6	" ..	— 6·0	—5·6	+ 3·1	+3·1	·0013	73·5	10·8	18·1	"	P	
" ..	1194	"	" ..	"	28	10	29	8	0 35 E.	5-10- 5	" ..	— 5·6	—5·6	+ 3·1	+3·1	·0013	73·5	10·8	18·1	"	P	
" ..	1201	"	" ..	"	28	2	40	10	3 35 W.	4- 4- 4- 4	" ..	— 8·5	—8·5	3·0	3·0	·0013	73·5	10·8	18·1	Good.....	P	
" ..	1202	"	" ..	"	28	2	51	9	3 45 W.	4- 4- 4- 4	" ..	— 8·5	—8·5	3·0	3·0	·0013	73·5	10·8	18·1	"	P	
" ..	1203	"	" ..	"	30	2	27	14	3 30 W.	4- 8- 4	" ..	— 5·4	—5·9	1·5	1·5	·0013	73·5	10·8	18·1	Windy....	P	
" ..	1204	"	" ..	"	30	2	47	25	4 00 W.	4- 8- 4	" ..	— 5·9	—6·5	1·5	1·3	·0013	73·5	10·8	18·1	"	P	
				1908.																		
" ..	1206	"	" ..	Jan.	1	12	44	8	1 55 W.	12-12-12-12	" ..	— 8·5	.....	— 5·6	.....	·0013	72·5	10·8	18·1	Fair......	P	
" ..	1207	"	" ..	"	1	12	54	8	2 05 W.	4- 8- 4	" ..	— 8·0	.....	— 5·6	.....	·0013	72·5	10·8	18·1	Good.....	P	
" ..	1212	"	" ..	"	3	9	39	8	1 00 E.	10-10-10-10	" ..	— 7·0	.....	— 4·4	.....	·0013	72·6	10·8	18·1	Fair to poor....	P	
" ..	1213	"	" ..	"	3	9	49	8	0 50 E.	10-10-10-10	" ..	— 7·0	—7·5	— 4·4	—4·2	·0013	72·6	10·8	18·1	Fair to poor....	P	
" ..	1219	"	" ..	"	10	12	28	10	2 15 W.	2- 4- 2	" ..	—12·7	.....	—10·5	.....	·0013	72·0	10·8	18·0	Very poor.	P	
" ..	1258	"	" ..	"	22	11	26	13	2 03 W.	1½-1½-1½	" ..	— 8·0	—9·5	0·2	0·2	·0013	72·5	10·8	18·09	Good.....	H	
" ..	1259	"	" ..	"	22	12	03	11	2 37 W.	1½-1½-1½	" ..	—10·0	—10·0	0·2	0·2	·0013	72·5	10·8	18·09	"	H	
" ..	1262	"	" ..	"	23	8	27	10	0 50 E.	1¼-1¼-1¼-1¼	" ..	—11·0	—11·2	— 5·3	—5·3	·0013	72·5	10·8	18·03	Fair......	P	
" ..	1263	"	" ..	"	23	8	39	10	0 40 E.	1¼-1¼-1¼-1¼	" ..	—11·2	—10·8	— 5·3	—5·3	·0013	72·5	10·8	18·03	"	P	
" ..	1265	"	" ..	"	23	9	24	8	0 00	1¼-1¼-1¼-1¼	" ..	—12·6	—12·2	— 5·3	—5·3	·0013	72·5	10·8	18·03	"	P	
" ..	1266	"	" ..	"	23	9	33	6	0 10 W.	1¼-1¼-1¼-1¼	" ..	—12·2	—13·0	— 5·3	—5·3	·0013	72·5	10·8	18·03	"	P	
" ..	1267	"	" ..	"	24	6	30	10	2 47 E.	1¼-1¼-1¼-1¼	" ..	—12·7	—13·0	— 9·0	—9·0	·0013	72·0	10·8	18·0	"	P	
" ..	1268	"	" ..	"	24	6	40	9	2 37 E.	1¼-1¼-1¼-1¼	" ..	—13·0	—13·6	— 9·0	—9·0	·0013	72·0	10·8	18·0	"	P	
" ..	1269	"	" ..	"	24	6	50	8	2 25 E.	1¼-1¼-1¼-1¼	" ..	—13·7	—14·2	— 9·0	—9·0	·0013	72·0	10·8	18·0	"	P	
" ..	1274	"	" ..	"	24	9	27	5	0 10 W.	1¼-1¼-1¼-1¼	" ..	—15·8	—15·6	— 9·0	—9·0	·0013	72·0	10·8	18·0	Fair to good....	P	
" ..	1275	"	" ..	"	24	9	38	7	0 20 W.	1¼-1¼-1¼-1¼	" ..	—15·6	—15·8	— 9·0	—9·0	·0013	72·0	10·8	18·0	Fair......	P	
" ..	1277	"	" ..	"	25	10	12	15	1 00 W.	1¼-1¼-1¼-1¼	" ..	— 0·6	—1·0	— 1·0	—1·0	·0013	72·5	10·8	18·18	Steady...	P	Partly clouded.
" ..	1278	"	" ..	"	25	10	27	14	1 15 W.	1¼-1¼-1¼-1¼	" ..	— 1·0	—1·3	— 1·0	—1·0	·0013	72·5	10·8	18·18	"	P	

ϵ ORIONIS 1046.

1907. Sept. 14.
G. M. T. $20^h\ 35^m$

Observed by J. S. PLASKETT.
Measured by W. E. HARPER.

Wt.	Mean of Settings.	Corrected Star Setting.	Disp^t in rev^{ns}	Velocity.	Wt.	Mean of Settings.	Corrected Star Setting.	Disp^t in rev^{ns}	Velocity.
2	54·7155	.....	.....	.....	2	45·2314	.....	.....	.....
2	53·3882	·4202	·0179	+20·46	$1\frac{1}{2}$	45·1984	·2406	·0019	− 1·98
$1\frac{1}{2}$	53·0779	.....	.....	.....					

Weighted mean	+12·54
V_a	−25·82
V_d	+ ·19
Curvature	− ·28
Radial velocity	− 38·3

ϵ ORIONIS 1046 *

1907. Sept. 14.
G. M. T. $20^h\ 35^m$

Observed by J. S. PLASKETT.
Measured by J. S. PLASKETT.

Wt.	Mean of Settings.	Corrected Star Setting.	Disp^t in rev^{ns}	Velocity.	Wt.	Mean of Settings.	Corrected Star Setting.	Disp^t in rev^{ns}	Velocity.
2	54·7422	.....	.....	.....	2	45·2558	.....	.....	.....
1	53·4222	·4252	·0229	+26·19	1	45·2060	·2238	·0149	−15·55
1	53·1078	.....	.....	.....					

Weighted mean	+ 5·32
V_a	+25·82
V_d	+ ·19
Curvature	− ·28
Radial velocity	+ 31·0

* Check measurement, the mean +35·0 being used.

ϵ ORIONIS 1059.

1907. Sept. 18.
G. M. T. $22^h\ 16^m$

Observed by W. E. HARPER.
Measured by W. E. HARPER.

Wt.	Mean of Settings.	Corrected Star Setting.	Disp^t in rev^{ns}	Velocity.	Wt.	Mean of Settings.	Corrected Star Setting.	Disp^t in rev^{ns}	Velocity.
2	54·0472	.....	.....	.....	2	45·2482	·2414	·0027	2·82
$1\frac{1}{2}$	53·4304	·4156	·0133	+15·20	1	27·4154	·4300	·0081	+7·02
2	53·1246	.....	.....	.....	2	27·2618	.....	.....	.....
2	45·2804	.....	.....	.....					

Weighted mean	+ 7·88
V_a	+25·77
V_d	+ ·04
Curvature	− ·28
Radial velocity	+33·4

ι ORIONIS 1069.

1907. Sept. 20.
G. M. T. 21h 19m

Observed by J. N. Tribble.
Measured by W. E. Harper.

Wt.	Mean of Settings.	Corrected Star Setting.	Dispt in revns	Velocity.	Wt.	Mean of Settings.	Corrected Star Setting.	Dispt in revns	Velocity.
2	54·0445				1½	45·2719			
2	53·4626	·4496	·0473	+54·06	1½	45·2597	·2614	·0227	+23·70
1	53·1235								

Weighted mean +41·05
Va +25·70
Vd + ·12
Curvature −·28

Radial velocity +66·0

ι ORIONIS 1070.

1907. Sept. 20.
G. M. T. 21h 44m.

Observed by J. N. Tribble.
Measured by W. E. Harper.

Wt.	Mean of Settings.	Corrected Star Setting.	Dispt in revns	Velocity.	Wt.	Mean of Settings.	Corrected Star Setting.	Dispt in revns	Velocity.
2	73·0712				2	53·1250			
2	72·9400	·8780	·0132	+19·15	2	45·2785			
2	72·5084				2	45·2603	2554	0167	17·43
2	54·0546				1	27·4605	·4390	0171	+14·84
1	53·4499	·4320	0297	33·95	2	27·2246			

Weighted mean +22·80
Va +25·70
Vd + ·09
Curvature −·28

Radial velocity +48·3

ι ORIONIS 1076.

1907. Sept. 30.
G. M. T. 21h 18m.

Observed by J. N. Tribble.
Measured by W. E. Harper.

Wt.	Mean of Settings.	Corrected Star Setting.	Dispt in revns	Velocity.	Wt.	Mean of Settings.	Corrected Star Setting.	Dispt in revns	Velocity.
2	72·9875				2	45·2743	·2606	·0119	+12·46
2	72·8292	·8126	·0061	−8·86	½	27·4720	·5141	·0176	+15·35
2	72·4221				2	27·2997			
2	54·0271				¼	20·8240	·8585	·0264	−21·57
2	53·4095	·3969	·0010	+ 1·14	2	20·5910			
2	53·1135				¼	15·5407	·5873	·0162	−12·60
½	48·3240	·3194	·0075	+ 8·12	2	15·4826			
2	45·2841								

Weighted mean + 1·70
Va +24·94
Vd + ·06
Curvature − ·28

Radial velocity +26.4

ι ORIONIS 1077.

1907. Sept. 30.
G. M. T. 21h 42m

Observed by J. N. TRIBBLE.
Measured by W. E. HARPER.

Wt.	Mean of Settings.	Corrected Star Setting.	Dispt in revns	Velocity.	Wt.	Mean of Settings.	Corrected Star Setting.	Dispt in revns	Velocity.
2	72·9168	.....	.....	.....	2	45·2137	·2737	·0250	+26·17
2	72·7597	·8048	·0139	—20·20	½	27·4230	·5095	·0130	+11·34
1	72·3592	.....	.....	.....	2	27·2350	.....	.....	.....
1	53·9664	.....	.....	.....	½	20·7647	·8690	·0159	—13·00
2	53·3351	·3834	·0068	— 7·78	2	20·5212	.....	.....	.....
2	53·0526	.....	.....	.....	1	11·8840	·0204	·0200	+15·00
2	45·2236	.....	.....	.....	2	11·5216	.....	.....	.....

Weighted mean..... + 1·32
V_a..... + 24·94
V_d..... ·00
Curvature..... — ·28

Radial velocity..... + 26·0

ι ORIONIS 1078.

1907. Sept. 30.
G. M. T. 22h 05m

Observed by J. N. TRIBBLE.
Measured by W. E. HARPER.

Wt.	Mean of Settings.	Corrected Star Setting.	Dispt in revns	Velocity.	Wt.	Mean of Settings.	Corrected Star Setting.	Dispt in revns	Velocity.
2	72·9007	.....	.....	.....	1½	48·2410	·3193	·0074	+ 8·01
2	72·7515	8145	0042	— 6·10	2	45·1981	.....	.....	.....
2	72·3363	.....	.....	.....	2	45·1880	·2735	·0248	+25·96
2	53·9450	.....	.....	.....	¼	27·3833	·4923	·0042	— 3·66
2	53·3275	·3997	·0095	+10·95	2	27·2128	.....	.....	.....
2	53·0276	.....	.....	.....	1¼	20·7372	·8558	·0291	—21·82
3	48·6927	.....	.....	.....	2	20·5069	.....	.....	.....

Weighted mean..... + 5·05
V_a..... + 24·94
V_d..... ·00
Curvature..... — ·28

Radial velocity..... + 29·7

ι ORIONIS 1079.

1907. Sept. 30.
G. M. T. 20h 28m

Observed by J. N. TRIBBLE.
Measured by W. E. HARPER.

Wt.	Mean of Settings.	Corrected Star Setting.	Disp^t in rev^{ns}	Velocity.	Wt.	Mean of Settings.	Corrected Star Setting.	Disp^t in rev^{ns}	Velocity.
2	54·6984	....	....	....	2½	45·2264	·2677	·0190	+19·90
1½	53·3630	·3927	·0025	+ 2·86	½	27·4335	·5030	·0065	+ 5·67
2	53·0665	....	....	....	2	27·2522	....	....	....
2	15·2423	....	....	....					

Weighted mean .... +12·64
V_a .... +24·94
V_d .... — ·04
Curvature .... — ·28

Radial velocity .... + 37·3

ι ORIONIS 1097.

1907. Oct. 8.
G. M. T. 20h 22m

Observed by J. N. TRIBBLE.
Measured by W. E. HARPER.

Wt.	Mean of Settings.	Measured Wave Length.	Normal W.L.	Disp^t	Velocity.	Wt.	Mean of Settings.	Measured Wave Length.	Normal W.L.	Disp^t	Velocity.
2	63·3291	4494·788	....	....	....	2	36·1211	4340·995	....	....	....
2	59·5445	4471·384	·676	·292	—19·56	½	35·9910	4340·499	·634	·135	— 9·31
2	58·7785	4466·781	....	....	....						

Weighted mean .... —17·51
V_a .... +23·73
V_d .... — ·09
Curvature .... — ·28

Radial velocity .... + 5·8

ι ORIONIS 1108.

1907. Oct. 28
G. M. T. 22h 34m

Observed by } W. E. HARPER.
Measured by }

Wt.	Mean of Settings.	Corrected Star Setting.	Disp^t in rev^{ns}	Velocity.	Wt.	Mean of Settings.	Corrected Star Setting.	Disp^t in rev^{ns}	Velocity.
2	73·1014	....	....	....	2	53·1406	....	....	....
1½	72·9868	·8964	·0310	+45·85	2½	45·3641	·3487	·1100	114·84
2	72·5416	....	....	....	2	45·2890	....	....	....
2	54·7815	....	....	....	1	27·5000	·5285	·1066	+92·53
2	53·5220	·4914	·0891	101·84	2	27·2177	....	....	....

Weighted mean .... +93·15
V_a .... +18·80
V_d .... − ·19
Curvature...... − ·28

Radial velocity .... +111·5

ι ORIONIS 1109.

1907. Oct. 28
G. M. T. $23^h\ 03^m$

Observed by } W. E. Harper.
Measured by }

Wt.	Mean of Settings.	Corrected Star Setting.	Dispt in revns	Velocity.	Wt.	Mean of Settings.	Corrected Star Setting.	Dispt in revns	Velocity.
2	73·0950	.....	.....	.....	2	53·1407	.....	.....	.....
1½	73·0040	·9196	0548	+79·51	2	45·2772	.....	.....	.....
2	72·5270	.....	.....	.....	2	45·3174	·3138	·0751	78·40
2	54·7747	.....	.....	.....	¼	27·4892	·5063	·0844	+73·26
½	53·5138	·4758	·0735	84·01	2	27·2294	.....	.....	.....

Weighted mean		+79·14
V_a		+18·80
V_d	− ·22	
Curvature.....	− ·28	
Radial velocity.....		+97·4

ι ORIONIS 1110.

1907. Oct. 29.
G. M. T. $20^h\ 27^m$

Observed by } W. E. Harper.
Measured by }

Wt.	Mean of Settings.	Corrected Star Setting.	Dispt in revns	Velocity.	Wt.	Mean of Settings.	Corrected Star Setting.	Dispt in revns	Velocity.
1	73·1635	.....	.....	.....	1	53·5207	·4040	0617	+ 1·94
½	73·0125	·8592	·0044	− 6·38	1½	53·2281	.....	.....	.....
1	72·5950	.....	.....	.....	2	45·3782	.....	.....	.....
1½	54·8591	.....	.....	.....	1	45 3680	·2634	·0247	+ 25·79

Weighted mean.....		+ 9 81
V_a		+ 18·50
V_d	− ·04	
Curvature.....	− ·28	
Radial velocity.....		+ 28·0

ι ORIONIS 1110.*

1907. Oct. 29.
G. M. T. 20h 27m

Observed by W. E. HARPER.
Measured by C. R. WESTLAND.

Wt.	Mean of Settings.	Corrected Star Setting.	Dispt in revns	Velocity.	Wt.	Mean of Settings.	Corrected Star Setting.	Dispt in revns	Velocity.
2	73·0440	....	.....	.....	2	53·1060	.....	... .	.....
1½	72 9005	·8677	·0029	+ 4·21	2	45·2563	.....	....	. ....
2	72·4737	.....	.....	....	2	45·2528	·2701	·0314	32 78
2	54·7368	.....	.....	.....	¼	27·3861	·4288	·0069	+ 5 99
2	53·3997	·4055	·0032	3·66	2	27·2036	....	.....	.. ..

Weighted mean.. ..... + 14·03
V_a ..... + 18·50
V_d ..... − ·04
Curvature.... − ·28

Radial velocity. ..... + 32·2

*Check measurement.

ι ORIONIS 1111.

1907. Oct. 29.
G. M. T. 20h 56m

Observed by } W. E. HARPER.
Measured by }

Wt.	Mean of Settings.	Corrected Star Setting.	Dispt in revns.	Velocity.	Wt.	Mean of Settings.	Corrected Star Setting.	Dispt in revns.	Velocity.
½	73·0750	....	.....	....	2	53·1387	.. ..	.....	.....
½	72 9210	·8565	·0083	—12·04	2	45·2877	.....	.....	.....
½	72·5071	....	....	....	1½	45·2700	·2559	·0172	+17·96
2	54·7737	.....	.....	....	½	27·4184	·4319	·0100	+ 8·68
1	53·4664	·4387	·0364	+41·60	2	27·2335	.....	.... . .	....

Weighted mean... .....+18·95
V_a..... ....+18·50
V_d.... .....— ·08
Curvature ..— ·28

Radial velocity. ..... +37·1

ι ORIONIS 1112.

1907. Oct. 29.
G. M. T. 21h 26m

Observed by } W. E. HARPER.
Measured by }

Wt.	Mean of Settings.	Corrected Star Setting.	Dispt in revns.	Velocity.	Wt.	Mean of Settings.	Corrected Star Setting.	Dispt in revns.	Velocity.
2	73·1037	.....	... .	....	2	53·1766	. ...	....	.....
1½	72 9681	·8750	·0102	+14·80	2	45·3253	.....	.....	.....
2	72·5357	.....	....	....	1½	45·3078	·2561	·0174	18·16
2	54·8072	....	.....	.....	¼	27·4795	·4534	·0315	+27·34
2	54·4865	·4217	·0214	24·46	2	27·2727	....	.. ..	.....

Weighted mean .. ..+20·04
V_a..... .. ..+18·50
V_d... .....— ·11
Curvature ..— ·28

Radial velocity. +38·1

ORIONIS 1113.

1907. Oct. 29.
G. M. T. $21^h\ 58^m$

Observed by } W. E. HARPER.
Measured by }

Wt.	Mean of Settings	Corrected Star Setting.	Disp^t in revns	Velocity.	Wt.	Mean of Settings.	Corrected Star Setting.	Disp^t in revns	Velocity.
2	72·9346				$\frac{1}{2}$	54·3201	·4357	·0334	38·17
$1\frac{1}{2}$	72·7900	·8651	·0003	+ 0·43	2	53·9954			
2	72·3691				2	45·1399			
2	54·6304				$1\frac{1}{2}$	45·1332	·2669	·0282	+29·44

Weighted mean ... +18·28
V_a ... +18·50
V_d ... −·16
Curvature ... −·28

Radial velocity ... +36·3

ORIONIS 1114.

1907. Oct. 29.
G. M. T. $22^h\ 43^m$

Observed by } W. E. HARPER.
Measured by }

Wt.	Mean of Settings.	Corrected Star Setting.	Disp^t in revns	Velocity.	Wt.	Mean of Settings.	Corrected Star Setting.	Disp^t in revns	Velocity.
2	73·0030				2	53·0721			
$2\frac{1}{2}$	72·8429	·8498	0150	−21·76	2	45·2197			
2	72·4376				$1\frac{1}{2}$	45·2102	·2641	·0254	+26·51
2	54·7051				$\frac{1}{2}$	27·3525	·4179	·0040	− 3·47
$1\frac{1}{2}$	53·3520	·3832	0191	−21·83	2	27·1813			

Weighted mean ... + 8·20
V_a ... +18·50
V_d ... −·19
Curvature ... −·28

Radial velocity ... +26·2

ORIONIS 1115.

1907. Oct. 30.
G. M. T. $18^h\ 42^m$

Observed by } W. E. HARPER.
Measured by }

Wt.	Mean of Settings.	Corrected Star Setting.	Disp^t in revns	Velocity.	Wt.	Mean of Settings.	Corrected Star Setting.	Disp^t in revns	Velocity.
2	54·8325				$1\frac{1}{2}$	45·1902	·1071	·1316	137·39
$1\frac{1}{2}$	53·3746	2834	·1189	− 124·47	$\frac{1}{2}$	27·3497	·2826	·1393	− 120·91
2	53·2060				2	27·3137			
2	45·3567								

Weighted mean ... −128·88
V_a ... +18·18
V_d ... + ·10
Curvature ... − ·28

Radial velocity ... − 110·9

ORIONIS 1116.

1907. Oct. 30.
G. M. T. 19h 12m

Observed by } W. E. HARPER.
Measured by }

Wt.	Mean of Settings.	Corrected Star Setting.	Dispt in revns	Velocity.	Wt.	Mean of Settings.	Corrected Star Setting.	Dispt in revns	Velocity.
2	73·0473				2	45·2756			
½	72·8040	·7654	·0994	−144·23	½	45·0737	·0717	·1670	174·35
1½	72·4867				1	27·2662	·2848	1371	119·00
1½	54·7598				2	27·2279			
½	53·2903	·2756	1267	144·82	2	15·3661			
1	53·1262				½	15·2765	·3090	·1643	−127·17

Weighted mean ..... −138·09
V ..... +18·18
Vd ..... + ·08
Curvature ..... − ·28

Radial velocity ..... − 120·1

ORIONIS 1117.

1907. Oct. 30.
G. M. T. 19h 47m

Observed by } W. E. HARPER.
Measured by }

Wt.	Mean of Settings.	Corrected Star Setting.	Dispt in revns	Velocity.	Wt.	Mean of Settings.	Corrected Star Setting.	Dispt in revns	Velocity.
2	73·0455				½	53·3016	·2867	·1156	132·13
½	72·8085	·7728	·0920	−133·49	2	53·1274			
1½	72·4810				2	45·2765			
2	54·7548				1	45·1154	·1125	·1262	−131·75

Weighted mean ..... −132·28
Va ..... + 18·18
Vd ..... + ·08
Curvature ..... − ·28

Radial velocity ..... −114·3

ORIONIS 1118.

1907. Oct. 30.
G. M. T. 20h 26m

Observed by } W. E. HARPER.
Measured by }

Wt.	Mean of Settings.	Corrected Star Setting.	Dispt in revns	Velocity.	Wt.	Mean of Settings.	Corrected Star Setting.	Dispt in revns	Velocity.
1	73·0501				1½	53·1317			
¼	72·8222	·7818	·0830	−120·43	2	45·2871			
1	72·4855				¾	45·1339	·1204	·1183	125·50
1½	54·7657				¾	27·2750	·2715	·1504	−130·55
1	53·3040	·2836	·1187	135·67	2	27·2501			

Weighted mean ..... −130·07
Va ..... + 18·18
Vd ..... − ·03
Curvature ..... − ·28

Radial velocity ..... −112·2

ORIONIS 1119.

1907. Oct. 30.
G. M. T. 21h 09m

Observed by W. E. HARPER.
Measured by C. R. WESTLAND.

Wt.	Mean of Settings.	Corrected Star Setting.	Dispt in revns	Velocity.	Wt.	Mean of Settings.	Corrected Star Setting.	Dispt in revns	Velocity.
2	73·0338	.....	.....	.....	2	45·2576	.....	.....	.....
½	72·7618	·7385	·1263	−183·26	½	45·0987	·1148	·1239	129·35
1½	72·4674	.....	.....	.....	1	27·2662	·2938	·1281	111·19
1½	54·7416	.....	.....	.....	2	27·2190	.....	.....	.....
½	53·2720	·2700	·1323	151·22	2	15·3557	.....	.....	.....
1	53·1143	.....	.....	.....	½	15·2510	·2939	·1794	−138·86

Weighted mean..... −137·24
V_a..... +18·18
V_d..... − ·09
Curvature..... − ·28

Radial velocity..... −119· 4

ORIONIS 1120.

1907. Oct. 30.
G. M. T. 21h 49m

Observed by W. E. HARPER.
Measured by C. R. WESTLAND.

Wt.	Mean of Settings.	Corrected Star Setting.	Dispt in revns	Velocity.	Wt.	Mean of Settings.	Corrected Star Setting.	Dispt in revns	Velocity.
2	73·0459	.....	.....	.....	1½	53·1323	.....	.....	.....
½	72·7938	·7568	·1080	−156·71	2	45·2814	.....	.....	.....
1½	72·4831	.....	.....	.....	½	45·1135	·1057	·1330	138·85
2	54·7613	.....	.....	.....	1	27·2586	·2570	·1649	−143·13
½	53·2911	·2709	·1314	150·19	2	27·2454	.....	.....	.....

Weighted mean..... −146·40
V_a..... +18·18
V_d..... − ·14
Curvature..... − ·28

Radial velocity..... −128 8

SESSIONAL PAPER No. 25a

ζ ORIONIS 1121.

1907. Oct. 31
G. M. T. 18h 47m

Observed by J. S. PLASKETT.
Measured by C. R. WESTLAND.

Wt.	Mean of Settings.	Corrected Star Setting.	Disp^{t} in rev^{ns}	Velocity.	Wt.	Mean of Settings.	Corrected Star Setting.	Disp^{t} in rev^{ns}	Velocity.
2	73·0599				1½	53·1383			
½	72·8780	·8300	·0348	− 50·49	2	45·2872			
1½	72·4888				½	45·1422	·1288	·1099	114·74
2	54 7706				½	27 2519	·2631	·1588	−137·84
1½	53·3238	2972	·1051	120·13	2	27·2354			

Weighted mean ..... −110·58
V_a ..... +17·87
V_d ..... + ·10
Curvature ..... − ·28

Radial velocity ..... − 92.9

ζ ORIONIS 1122.

1907. Oct. 31
G. M. T. 19h 45m

Observed by J. S. PLASKETT.
Measured by W. E. HARPER.

Wt.	Mean of Settings.	Corrected Star Setting.	Disp^{t} in rev^{ns}	Velocity.	Wt.	Mean of Settings.	Corrected Star Setting.	Disp^{t} in rev^{ns}	Velocity.
2	73·0509				2	45·2752			
2	72·8412	·7988	·0660	− 95·77	2	45·1575	·1559	·0829	86·55
2	72·4911				½	27 2856	·2961	·1258	109·19
2	54·0475				2	27·2360			
2	53·3297	·3118	·0905	103·44	½	15·3259	·3527	·1206	− 93·34
2	53·1249				2	15·3718			

Weighted mean ..... − 96·11
V_a ..... +17·87
V_d ..... + ·02
Curvature ..... − ·28

Radial velocity ..... − 78·5

ι ORIONIS 1123.

1907. Oct. 31.
G. M. T. 20h 40m

Observed by J. S. PLASKETT.
Measured by W. E. HARPER.

Wt.	Mean of Settings.	Corrected Star Setting.	Displt in revns	Velocity.	Wt.	Mean of Settings.	Corrected Star Setting.	Displt in revns	Velocity.
2	73·0181	.....	.....	.....	½	45·1072	·1295	·1092	114·00
½	72·8295	·8219	·0429	− 62·25	2	27·2126	.....	.....	.....
2	72·4510	.....	.....	.....	2	20·4696	.....	.....	.....
2	54·7319	.....	.....	.....	½	20·6023	·6525	·1281	104·27
½	53·2796	·2940	·1083	123·79	2	15·3396	.....	.....	.....
2	53·0970	.....	.....	.....	½	15·2841	·3431	1302	− 100·77
2	45·2514	.....	.....	.....					

Weighted mean..... − 101·02
V_a ..... + 17·87
V_d..... − ·06
Curvature ..... − ·28

Radial velocity..... − 83·5

ι ORIONIS 1124.

1907. Nov. 1.
G. M. T. 18h 35m

Observed by J. S. PLASKETT.
Measured by W. E. HARPER.

Wt.	Mean of Settings.	Corrected Star Setting.	Displt in revns	Velocity.	Wt.	Mean of Settings.	Corrected Star Setting.	Displt in revns	Velocity.
2	72·9648	.....	.....	.....	2	45·1927	.....	.....	.....
1	72·7650	·8102	·0546	− 79·22	1½	45·0610	·1419	·0968	101·06
2	72·3991	.....	.....	.....	½	20·5629	·6452	·1354	110·21
2	54·6686	.....	.....	.....	2	20·4177	.....	.....	.....
1	53·2242	·2958	·1065	121·73	2	15·2945	.....	.....	.....
2	53·0410	.....	.....	.....	½	15·2807	·3848	·0885	− 68·50

Weighted Mean ..... − 98·31
V_a ..... + 17·56
V_d..... + ·10
Curvature..... − ·28

Radial Velocity ..... − 80·9

ι ORIONIS 1125.

1907. Nov. 1
G. M. T. $19^h\ 20^m$

Observed by J. S. Plaskett.
Measured by W. E. Harper.

Wt.	Mean of Settings.	Corrected Star Setting.	Displ^t in revns	Velocity.	Wt.	Mean of Settings.	Corrected Star Setting.	Displ^t in revns	Velocity.
2	73·0315				2	45·2519			
2	72·8312	8100	·0548	−79·51	2	45·1570	·1787	·0600	62·64
2	72·4647				¼	27·2860	·3223	·0996	86·45
2	54·7349				2	27·2102			
2	53·3142	·3232	·0791	90·41	2	15·3484			
2	53·1026				¾	15·3090	·3592	·1141	−88·31

Weighted mean		− 79·00
V_a	+17·56	
V_d	+ ·04	
Curvature		− ·28
Radial velocity		−61·7

ι ORIONIS 1126.

1907. Nov. 1
G. M. T. 20^h

Observed by J. S. Plaskett.
Measured by C. R. Westland.

Wt.	Mean of Settings.	Corrected Star Setting.	Displ^t in revns	Velocity.	Wt.	Mean of Settings.	Corrected Star Setting.	Displ^t in revns	Velocity.
2	73·0472				½	45·1326	·1349	·1038	108·37
½	72·8006	·7643	·1005	−145·83	2	27·2330			
2	72·4798				½	27·2995	·3132	·1087	94·35
2	54·7497				2	20·5007			
½	53·3095	·3015	·1008	115·21	½	20·6501	6693	·1305	106·22
2	53·1200				2	15·3751			
2	45·2714				½	15·3811	·4046	·0687	−54·25

Weighted mean		−104·04
V_a	+17·56	
V_d	·00	
Curvature		− ·28
Radial velocity		−96·8

ι ORIONIS 1126.*

1907. Nov. 1.
G. M. T. 20h

Observed by } J. S. PLASKETT.
Measured by }

Wt.	Mean of Settings.	Corrected Star Setting.	Dispt in revns	Velocity.	Wt.	Mean of Settings.	Corrected Star Setting.	Dispt in revns	Velocity.
2	73·0412	.....	.....	.....	1	45·1225	·1346	·1041	108·47
½	72·8255	·7955	·0693	−100·53	½	27·3050	·3300	·0919	86·37
2	72·4711	.....	.....	.....	2	27·2209	.....	.....	.....
2	54·0318	.....	.....	.....	½	20·6190	·6500	·1306	103·80
1	53·3268	·3270	·0753	86·07	2	20·4890	.....	.....	.....
2	53·1100	.....	.....	.....	½	15·3200	·3600	·1133	−87·69
2	45·2615	.....	.....	.....	2	15·3615	.....	.....	.....

Weighted mean	− 95·90
V_a	+ 17·56
V_d	·00
Curvature	− ·28
Radial velocity	− 88·6

* Check measurement.

ι ORIONIS 1127.

1907. Nov. 1.
G. M. T. 20h 23m

Observed by J. S. PLASKETT.
Measured by C. R. WESTLAND.

Wt.	Mean of Settings.	Corrected Star Setting.	Dispt in revns	Velocity.	Wt.	Mean of Settings.	Corrected Star Setting.	Dispt in revns	Velocity.
2	73·0357	.....	.....	.....	2	53·1115	.....	.....	.....
½	72·8528	·8278	·0370	−50·54	2	45·2561	.....	.....	.....
2	72·4680	.....	.....	.....	½	45·1314	·1491	0896	−93·54
2	54·7377	.....	.....	.....	2	27·2051	.....	.....	.....
½	53·3468	·3478	·0545	62·29					

Weighted mean	− 68·79
V_a	+ 17·56
V_d	− ·04
Curvature	− ·28
Radial velocity	− 51·6

SESSIONAL PAPER No. 25a

ι ORIONIS 1136.

1907. Nov. 11.
G. M. T. 18h 28m

Observed by W. E. HARPER.
Measured by C. R. WESTLAND.

Wt.	Mean of Settings.	Corrected Star Setting.	Dispt in revns	Velocity.	Wt.	Mean of Settings.	Corrected Star Setting.	Dispt in revns	Velocity.
2	72·9926	.....	.....	.....	½	20·7772	·7743	·0063	− 5·13
½	72·8419	·8584	·0064	− 9·23	2	20·5231	.....	.....	.....
2	72·4308	.....	.....	.....	1	15·5042	·4979	0246	+ 19·04
2	45·2621	.....	.....	.....	2	15·4059	.....	.....	.....
½	45·2245	·2355	·0032	− 3·34	1½	11·8618	·8603	·0089	+ 6·67
2	27·2420	.....	.....	.....	2	11·5086	.....	.....	.....
½	27·4060	·4106	·0113	− 9·81					

Weighted mean..... + 3·37
V_a ..... + 14·17
V_d ..... − ·07
Curvature..... − ·28

Radial velocity..... + 17·3

ι ORIONIS 1136*

1907. Nov. 11
G. M. T. 18h 28m

Observed by } W. E. HARPER.
Measured by }

Wt.	Mean of Settings.	Corrected Star Setting.	Dispt in revns	Velocity.	Wt.	Mean of Settings.	Corrected Star Setting.	Dispt in revns	Velocity.
2	72·9950	.....	.....	.....	1	20·7660	·7556	·0250	− 20·35
1	72·8435	·8575	·0073	− 10·59	2	20·5308	.....	.....	.....
2	72·4333	.....	.....	.....	1	15·4940	·4818	·0085	+ 6·58
2	45·2652	.....	.....	.....	2	15·4108	.....	.....	.....
½	45·2622	·2705	·0317	+ 34·50	1½	11·8659	·8604	·0090	+ 6·74
1	27·4337	·4327	·0108	+ 9·37	2	11·5120	.....	.....	.....
2	27·2477	.....	.....	.....					

Weighted mean..... + 2·06
V_a ..... + 14·17
V_d ..... + ·07
Curvature..... − ·28

Radial Velocity..... + 16·0

*Check measurement.

ζ ORIONIS 1137.

1907. Nov. 11.
G. M. T. $19^h\ 07^m$.

Observed by W. E. HARPER.
Measured by C. R. WESTLAND.

Wt.	Mean of Settings.	Corrected Star Setting.	Disp^t in rev^{ns}	Velocity.	Wt.	Mean of Settings.	Corrected Star Setting.	Disp^t in rev^{ns}	Velocity.
2	72·9998	.....	.....	.....	2	45·2740	.....	.....	.....
½	72·8521	·8617	·0031	− 4·50	½	45·2388	·2384	·0093	− 0·31
2	72·4362	.....	.....	.....	2	27·2602	.....	.....	.....
2	54·7390	.....	.....	.....	½	27·4570	·4436	·0217	+18·84
1	53·4180	·4242	·0219	+25·03	2	20·5420	.....	.....	.....
2	53·1050	.....	.....	.....	½	20·8277	·8060	·0254	+20·68

Weighted mean..... +14·13
V_a..... −14·17
V_d..... + ·01
Curvature... − ·28

Radial velocity..... −28·0

ζ ORIONIS 1141.

1907. Nov. 15.
G. M. T. $18^h\ 02^m$

Observed by W. E. HARPER.
Measured by C. R. WESTLAND.

Wt.	Mean of Settings.	Corrected Star Setting.	Disp^t in rev^{ns}	Velocity.	Wt.	Mean of Settings.	Corrected Star Setting.	Disp^t in rev^{ns}	Velocity.
2	72·9746	.....	.....	.....	2	53·0929	.....	.....	.....
½	72·8089	·8425	·0223	−32·36	2	45·2578	.....	.....	.....
2	72·4154	.....	.....	.....	½	45·2411	·2569	·0182	+19·00
2	54·7246	.....	.....	.....	2	27·2555	.....	.....	.....
½	53·4097	·4286	·0263	+30·06	½	27·4851	·4765	·0546	+48·42

Weighted mean..... +16·28
V_a..... +12·63
V_d..... + ·09
Curvature... − ·28

Radial velocity..... +28·7

ζ ORIONIS 1142.

1907. Nov. 15.
G. M. T. $18^h\ 19^m$

Observed by W. E. Harper.
Measured by C. R. Westland.

Wt.	Mean of Settings.	Corrected Star Setting.	Disp^t in rev^{ns}.	Velocity.	Wt.	Mean of Settings.	Corrected Star Setting.	Disp^t in rev^{ns}.	Velocity.
2	72·9845				2	53·1006			
½	72·8334	·8571	·0077	−11·17	2	45·2669			
2	72·4253				½	45·2613	·2680	·0293	+30·59
2	54·7302				2	27·2628			
½	53·4121	·4236	·0213	−24·34	½	27·4575	·4415	·0196	+17·01

Weighted mean . . . . . +15·19
V_a . . . . . +12·63
V_d . . . . . + ·06
Curvature . . — ·28

Radial Velocity . . . . . − 27·6

ζ ORIONIS 1143.

1907. Nov. 15.
G. M. T. $18^h\ 36^m$

Observed by W. E. Harper.
Measured by C. R. Westland.

Wt.	Mean of Settings.	Corrected Star Setting.	Disp^t in rev^{ns}.	Velocity.	Wt.	Mean of Settings.	Corrected Star Setting.	Disp^t in rev^{ns}.	Velocity.
2	54·7535				2	27·2942			
½	53·4373	·4248	·0225	+25·72	½	27·5026	·4554	·0335	−29·07
2	53·1247				2	20·5812			
2	45·2965				½	20·8614	·8008	·0202	−16·44
½	45·2878	·2649	·0262	+27·35					

Weighted mean . . . . . +24·64
V_a . . . . . +12·63
V_d . . . . . + ·03
Curvature . . — ·28

Radial velocity . . . . . +37·0

ORIONIS 1147.

1907. Nov. 16.
G. M. T. 17h 20m

Observed by J. S. PLASKETT.
Measured by C. R. WESTLAND.

Wt.	Mean of Settings.	Corrected Star Setting.	Dispt in revns	Velocity.	Wt.	Mean of Settings.	Corrected Star Setting.	Dispt in revns	Velocity.
2	73·0063				2	45·3063			
1	72·8944	·8971	·0323	+46·87	1	45·2902	·2575	·0188	19·63
2	72·4452				2	27·3171			
2	54·7582				½	27·5420	·4719	·0500	43·40
½	53·4526	·4317	·0294	33·60	2	20 5989			
2	53 1340				½	20·8887	·8095	·0289	+23·52

Weighted mean ..... +33·36
V_a ..... +12·25
V_d ..... + ·12
Curvature ..... − ·28

Radial velocity ..... +45· 4

ORIONIS 1148.

1907. Nov. 16.
G. M. T. 17h 40m

Observed by J. S. PLASKETT
Measured by C. R. WESTLAND.

Wt.	Mean of Settings.	Corrected Star Setting.	Dispt in revns	Velocity.	Wt.	Mean of Settings.	Corrected Star Setting.	Dispt in revns	Velocity.
2	72 9794				2	45·2697			
1	72·8322	·8628	·0020	− 2·90	½	45·2697	·2736	·0349	+36·44
2	72·4137				2	27·2717			
2	54·7290				½	27·4928	·4680	·0461	+40·01
1	53·4398	·4495	·0472	+53·95	2	20·5574			
2	53·1032				½	20·8315	·7946	0140	+11·40

Weighted mean ..... +27·13
V_a ..... +12·25
V_d ..... + ·11
Curvature ..... − ·28

Radial velocity ..... +39· 2

SESSIONAL PAPER No. 25a

ι ORIONIS 1161.

1907. Nov. 28.
G. M. T. 21h 08m

Observed by J. S. PLASKETT.
Measured by C. R. WESTLAND.

Wt.	Mean of Settings.	Corrected Star Setting.	Dispt in revns	Velocity.	Wt.	Mean of Settings.	Corrected Star Setting.	Dispt in revns	Velocity.
2	54·7524	... ...	... ...	... ...	½	27·2370	·2785	·1434	124·46
½	53·2823	·2737	·1286	− 146·99	2	27·2051	... ...	... ...	... ...
2	53·1204	... ...	... ...	... ...	2	15·3372	... ...	... ...	... ...
2	45·2622	... ...	... ...	... ...	¼	15·2620	·3234	·1499	− 116·02
¼	45·0952	·1066	·1321	137·91					

Weighted mean		− 132·80
V_a	+ 6·80	
V_d		− ·22
Curvature		− ·28
Radial velocity		− 126·5

ι ORIONIS 1161.*

1907. Nov. 28.
G. M. T. 21h 08m

Observed by J. S. PLASKETT.
Measured by J. S. PLASKETT.

Wt.	Mean of Settings.	Corrected Star Setting.	Dispt in revns	Velocity.	Wt.	Mean of Settings.	Corrected Star Setting.	Dispt in revns	Velocity.
2	73·0507	... ...	... ...	... ...	¾	45 1247	·1427	·0960	100·20
½	72·8140	·7720	0928	− 134·65	2	43·5126	... ...	... ...	... ...
2	72·4924	... ...	... ...	... ...	½	27·2550	·2990	·1229	106·67
1	54 0324	... ...	... ...	... ...	2	27·2021	... ...	... ...	... ...
1	53·3012	·2977	·1046	115·26	2	15·3322	... ...	... ...	... ...
2	53·1158	... ...	... ...	... ...	½	15·2784	·3454	·1279	− 99·03
2	45·2562	... ...	... ...	... ...					

Weighted mean		− 110·17
V_a	+ 6·80	
V_d		− ·22
Curvature		− ·28
Radial velocity		− 103·9

* Check measurement.

ι ORIONIS 1161.*

1907. Nov. 28.
G. M. T. 21h 08m.

Observed by J. S. Plaskett.
Measured by W. E. Harper.

Wt.	Mean of Settings.	Corrected Star Setting.	Displt in revns	Velocity.	Wt.	Mean of Settings.	Corrected Star Setting.	Displt in revns	Velocity.
2	72·9617				3	45·1636			
1	72·7048	·7525	·1123	−162·85	1	45·0212	·1312	·1075	112·23
1½	72·3985				2	27·1065			
2	53·9388				1	27·1502	·2900	·1319	114·49
1	53·1973	·2877	·1146	130·99	2	15·2349			
2	53·0216				1	15·1660	·3297	·1636	−126·63

Weighted mean....		−126·57
V_a.....	+6·80	
V_d...		−·22
Curvature....		−·28
Radial velocity...		120·3

* Second check measurement.

ι ORIONIS 1162.

1907. Nov. 28.
G. M. T. 21h 30m

Observed by J. S. Plaskett.
Measured by C. R. Westland.

Wt.	Mean of Settings.	Corrected Star Setting.	Displt in revns	Velocity.	Wt.	Mean of Settings.	Corrected Star Setting.	Displt in revns	Velocity.
2	45·3964				2	27·3308			
1	45·2433	·1208	·1179	−123·08	1	15·3655	·3116	·1617	−125·16
2	44·3798				2	15·4527			
1	27·3032	·2190	·2029	176·12					

Weighted mean		−150·12
V	+6·80	
V_d ...		−·23
Curvature....		−·28
Radial velocity....		−143·8

ORIONIS 1162.*

1907, Nov. 28.
G. M. T. 21h 30m

Observed by J. S. PLASKETT.
Measured by J. S. PLASKETT.

Wt.	Mean of Settings.	Corrected Star Setting.	Dispt in revns	Velocity.	Wt.	Mean of Settings.	Corrected Star Setting.	Dispt in revns	Velocity.
2	73·0700	.....	.....	.....	2	43·5136	.....	.....	.....
½	72·8474	·7874	·0774	—112·32	¼	27·1864	·2440	·1779	154·49
2	72·5033	.....	.....	.....	2	27·1888	.....	.....	.....
2	45·2536	.....	.....	.....	½	15·2524	·3364	·1369	—106·00
½	45·1152	·1362	·1025	106·98	2	15·3137	.....	.....	.....

Weighted mean		—	115·00
V_a	+ 6·80		
V_d		—	·23
Curvature		—	·28
Radial velocity		—	108·7

* Check measurement.

ORIONIS 1162.*

1907, Nov. 28.
G. M. T. 21h 30m

Observed by J. S. PLASKETT.
Measured by W. E. HARPER.

Wt.	Mean of Settings.	Corrected Star Setting.	Dispt in revns	Velocity.	Wt.	Mean of Settings.	Corrected Star Setting.	Dispt in revns	Velocity.
2	73·1068	.....	.....	.....					
½	72·8884	·7913	·0735	—106·65	2	27·2115	·2335	·1884	163·53
2	72·5422	.....	.....	.....	2	27·2246	.....	.....	.....
2	45·2915	.....	.....	.....	½	15·3453	.....	.....	.....
1½	45·1452	·1273	·1114	116·30		15·2825	·3358	·1375	—106·42

Weighted mean		—	120·91
V_a	+6·80		
V_d		—	·23
Curvature		—	·28
Radial velocity		—	114·6

*Second check measurement.

ι ORIONIS 1166.

1907 Nov. 29.
G. M. T. $21^h\ 41^m$

Observed by W. E. HARPER.
Measured by C. R. WESTLAND.

Wt.	Mean of Settings.	Corrected Star Setting.	Displt in revns	Velocity.	Wt.	Mean of Settings.	Corrected Star Setting.	Displt in revns	Velocity.
2	73·0522				1	45·1060	·1374	·1013	105·76
½	72·8498	·8084	·0564	— 81·84	2	44·2251			
2	72·4845				½	27·2503	·3198	·1021	88·62
2	72·7322				2	27·1770			
1	53·3124	·3225	·0798	91·21	½	15·2792	·3780	·0953	− 73·76
2	53·1018				2	15·2998			
2	45·2427								

Weighted mean		−91·16
V_a	+6·43	
V_d		− ·25
Curvature		− ·28
Radial velocity		− 85·3

ι ORIONIS 1167.

1907 Nov. 29.
G. M. T. $21^h\ 58^m$

Observed by W. E. HARPER.
Measured by C. R. WESTLAND.

Wt.	Mean of Settings.	Corrected Star Setting.	Displt in revns	Velocity.	Wt.	Mean of Settings.	Corrected Star Setting.	Displt in revns	Velocity.
2	73·0612				½	45·1125	·1189	·1198	125·07
½	72·8198	·7670	·0978	−141·91	2	44·2489			
2	72·4996				½	27·2197	·2592	·1627	141·22
2	54·7544				2	27·2071			
¼	53·2647	·2541	·1482	169·39	¼	15·2647	·3353	·1380	−106·81
2	53·1224				2	15·3281			
2	45·2680								

Weighted mean		−136·57
V_a	+ 6·43	
V_d		− ·28
Curvature		− ·28
Radial velocity		− 139·7

ι ORIONIS 1167*

1907. Nov. 29.
G. M. T. 21h 58m

Observed by } W. E. HARPER.
Measured by }

Wt.	Mean of Settings.	Corrected Star Setting.	Dispt in revns	Velocity.	Wt.	Mean of Settings.	Corrected Star Setting.	Dispt in revns	Velocity.
2	73·0566				2	53·1160			
½	72·8090	·7618	·1030	− 149·45	2	45·2635			
2	72·4932				¼	45·1252	·1352	·1035	108·05
2	54·7458				¼	27·2835	·3323	·0896	− 77·77
¼	53·3060	3020	·1003	114·64	2	27·2978			

Weighted mean		− 119·86
V_a	+ 6·43	
V_d		− ·28
Curvature		− ·28
Radial velocity		− 114·0

*Check measurement: − 120 accepted result.

ι ORIONIS 1168.

1907. Dec. 3.
G. M. T. 15h 25m

Observed by J. S. PLASKETT.
Measured by C. R. WESTLAND.

Wt.	Mean of Settings.	Corrected Star Setting.	Dispt in revns	Velocity.	Wt.	Mean of Settings.	Corrected Star Setting.	Dispt in revns	Velocity.
2	72·9936				½	45·1582	·1973	·0414	43·22
1	72·8201	·8342	·0306	− 44·40	2	44·2191			
2	72·4358				¼	27·3302	·3808	·0411	35·67
2	54·7115				2	27·1959			
¾	53·3080	·3393	·0630	72·01	½	15·3780	·4346	·0387	− 29·95
2	53·0806				2	15·3420			
2	45·2346								

Weighted mean		− 43·16
V_a	+ 4·75	
V_d	+ ·19	
Curvature		− ·28
Radial velocity		− 38·5

ι ORIONIS 1169.

1907. Dec. 3.
G. M. T. 15h 36m

Observed by J. S. PLASKETT.
Measured by C. R. WESTLAND.

Wt.	Mean of Settings.	Corrected Star Setting.	Displt in revns	Velocity.	Wt.	Mean of Settings.	Corrected Star Setting.	Displt in revns	Velocity.
2	73·0222				½	45·2387	·2367	·0020	− 2·09
½	72·8747	·8617	·0031	− 4·50	2	45·2756			
2	72·4596				¼	27·4303	·4413	·0194	+ 16·84
2	54·7477				2	27·2355			
½	54·3728	·3645	·0378	− 43 20	1	15·4306	·4507	·0226	− 17·49
2	53·1207				2	15·3785			

Weighted mean		− 13·88
V_a	+ 4 75	
V_d	+ ·17	
Curvature		− ·28
Radial velocity		− 9·2

ι ORIONIS 1170.

1907. Dec. 3.
G. M. T. 15h 48m

Observed by J. S. PLASKETT.
Measured by C. R. WESTLAND.

Wt.	Mean of Settings.	Corrected Star Setting.	Displt in revns	Velocity.	Wt.	Mean of Settings.	Corrected Star Setting.	Displt in revns	Velocity.
2	73·0263				2	44·2491			
½	72·8605	·8445	·0203	− 29·46	¼	27·3948	·4114	0105	− 9·11
2	72·4597				2	27·2299			
2	54·7401				½	20·6982	·7165	·0641	− 52·18
½	53·3781	·3798	·0225	− 25·72	2	20·5017			
2	53·1106				½	11·8440	·8785	·0266	+ 91·92
2	45·2685				2	11·4720			
¼	45·1927	·1981	0406	− 42·39					

Weighted mean		− 30·64
V_a	+ 4·75	
V_d	+ ·16	
Curvature		− ·28
Radial velocity		− 26·0

ORIONIS 1178.

1907. Dec. 4.
G. M. T. $17^h\ 27^m$

Observed by W. E. HARPER.
Measured by C. R. WESTLAND.

Wt.	Mean of Settings.	Corrected Star Setting.	Dispt in revns	Velocity.	Wt.	Mean of Settings.	Corrected Star Setting.	Dispt in revns	Velocity.
2	73·0413				2	53·1177			
1½	72·8768	·8452	·0196	−28·44	½	45·2436	·2452	·0065	+ 6·79
2	72·4767				2	45·2720			
2	54·7452				½	27·3877	·4013	·0206	−17·88
1	53·3915	3862	·0161	−18·42	2	27·2340			

Weighted mean	− 19·03
V_a	+ 4·33
V_d	+ ·02
Curvature	− ·28
Radial velocity	− 15·0

ORIONIS 1188.

1907. Dec. 21.
G. M. T. $15^h\ 46^m$

Observed by J. S. PLASKETT.
Measured by J. S. PLASKETT.

Wt.	Mean of Settings.	Corrected Star Setting.	Dispt in revns	Velocity.	Wt.	Mean of Settings.	Corrected Star Setting.	Dispt in revns	Velocity.
2	73·0552				½	53·5004	·4715	·0692	79·13
½	72·9681	92·26	·0578	+83·88	2	53·1390			
2	72·4906				2	45·2915			
2	54·0604				¼	45·3025	·2845	·0458	+47·80

Weighted mean	+ 74·76
V_a	− 3·54
V_d	+ ·02
Curvature	− ·28
Radial velocity	+ 71·0

ORIONIS 1189.

1907. Dec. 21.
G. M. T. $18^h\ 10^m$

Observed by } J. S. PLASKETT.
Measured by }

Wt.	Mean of Settings.	Corrected Star Setting.	Disp^t in revns	Velocity.	Wt.	Mean of Settings.	Corrected Star Setting.	Disp^t in revns	Velocity.
2	73·0774	.....	.....	.....	2	44·7824	.....	.....	.....
1	72·9963	·9273	·0625	+ 90·70	1	44·8130	·3042	·0655	68·36
2	72·5164	.....	.....	.....	½	27·0224	·5263	·1044	90·61
2	53·5540	.....	.....	.....	2	26·7427	.....	.....	.....
1	52·9977	·4757	·0734	83·94	½	14·6664	·6323	·1593	+123·35
2	52·6326	.....	.....	.....	2	14·4327	.....	.....	.....

Weighted mean ..... +83·28
V_a ..... −3·57
V_d ..... − ·13
Curvature ..... − ·28

Radial velocity ..... +79·2

ORIONIS 1190.

1907. Dec. 24.
G. M. T. $15^h\ 40^m$

Observed by } J. S. PLASKETT.
Measured by }

Wt.	Mean of Settings.	Corrected Star Setting.	Disp^t in revns	Velocity.	Wt.	Mean of Settings.	Corrected Star Setting.	Disp^t in revns	Velocity.
2	73·0062	.....	.....	.....	1	45·2830	·3370	·0983	102·60
1	72·9266	·9285	·0637	+ 92·44	2	45·2192	.....	.....	.....
2	72·4464	.....	.....	.....	½	27·4368	·5205	·0989	85·84
2	53·9920	.....	.....	.....	2	27·1620	.....	.....	.....
½	53·4803	·5153	·1130	129·22	1	15·5273	·6330	·1597	+123·66
2	53·0787	.....	.....	.....	2	15·2920	.....	.....	.....

Weighted mean ..... +106·58
V_a ..... −4·88
V_d ..... + ·04
Curvature ..... − ·28

Radial velocity ..... +101·5

ι ORIONIS 1191.

1907. Dec. 28
G. M. T. 13h

Observed by } J. S. PLASKETT.
Measured by }

Wt.	Mean of Settings.	Corrected Star Setting.	Dispt in revns	Velocity.	Wt.	Mean of Settings.	Corrected Star Setting.	Dispt in revns	Velocity.
2	73·0603				2	30·8396			
½	72·8436	·7946	·0702	−101·87	½	28·5014	·5352	·1183	103·93
2	72·4910				½	27·2971	·3361	·0942	81·76
2	54·0477				2	27·2070			
¼	53·3462	·3307	·0716	81·88	½	20·5932	·6462	·1344	109·37
2	53·1256				2	20·4670			
2	45·2714				¼	15·3137	·3846	·0887	− 68·68
⅛	45·1374	·1400	·0987	103·01	2	15·3287			
2	43·5297								

Weighted mean ..... −97·57
V_a ..... − 6·64
V_d ..... + 0·22
Curvature ..... − 0·28

Radial velocity ..... −104·3

ι ORIONIS 1192.

1907. Dec. 28
G. M. T. 15h 05m

Observed by } J. S. PLASKETT.
Measured by }

Wt.	Mean of Settings.	Corrected Star Setting.	Dispt in revns	Velocity.	Wt.	Mean of Settings.	Corrected Star Setting.	Dispt in revns	Velocity.
3	73·0167				3	45·2280			
1	72·8150	·8085	0563	− 81·70	1	45·0738	·1195	·1192	124·41
3	72·4507				⅓	27·2082	·3492	·0727	63·10
2	54·0001				2	27·1771			
1	53·2563	·2845	·1178	134·72	½	20·5304	·6080	·1726	−140·46
2	53·0843				2	20·4424			

Weighted mean ..... −110·65
V_a ..... − 6·68
V_d ..... + ·07
Curvature ..... − ·28

Radial velocity ..... −117·5

ζ ORIONIS 1193.

1907. Dec. 28.
G. M. T. 15h 18m

Observed by } J. S. PLASKETT.
Measured by }

Wt.	Mean of Settings.	Corrected Star Setting.	Displ^t in revns	Velocity.	Wt.	Mean of Settings.	Corrected Star Setting.	Displ^t in revns	Velocity.
2	73·0757	...	...	...	2	30·8342	...	...	...
1	72·8526	7862	·0786	114·06	½	28·4722	·5167	·1368	120·19
2	72·1524	...	...	...	½	27·2457	2937	·1282	111·26
2	54·0462	...	...	...	2	27·1976	...	...	...
½	53·3165	3020	·1003	114·70	¼	20·5587	·6165	·1641	133·54
2	53·1258	...	...	...	2	20·4620	...	...	...
2	45·2652	...	...	...	¼	15·2884	·3634	·1100	−85·17
1	45·1469	·1555	·0832	86·84	2	15·3227	...	...	...

Weighted mean ...	−107·16
V_a ...	− 6·68
V_d ...	+ ·05
Curvature ...	− ·28
Radial velocity ...	− 114·1

ζ ORIONIS 1194.

1907. Dec. 28.
G. M. T. 15h 29m

Observed by } J. S. PLASKETT.
Measured by }

Wt.	Mean of Settings.	Corrected Star Setting.	Displ^t in revns	Velocity.	Wt.	Mean of Settings.	Corrected Star Setting.	Displ^t in revns	Velocity.
2	73·0740	...	...	...	1	45·1340	·1275	·1112	116·06
1	72·8390	·7765	·0883	−128·14	½	27·2787	2980	·1239	107·53
2	72·5068	...	...	...	½	27·2266	...	...	...
2	54·0544	...	...	...	¼	20·6380	·6680	·1120	91·63
1	53·3222	·2966	·1057	120·88	2	20·4900	...	...	...
2	53·1377	...	...	...	½	15·2950	·3390	·1343	−103·99
2	45·2804	...	...	...	2	15·3542	...	...	...

Weighted mean ...	−116·18
V_a ...	− 6·68
V_d ...	+ ·04
Curvature ...	− ·28
Radial velocity ...	−123·1

ι ORIONIS 1201.

1907. Dec. 28
G. M. T. $19^h\ 40^m$

Observed by } J. S. PLASKETT.
Measured by }

Wt.	Mean of Settings.	Corrected Star Setting.	Disp^t in rev^{ns}	Velocity.	Wt.	Mean of Settings.	Corrected Star Setting.	Disp^t in rev^{ns}	Velocity.
2	73·0644	....	....	....	½	45·1351	·1465	·0922	96·23
¼	72·8316	·7774	·0874	—126·83	½	27·2532	2875	1344	116 64
2	72·4984	....	.....	....	2	27·2120	.....	....	. .....
2	54 0412	.....	.....	.....	¼	20·6014	6402	·1404	114·25
¾	53·3302	·3202	·0829	93·89	2	20·4812	.. ....	..... .	.....
2	53·1210	... .	.....	.....	½	15·2994	·3530	·1203	93·15
2	45·2625	. .....	....	.....	2	15 3450	.. ....	... ..	.....

Weighted mean .... —106·16
V_a..... — 6·76
V_d. .. .. — ·25
Curvature..... — ·28

Radial velocity..... — 113·4

ι ORIONIS 1202.

1907. Dec. 28.
G. M. T. $19^h\ 51^m$

Observed by } J. S. PLASKETT.
Measured by }

Wt.	Mean of Settings.	Corrected Star Setting.	Disp^t in rev^{ns}	Velocity.	Wt.	Mean of Settings.	Corrected Star Setting.	Disp^t in rev^{ns}	Velocity.
2	73 0465	....	.. ..	. ....	½	45·1005	·1280	·1107	115·53
¼	72 8150	·7850	·0798	—115·81	½	27·2350	·2990	·1229	106·66
2	72 4750	.....	.. ..	.....	2	27·1821	....	.....	.....
2	54·0202	.....	....	.....	¼	20·5322	6055	·1751	142·50
½	53·2996	·3081	·0942	107·73	2	20·4462	.. ....	....	.. ..
2	53·1038	....	....	....	¼	15·2402	·3285	·1448	—112·12
2	45·2462	. .. .	.....	....	2	15·3098	....	..... .	.....

Weighted Mean.. ..... —115·56
V_a..... — 6·76
V_d..... — ·25
Curvature..... — ·28

Radial velocity..... — 122·8

ζ ORIONIS 1203.

1907. Dec. 30.
G. M. T. 19h 27m

Observed by J. S. PLASKETT.
Measured by C. R. WESTLAND.

Wt.	Mean of Settings.	Corrected Star Setting.	Displt in revns	Velocity.	Wt.	Mean of Settings.	Corrected Star Setting.	Displt in revns	Velocity.
2	73·0160	.....	.....	.....	½	45·1414	·1804	·0583	60·86
1½	72·8514	·8439	·0209	−30·32	½	27·3349	·4005	·0214	18·58
2	72·4553	.....	.....	.....	2	27·1898	.....	.....	.....
2	54·7175	.....	.....	.....	2	20·4458	.....	.....	.....
1	53·3483	·3740	·0283	32·35	¼	15·3175	·4005	·0728	−56·34
2	53·0861	.....	.....	.....	2	15·3156	.....	.....	.....
2	45·2348	.....	.....	.....					

Weighted mean ..... − 35·10
V_a ..... − 7·65
V_d ..... − ·25
Curvature ..... − ·28

Radial velocity ..... − 43·1

ζ ORIONIS 1204.

1907. Dec. 30.
G. M. T. 19h 47m

Observed by J. S. PLASKETT.
Measured by C. R. WESTLAND.

Wt.	Mean of Settings.	Corrected Star Setting.	Displt in revns	Velocity.	Wt.	Mean of Settings.	Corrected Star Setting.	Displt in revns	Velocity.
2	73·0368	.....	.....	.....	½	45·1771	·2151	·0236	24·64
1½	72·8619	·8351	·0297	−43·09	¼	27·2953	·3690	·0529	45·92
2	72·4699	.....	.....	.....	2	27·1727	.....	.....	.....
2	54·7217	.....	.....	.....	2	20·4311	.....	.....	.....
1	53·3351	·3582	·0141	50·41	1	15·3263	·4287	·0446	−34·52
2	53·0885	.....	.....	.....	2	15·2962	.....	.....	.....
2	45·2356	.....	.....	.....					

Weighted mean ..... − 40·97
V_a ..... − 7·65
V_d ..... − ·28
Curvature ..... − ·28

Radial velocity ..... − 49·2

ι ORIONIS 1206.

1908. Jan. 1.
G. M. T. $17^h\ 44^m$

Observed by J. S. Plaskett.
Measured by C. R. Westland.

Wt.	Mean of Settings.	Corrected Star Setting.	Disp^t in rev^{ns}	Velocity.	Wt.	Mean of Settings.	Corrected Star Setting.	Disp^t in rev^{ns}	Velocity.
2	73·0104	.....	.....	.....	$\frac{1}{2}$	45·1876	2382	·0005	0·52
$1\frac{1}{2}$	72·8445	·8441	·0207	−30·04	$\frac{1}{2}$	27·3378	4015	·0204	38·11
2	72·4450	.....	.....	.....	2	27·1829	.....	.....	.....
2	54·7112	.....	.....	.....	2	20·4529	.....	.....	.....
1	53·3621	·3993	·0030	3·43	$\frac{1}{4}$	15·3684	4424	·0309	−54·82
2	53·0705	.....	.....	.....	2	15·3246	.....	.....	.....
2	45·2230	.....	.....	.....					

Weighted mean	− 21·73
V_a	− 8·49
V_d	− ·15
Curvature	− ·28
Radial velocity	− 30·6

ι ORIONIS 1207.

1908. Jan. 1.
G. M. T. $17^h\ 54^m$

Observed by J. S. Plaskett.
Measured by C. R. Westland.

Wt.	Mean. of Settings.	Corrected Star Setting.	Disp^t in rev^{ns}	Velocity.	Wt.	Mean of Settings.	Corrected Star Setting.	Disp^t in rev^{ns}	Velocity.
2	73·0202	.....	.....	.....	2	45·2500	.....	.....	.....
2	72·8691	·8559	·0089	−12·92	$\frac{1}{2}$	45·1955	·2191	·0196	−20·46
2	72·4644	.....	.....	.....	$\frac{1}{4}$	27·3682	·4119	·0100	− 8·68
2	54·7302	.....	.....	.....	$\frac{1}{4}$	15·4206	4753	·0020	+ 1·54
$1\frac{1}{2}$	53·3729	·3835	·0188	−21·48	2	15·3439	.....	.....	.....
2	53·1016	.....	.....	.....					

Weighted mean	− 15·57
V_a	− 8·49
V_d	− ·16
Curvature	− ·28
Radial velocity	− 24·5

ι ORIONIS 1212.

1908. Jan. 3.
G. M. T. 14h 39m

Observed by J. S. PLASKETT.
Measured by C. R. WESTLAND.

Wt.	Mean of Settings.	Corrected Star Setting.	Dispt in revns	Velocity.	Wt.	Mean of Settings.	Corrected Star Setting.	Dispt in revns	Velocity.
2	72·9869	....	....	....	2	53·0591	....	....	....
2	72·8550	·8784	·0136	+19·73	2	45·2082	....	....	....
2	72·4197	....	....	....	1	45·1630	·2284	·0103	−10·76
2	54·6914	....	....	....	½	27·3483	·4135	·0084	− 7·29
1	53·3595	·4104	·0081	− 9·26	2	27·1631	....	....	....

Weighted mean .... + 7·62
V_a .... − 9·33
V_d .... + ·09
Curvature .... − ·28

Radial velocity .... − 1·9

ι ORIONIS 1213.

1908. Jan. 3.
G. M. T. 1h 49m

Observed by J. S. PLASKETT.
Measured by C. R. WESTLAND.

Wt.	Mean of Settings.	Corrected Star Setting.	Dispt in revns	Velocity.	Wt.	Mean of Settings.	Corrected Star Setting.	Dispt in revns	Velocity.
2	73·0457	....	....	....	2	45·2436	....	....	....
2	72·9059	·8697	·0049	+ 7·11	1	45·2000	·2300	·0087	− 9·08
2	72·4819	....	....	....	½	27·3521	·4121	·0098	− 8·67
2	54·7352	....	....	....	2	27·1863	....	....	....
1½	53·3953	·4071	·0048	+ 5·49	¼	20·6785	·7463	·0343	−27·96
2	53·0990	....	....	....	2	20·4519	....	....	....

Weighted mean .... + 0·39
V_a .... −9·33
V_d .... + ·08
Curvature .... − ·28

Radial velocity .... − 9·1

SESSIONAL PAPER No. 25a

ι ORIONIS 1219.

1908. Jan. 10
G. M. T. 17h 28m

Observed by } J. S. Plaskett.
Measured by }

Wt.	Mean of Settings.	Corrected Star Setting.	Dispt in revns	Velocity.	Wt.	Mean of Settings.	Corrected Star Setting.	Dispt in revns	Velocity.
2	72·9958				½	48·3716	·3676	0669	72·23
½	72·8962	·9095	·0447	+64·87	½	45·2916	·2850	·0463	48·32
2	72·4327				2	45·2802			
1	54·0287				¼	27·4973	·4660	·0441	38·27
½	53·4557	·4537	·0514	58·78	2	27·2786			
2	53·1154				½	20·8537	·8140	·0334	+27·18
2	48·7726				2	20·5617			

Weighted mean ..... +49·13
V_a ..... − 12·31
V_d ..... − 0·17
Curvature ..... − 0·28
Radial velocity ..... + 36·4

ι ORIONIS 1258.

1908. Jan. 22.
G. M. T. 16h 26m

Observed by W. E. Harper.
Measured by C. R. Westland.

Wt.	Mean of Settings.	Corrected Star Setting.	Dispt in revns	Velocity.	Wt.	Mean of Settings.	Corrected Star Setting.	Dispt in revns	Velocity.
2	73·0539				1½	45·3004	·3315	·0928	96·88
2	72·9523	·9089	·0441	+ 63·99	2	45·2425			
2	72·4852				½	27·4588	·4990	0771	66·92
2	54·7336				2	27·2063			
1½	53·4666	·4806	·0783	89·50	¼	15·5545	·6098	·1365	+105·65
2	53·0964				2	15·3428			

Weighted mean ..... +81·30
V_a ..... − 16·88
V_d ..... − ·16
Curvature ..... − ·28
Radial velocity ..... + 64·0

ι ORIONIS 1258.*

1908. Jan. 22.
G. M. T. $16^h\ 26^m$

Observed by } W. E. HARPER.
Measured by }

Wt.	Mean of Settings.	Corrected Star Setting.	Displ^t in revns	Velocity.	Wt.	Mean of Settings.	Corrected Star Setting.	Displ^t in revns	Velocity.
2	73·0780	....	....	....	1½	45·3193	·3512	·1125	117·45
1	73·0077	·9400	·0752	+109 11	2	45·2717	....	....	....
1	72·5112	....	....	....	1	27·5468	·5585	·1366	118·57
1½	54·0495	....	....	....	2	27·2328	....	....	....
1	53·4869	·4687	·0664	75·90	½	15·6297	·6577	·1844	+142·72
2	53 1290	....	....	....	2	15·3700	....	....	....

Weighted mean..... +110·22
V_a..... −16·88
V_d..... − ·16
Curvature ... − ·28

Radial velocity... ... + 92·9

* Check measurement.

ι ORIONIS 1259.

1908. Jan. 22.
G. M. T. $17^h\ 03^m$

Observed by W. E. HARPER.
Measured by C. R. WESTLAND.

Wt.	Mean of Settings.	Corrected Star Setting.	Displ^t in revns	Velocity.	Wt.	Mean of Settings.	Corrected Star Setting.	Displ^t in revns	Velocity.
2	73·0069	....	....	....	2	45·2287	....	....	....
1	72·9156	·9191	·0543	+78·79	½	27·4702	·5323	·1104	95·83
2	72·4385	....	....	....	2	27·1842	....	....	....
2	54 7122	....	....	....	½	15·5499	·6241	·1508	+116·72
1	53·4594	·4898	·0875	100 00	2	15 3242	....	....	....
2	53·0814	....	....	....					
1	45·2886	·3335	·0948	98 97					

Weighted mean..... +96 01
V_a..... −16·88
V_d..... − ·19
Curvature..... − ·28

Radial velocity..... +78·7

ORIONIS 1259*

1908. Jan. 22.
G. M. T. 17h 03m

Observed by } W. E. HARPER.
Measured by }

Wt.	Mean of Settings.	Corrected Star Setting.	Dispt in revns	Velocity.	Wt.	Mean of Settings.	Corrected Star Setting.	Dispt in revns	Velocity.
2	73·0603	.....	.....	.....	2	45·2795	.....	.....	.....
1½	72·9506	·9003	·0355	+51·52	1	27·5680	·5779	·1560	135·59
2	72·4945	.....	.....	.....	2	27·2365	.....	.....	.....
3	57·8563	.....	.....	.....	½	20·8613	·8740	·0934	76·00
2	54·0521	.....	.....	.....	2	20·5072	.....	.....	.....
1	53·5196	·4976	·0953	108·98	1	15·6030	·6270	·1537	+119·00
2	53·1335	.....	.....	.....	2	15·3742	.....	.....	.....
1	45·3277	·3197	·0810	84·53					

Weighted mean ..... +93·86
V_a ..... —16·88
V_d ..... — ·19
Curvature... — ·28

Radial velocity ..... +76·5

* Check measurement.

ORIONIS 1262.

1908. Jan. 23.
G. M. T. 13h 27m

Observed by J. S. PLASKETT.
Measured by C. R WESTLAND.

Wt.	Mean of Settings.	Corrected Star Setting.	Dispt in revns	Velocity.	Wt.	Mean of Settings.	Corrected Star Setting.	Dispt in revns	Velocity.
2	73·0116	.....	.....	.....	2	45·3203	·3329	·0942	98·34
2	72·9588	·9576	·0928	+134·65	2	45·2410	.....	.....	.....
2	72·4116	.....	.....	.....	1	27·5200	·5610	·1391	120·74
2	54·7243	.....	.....	.....	2	27·2055	.....	.....	.....
2	53·4805	·5005	·0982	112·24	¼	15·6007	·6492	·1759	+136·14
2	53·0912	.....	.....	.....	2	15·3500	.....	.....	.....

Weighted Mean..... +116·58
V_a... .....—17·31
V_d... ..... + ·09
Curvature...— ·28

Radial velocity... ..... +99·1

ι ORIONIS 1262*

1908. Jan. 23.
G. M. T. 13h 27m

Observed by } J. S. PLASKETT.
Measured by }

Wt.	Mean of Settings.	Corrected Star Setting.	Displt in revns	Velocity.	Wt.	Mean of Settings.	Corrected Star Setting.	Displt in revns	Velocity.
2	73·0200	.....	.....	.....	1	45·3416	·3630	·1243	129·73
½	72·9583	·9480	·0832	− 120·74	2	45·2522	.....	.....	.....
1	72·4585	.....	.....	.....	½	27·5438	·5730	·1513	131·31
2	54·7346	.....	.....	.....	2	27·2172	.....	.....	.....
1	53·4966	·5066	·1043	119·27	½	20·9045	·9375	·1569	+ 127·68
2	53·1005	.....	.....	.....	2	20·4866	.....	.....	.....

Weighted mean ..... +125·39
V_a ..... − 17·31
V_d ..... + ·09
Curvature ..... − ·28

Radial velocity ..... +107·9

* Check measurement.

ι ORIONIS 1263.

1908. Jan. 23.
G. M. T. 13h 39m

Observed by J. S. PLASKETT.
Measured by C. R. WESTLAND.

Wt.	Mean of Settings.	Corrected Star Setting.	Displt in revns	Velocity.	Wt.	Mean of Settings.	Corrected Star Setting.	Displt in revns	Velocity.
2	73·0395	.....	.....	.....	2	45·3299	·3515	·1128	117·76
1	72·9916	·9620	·0972	− 141·04	2	45·2520	.....	.....	.....
2	72·4744	.....	.....	.....	1	27·4624	·5060	·0841	73·00
2	54·7377	.....	.....	.....	2	27·2027	.....	.....	.....
2	53·4958	·4998	·0975	111·44	¼	15·5665	·6235	·1502	+ 116·25
2	53·1087	.....	.....	.....	2	15·3414	.....	.....	.....

Weighted mean ..... +112·24
V_a ..... − 17·31
V_d ..... + ·06
Curvature ..... − ·28

Radial velocity ..... + 94·7

ι ORIONIS 1263.*

1908. Jan. 23.
G. M. T. $13^h\ 39^m$

Observed by J. S. PLASKETT.
Measured by W. E. HARPER.

Wt.	Mean of Settings.	Corrected Star Setting.	Disp^t in rev^{ns}	Velocity.	Wt.	Mean of Settings.	Corrected Star Setting.	Disp^t in rev^{ns}	Velocity.
2	73·0670	.....	.....	.....	2	45·2795	.....	.....	.....
1	73·0282	·9718	·1070	+155·26	½	27·4987	·5147	·0928	80·55
½	72·4990	.....	.....	.....	2	27·2300	.....	.....	.....
½	66·3447	·3016	·1137	151·45	1	20·9045	·9310	·1504	122·42
2	54·7649	.....	.....	.....	2	20·4930	.....	.....	.....
1	53·5430	·5232	·1209	138·25	1	15·6063	·6383	·1650	+127·71
1½	53·1311	.....	.....	.....	2	15·3665	.....	.....	.....
1	45·3650	·3591	·1204	125·70					

Weighted mean		+130·90
V_a	−17·31	
V_d	+	·06
Curvature	−	·28
Radial velocity		+ 113·4

* Check measurement.

ι ORIONIS 1265.

1908. Jan. 23.
G. M. T. $14^h\ 24^m$

Observed by J. S. PLASKETT.
Measured by W. E. HARPER.

Wt.	Mean of Settings.	Corrected Star Setting.	Disp^t in rev^{ns}	Velocity.	Wt.	Mean of Settings.	Corrected Star Setting.	Disp^t in rev^{ns}	Velocity.
1½	73·0823	.....	.....	.....	1	53·1506	.....	.....	.....
1	73·0381	·9658	·1010	+146·55	1½	45·3950	·3776	·1389	145·01
1	72·5160	.....	.....	.....	2	45·2910	.....	.....	.....
2	57·8679	.....	.....	.....	1	27·5965	·5969	·1750	+151·90
1	54·0628	.....	.....	.....	1	27·2462	.....	.....	.....
1½	53·5166	·4795	·0772	88·24					

Weighted mean		+129·66
V_a	−17·31	
V_d		·00
Curvature	−	·28
Radial velocity		+112·0

ζ ORIONIS 1266.

1908. Jan. 23.
G. M. T. 14h 33m

Observed by J. S. Plaskett.
Measured by C. R. Westland.

Wt.	Mean of Settings.	Corrected Star Setting.	Displt in revns	Velocity.	Wt.	Mean of Settings.	Corrected Star Setting.	Displt in revns	Velocity.
2	73·0153	.....	.....	.....	1	45·3003	·3224	·0837	87·38
1½	72·9310	·9247	0599	+ 86·91	2	45·2515	.....	.....	.....
2½	72·4559	.....	.....	.....	½	27·4910	·5176	·0957	83·07
2	54·7312	.....	.....	.....	2	27·2200	.....	.....	.....
1	53·4792	·4904	·0881	100·70	½	15·5689	·6022	·1289	+ 99·77
2	53·0992	.....	.....	.....	2	15·3653	.....	.....	.....

Weighted mean ..... + 91 08
V_a ..... − 17·31
V_d ..... − ·01
Curvature ... − ·28

Radial velocity ..... − 73 5

ζ ORIONIS 1266.*

1908. Jan. 23.
G. M. T. 14h 33m

Observed by } J. S. Plaskett.
Measured by }

Wt.	Mean of Settings.	Corrected Star Setting.	Displt in revns	Velocity.	Wt.	Mean of Settings.	Corrected Star Setting.	Displt in revns	Velocity.
2	73·0234	.....	.....	.....	2	45·2602	.....	.....	.....
1	72·9542	·9400	·0752	+109·13	¼	27·5061	·5215	·0996	86·44
2	72·4622	.....	.....	.....	2	27·2310	.....	.....	.....
1	54·0274	.....	.....	.....	¼	20·9008	·9195	·1389	113·04
1	53·4954	·4994	·0971	111·05	2	20·5012	.....	.....	.....
2	53·1065	.....	.....	.....	¼	15·5955	·6190	·1457	+112·82
½	45·3192	·3325	·0938	97·90	2	15·3749	.....	.....	.....

Weighted mean ..... +103 76
V_a ..... − 17·31
V_d ..... − ·01
Curvature.... − ·28

Radial velocity ..... + 86·2

*Check measurement.

SESSIONAL PAPER No. 25a

ζ ORIONIS 1267.

1908. Jan. 24.
G. M. T. 11h 40m

Observed by } J. S. Plaskett.
Measured by }

Wt.	Mean of Settings.	Corrected Star Setting.	Displt in revns	Velocity.	Wt.	Mean of Settings.	Corrected Star Setting.	Displt in revns	Velocity.
2	73·0014	.....	.....	.....	2	45·2700	.....	.....	.....
¼	72·9668	·9740	·1092	+158·47	½	27·5734	·5410	·1191	103·37
2	72·4391	.....	.....	.....	2	27·2696	.....	.....	.....
2	54·0260	.....	.....	.....	¼	20·9524	·9220	·1414	115·07
½	53·5284	·5306	·1273	145·57	1½	20·5518	.....	.....	.....
2	53·1103	.....	.....	.....	¾	15·6824	·6404	·1671	+129·38
½	45·3414	·3450	·1063	110·94	2	15·4418	.....	.....	.....

Weighted mean ..... +124·74
V_a ..... −17·50
V_d ..... + ·21
Curvature ..— ·28

Radial velocity. ..... +107·2

ζ ORIONIS 1268.

1908. Jan. 24.
G. M. T. 11h 40m

Observed by J. S. Plaskett.
Measured by C. R. Westland.

Wt.	Mean of Settings.	Corrected Star Setting.	Displt in revns	Velocity.	Wt.	Mean of Settings.	Corrected Star Setting.	Displt in revns	Velocity.
2	72·9930	.....	.....	.....	1½	45·3092	·3365	·0978	102·10
1	72·9194	·9363	·0715	+103·75	2	45·2463	.....	.....	.....
2	72·4273	.....	.....	.....	½	27·5213	·5452	·1233	107·02
2	54·7191	.....	.....	.....	2	27·2227	.....	.....	.....
2	53·4771	·5009	·0986	112·70	¼	15·6014	·6224	·1491	+115·40
2	53·0879	.....	.....	.....	2	15·3776	.....	.....	.....

Weighted mean ..... +107·55
V_a ..... −17·50
V_d ..... + ·20
Curvature..— ·28

Radial velocity..... + 90·0

ι ORIONIS 1268*

1908. Jan. 24.
G. M. T. 11h 40m

Observed by J. S. PLASKETT.
Measured by W. E. HARPER.

Wt.	Mean of Settings.	Corrected Star Setting.	Dispt in revns	Velocity.	Wt.	Mean of Settings.	Corrected Star Setting.	Dispt in revns	Velocity.
1½	72·9861	.....	.....	.....	2	45·2365	.....	.....	.....
1½	72·9076	·9318	·0670	+ 97·22	1	27·5394	·5749	·1530	132·80
1½	72·4190	.....	.....	.....	2	27·2115	.....	.....	.....
2	54·7041	.....	.....	.....	1	20·8613	·8955	·1149	93·53
1½	53·4778	·5171	·1148	131·22	2	20·4859	.....	.....	.....
2	53·0723	.....	.....	.....	½	15·5531	·5890	·1157	+ 89·55
2	45·3066	·3437	·1050	109·62	2	15·3625	.....	.....	.....

Weighted Mean ..... +111·07
V_a ..... − 17·50
V_d ..... + ·20
Curvature... − ·28

Radial Velocity ..... + 93·5

* Check measurement.

ι ORIONIS 1269.

1908. Jan. 24.
G. M. T. 11h 50m

Observed by J. S. PLASKETT.
Measured by W. E. HARPER.

Wt.	Mean of Settings.	Corrected Star Setting.	Dispt in revns	Velocity.	Wt.	Mean of Settings.	Corrected Star Setting.	Dispt in revns	Velocity.
2	73·0110	.....	.....	.....	2	45·2762	.....	.....	.....
1½	72·9546	·9530	·0882	+127·98	½	27·5563	·5440	·1221	105·98
1½	72·4522	.....	.....	.....	2	27·2590	.....	.....	.....
2	54·0341	.....	.....	.....	½	20·9592	·9417	·1611	131·13
1	53·4922	·4895	·0872	99·67	2	20·5361	.....	.....	.....
2	53·1137	.....	.....	.....	½	15·6998	·6834	·2101	+ 162·61
1	45·3617	·3591	·1204	125·70	2	15·4152	.....	.....	.....

Weighted mean ..... +123·44
V_a ..... — 17·50
V_d ..... + ·19
Curvature ..... — ·28

Radial velocity. ..... +105·8

ι ORIONIS 1274.

1908. Jan. 24.
G. M. T. $14^h\ 27^m$

Observed by J. S. PLASKETT.
Measured by C. R. WESTLAND.

Wt.	Mean of Settings.	Corrected Star Setting.	Disp^t in rev^{ns}	Velocity.	Wt.	Mean of Settings.	Corrected Star Setting.	Disp^t in rev^{ns}	Velocity.
2	54·7092	.....	.....	... .	½	27·5182	·5372	·1153	100·07
1	53·4465	·4835	·9812	+ 92·86	2	27·2278	.....	.....	.....
2	53·0742	.... ..	.....	.....	½	15·5660	·5805	·1072	+ 83·00
1½	45·2736	·3050	·0663	69·20	2	15·3844	. . ....	... .	....
2	45·2423	... .	....	.....					

Weighted mean ..... +82·34
V_a ..... −17·50
V_d ..... ·00
Curvature ..... − ·28

Radial velocity .... + 64·6

ι ORIONIS 1274.*

1908. Jan. 24.
G. M. T. $14^h\ 27^m$

Observed by } J. S. PLASKETT.
Measured by }

Wt.	Mean of Settings.	Corrected Star Setting.	Disp^t in rev^{ns}	Velocity.	Wt.	Mean of Settings.	Corrected Star Setting.	Disp^t in rev^{ns}	Velocity.
1	54·7350	.....	... .	.....	2	27·2528	... .	.....	.....
1	53·4888	·4958	·0935	+106·92	1	20·9320	·9200	·1394	113·44
1	53·1048	.....	....	.....	2	20·5318	.... ..	.....	.....
1	45·3146	·3208	·0821	85·68	¼	15·6166	·6032	·1300	+100·66
2	45·2675	....	.....	.....	2	15·3862	.....	....	....
¼	27·5594	·5532	·1313	113·95					

Weighted mean ..... +101·34
V_a ..... −17·50
V_d ..... ·00
Curvature ..... − ·28

Radial velocity ..... + 84·5

* Check measurement.

ORIONIS 1275.

1908. Jan. 24.
G. M. T. 14h 38m

Observed by } J. S. PLASKETT.
Measured by }

Wt.	Mean of Settings.	Corrected Star Setting.	Dispt in revns	Velocity.	Wt.	Mean of Settings.	Corrected Star Setting.	Dispt in revns	Velocity.
2	72·9908				2	45·2533			
¼	72·9240	·9429	·0781	+113·33	½	27·5626	·5620	·1401	121·52
1	72·4261				2	27·2480			
1	54·0097				¼	20·8872	·8962	·1156	93·85
1	53·4694	·4890	·0867	99·14	2	20·5297			
2	53·0920				½	15·6614	·6500	·1767	+136·76
½	45·3260	·3460	·1073	112·01	2	15·1106			

Weighted mean . . . . . +112·02
V_a . . . . . −17·50
V_d . . . . . ·04
Curvature . . . . −·28

Radial velocity . . . . . + 94·3

ORIONIS 1277.

1908. Jan. 25.
G. M. T. 15h 12m

Observed by } J. S. PLASKETT.
Measured by }

Wt.	Mean of Settings.	Corrected Star Setting.	Dispt in revns	Velocity.	Wt.	Mean of Settings.	Corrected Star Setting.	Dispt in revns	Velocity.
2	73·0765				¼	45·2179	·2356	·0031	− 3·23
½	72·9238	·8578	·0070	−10·16	¼	27·3695	·4275	·0056	+ 4·86
1	72·5099				2	27·1868			
2	54·0395				½	20·6785	·7545	·0261	−21·24
½	53·3982	·3887	·0136	15·55	2	20·4425			
2	53·1206				¼	15·4258	·5038	·0305	+23·62
2	45·2559				2	15·3079			

Weighted mean . . . . . − 7·63
V_a . . . . . −17·89
V_d . . . . . − ·09
Curvature . . . . . − ·28

Radial Velocity . . . . . − 25·9

ζ ORIONIS 1278.

1908, Jan. 25 — Observed by } J. S. PLASKETT.
G. M. T. 15h 27m — Measured by }

Wt.	Mean of Settings.	Corrected Star Setting.	Disp^{t} in revns	Velocity.	Wt.	Mean of Settings.	Corrected Star Setting.	Disp^{t} in revns	Velocity.
2	73·0714				½	45·2477	·2585	·0198	+20·66
½	72·9068	·8456	·0192	−27·86	¼	27·3824	·4330	·0111	− 9·63
1	72·5051				2	27·1954			
2	54·0384				½	20·7192	·7860	·0054	+ 4·39
¼	53·4594	·4409	·0386	+44·15	2	20·4526			
2	53·1212				¼	15·4008	·4785	·0052	+ 4·02
2	45·2628				1	15·3204			

Weighted mean . . . . . + 6·19
V_a . . . . . − 17·90
V_d . . . . . − ·10
Curvature . . . . . − ·28
Radial velocity . . . . . − 12·1

PREVIOUS OBSERVATIONS OF ζ ORIONIS.

Date.	Julian Day.	Velocity.	Phase.	Residuals C−O.
1903.				
Sept. 5·93	2,416,363·93	+21·	1·64	− 5·
" 25·91	383·91	+40·	21·63	+15·
" 26·94	384·94	+57·	22·65	+ 4·
Oct. 17·97	405·97	+35·	14·55	−15·
23·98	411·98	+42·	20·56	+ 7·
30·83	2,416,418·83	+90·	27·33	0·

ζ ORIONIS.

SUMMARY OF MEASURES.

Brashear Spectroscope.

Plate Number.	Date.	Julian Day.	Velocities.	Weighted Mean.	Phase.	Residuals C—O
	1906					
453	Dec. 11·64	2,417,556·64	− 116·		28·91	− 14·
485	" 18·58	563·58	− 22·		6·71	− 14·
	1907					
517	Jan. 2·63	578·63	+ 34·		21·76	+ 22
522	" 9·61	585·61	+ 101·		28·74	+ 1·
535	" 15·64	591·64	− 51·		5·64	0·
539	" 16·64	592·64	− 6·		6·64	− 30·
556	" 18·65	591·65	+ 6·		8·65	− 25·
565	" 21·64	597·64	+ 21·		11·64	− 17·
570	" 22·67	598·67	+ 10·		12·67	0·
585	" 28·58	604·58	+ 43·		18·58	− 3·
587	" 30·52	606·52	− 65·	+ 56	20·59	− 16·
592	" 30·66	606·66	+ 48·			+ 1·
594	Feb. 4·51	611·51	+ 66·		25·51	+ 11·
601	" 6·64	613·64	+ 77·		27·64	+ 16·
605	" 7·51	614·51	+ 106·		28·51	− 6·
609	" 12·50	619·50	− 82		4·37	+ 7·
618	" 21·56	628·56	+ 9·		13·43	+ 5·
627	" 22·62	629·62	+ 22·		14·49	− 1·
647	Mar. 6·51	641·51	+ 83·	+ 79·	26·44	+ 1·
650	" 6·64	641·64	+ 75			+ 9·
653	" 8·52	643·52	+ 106·	+ 108·	28·45	− 6·
655	" 8·64	643·64	+ 109·			− 9·
659	" 11·54	646·54	− 101·	− 112·	2·34	0·
662	" 11·64	646·64	− 122			+ 7·
665	" 20·52	655·52	+ 13·	+ 13·	11·31	− 11·
666	" 20·54	655·54	+ 15·			− 13·
667	" 20·61	655·61	+ 11			− 9·
672	" 26·52	661·52	+ 33·		17·27	+ 1·
673	" 28·52	663·52	+ 40·		19·27	− 3·
678	" 30·53	665·53	+ 62·		21·28	− 9·
686	April 3·54	669·54	+ 70·	+ 66·	25·30	+ 5·
687	" 3·56	669·56	+ 61·			+ 14·
693	" 5·52	671·52	+ 86·	+ 76·	27·28	+ 4·
695	" 5·55	671·55	+ 67·			+ 13·
702	" 6·52	672·52	+ 90·	+ 99	28·27	+ 8·
703	" 6·53	672·53	+ 107·			− 9·
705	" 11·53	677·53	− 89·		4·14	+ 9·

Single-Prism Spectroscope.

1046	Sept. 14·86	833·86	+ 38· H + 31· P	+ 35·	14·76	− 13·
1059	" 18·93	837·93	+ 33·		18·83	
1069	" 20·89	839·89	+ 66·	+ 57·	20·80	− 15·
1070	" 20·90	839·90	+ 48·			+ 3·
1076	" 30·89	849·89	+ 26·	+ 30·	1·68	− 6·
1077	" 30·91	849·91	+ 26·			− 6·
1078	" 30·92	849·92	+ 30			− 10·
1079	" 30·93	849·93	+ 37·			− 17·
1097	Oct. 8·85	857·85	+ 6·		9·61	− 15·
1108	" 28·94	877·94	+ 111·	+ 104·	0·59	− 9·
1109	" 28·96	877·96	+ 97·			+ 5·
1110	" 29·85	878·85	+ 28· H + 32· W			+ 11· + 7·
1111	" 29·87	878·87	+ 37·	+ 34	1·54	+ 4·
1112	" 29·89	878·89	+ 38·			+ 2·
1113	" 29·92	878·92	+ 36·			+ 0·
1114	" 29·95	2,417,878·95	+ 26·			+ 4·

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SUMMARY OF MEASURES—*Continued.*

Plate Number.	Date.	Julian Day.	Velocities.	Weighted Mean.	Phase.	Residuals C—O.
1115	Oct. 30·78	2,417,879·78	− 111			− 5
1116	" 30·80	879·80	− 120	−114	2·45	+ 3
1117	" 30·82	879·82	− 114			− 4
1118	" 30·85	879·85	− 112			− 7
1119	" 30·88	879·88	− 119	−124	2 53	− 1
1120	" 30·90	879·90	− 129			+ 9
1121	" 31·78	880·78	− 93			− 7
1122	" 31·82	880·82	− 78	− 85	3·46	−21
1123	" 31·86	880·86	− 84			− 4
1124	Nov. 1·77	881·77	− 81			+ 9
1125	" 1·81	881·81	− 62			− 10
1126	" 1·83	881·83	− 97 W	− 74	4 45	+25
			− 89 P			+17
1127	" 1·85	881·85	− 52			−18
1136	" 11·77	891 77	+ 17 W			+ 3
			+ 16 H	+ 22	14·43	+ 4
1137	" 11·79	891 77	+ 28			− 8
1141	" 15·75	895·75	+ 27			+10
1142	" 15·76	895·76	+ 28	+ 31	18·40	+11
1143	" 15·77	895·77	+ 37			+ 2
1147	" 16·73	896·73	+ 45			− 4
1148	" 16·75	896 75	+ 39	+ 42	19·38	+ 2
1161	" 28·88	908 88	− 126 W			+12
			− 104 P			−10
			− 120 H	−115	2·40	+ 6
1162	" 28·90	908·90	− 144 W			+30
			− 109 P			− 5
			− 115 H			+ 1
1166	" 29·90	909·90	− 85			−15
1167	" 29 91	909·91	− 131 W	−111	3·40	+31
			− 114 H			+14
1168	Dec. 3·64	913·64	− 38			− 7
1169	" 3 65	913·65	− 9	− 27	7 14	+20
1170	" 3·66	913·66	− 26			+ 5
1178	" 4·73	914·73	− 15		8·23	− 6
1188	" 21·65	931·65	+ 71			+ 5
1189	" 21·76	931·76	79	+ 76	25·20	− 3
1190	" 24 66	934·66	+ 104		28 14	+ 4
1191	" 28·54	938·54	− 104			+12
1192	" 28·63	938·63	− 117	−116	3 00	− 4
1193	" 28·64	938 64	− 114			− 1
1194	" 28·64	938·64	− 123			+ 9
1201	" 28·82	938·82	− 113	−118	3·18	+ 5
1202	" 28·82	938·82	− 123			+15
1203	" 30·81	940·81	− 43	− 46	5·17	−14
1204	" 30·82	940 82	− 49			− 8
	1908.					
1206	Jan. 1·74	942·74	− 31	− 28	7·10	+ 1
1207	" 1·75	942·75	− 24			− 7
1212	" 3·61	944·61	− 2	− 6	8 98	−16
1213	" 3·62	944·62	− 9			− 5
1219	" 10·73	951·73	+ 36		6 09	− 8
1258	" 22·69	963·69	+ 64 W			+32
			+ 93 H	+ 81	28·06	+ 3
1259	" 22·71	963·71	+ 79 W			+17
			+ 77 H			+19
1262	" 23·56	964·56	+ 99 W			+ 4
			+ 108 P			− 5
1263	" 23·57	964·57	+ 95 W	+102	28·94	+ 8
			+ 113 H			−10
1265	" 23·60	964·60	+ 112			− 9
1266	" 23·60	964·60	+ 82			+21
1267	" 24·49	965·49	+ 107			− 6
1268	" 24·49	965·49	+ 90 W	+101	0·71	+12
			+ 94 H			+ 8
1269	" 24·50	965·50	+ 106			− 4

SUMMARY OF MEASURES—*Concluded.*

Plate Number.	Date.	Julian Day.	Velocities.	Weighted Mean.	Phase.	Residuals C—O.
	1908.					
1274	Jan. 24·60	2,417,965·60	− 6 W.			+28·
			− 84 H.	− 85·	9·82	+ 9
1275	" 24·80	965·80	− 94			− 1·
1277	" 25·63	966·63	− 26	− 19·	1·85	+ 6·
1278	" 25·64	2,417,966·64	− 12			− 8·

PHASES AND VELOCITIES.

Phase.	Mean Velocity.	No. of Plates.	Phase.	Mean Velocity.	No. of Plates.
0·65	−101·3	5	14·53	+ 27·4	5
0·82	− 91·0	2	16·67	+ 34·7	2
1·69	− 30·8	10	18·44	+ 34·3	4
1·85	− 21·3	2	19·32	+ 41·2	2
2·43	−115·7	10	20·67	+ 51·2	5
3·07	118·2	5	21·65	+ 45·3	3
3·44	92·1	5	22·65	+ 57·0	1
4·39	− 75·7	6	25·30	+ 70·0	5
5·33	− 47·8	3	26·44	+ 79·0	2
6·68	− 14·0	2	27·39	+ 80·0	4
7·12	− 27·3	5	28·16	+ 92·1	5
8·89	− 2·1	5	28·53	+105·5	4
11·39	+ 15·0	4	28·93	+104·9	5
13·05	+ 9·5	2			

As previously stated, the observations corresponding to the velocities given in columns 4 and 5 and the phases in column 6 of the table containing the summary of measures, are plotted in Fig. 4, where the single circles represent single observations and the double circles the weighted means of two or more observations on the same night. The grouped results in the succeeding table of observations grouped in phases are plotted in Fig. 5. The full line curve in the latter figure is the velocity curve for an eccentricity e of 0·75, a longitude of the apse ω of 110° and a double amplitude $2K$ of 224 kms., which are the values chosen for the elements as best agreeing with the observations.

Owing to the considerations previously mentioned, especially that relating to the possibility of a secondary disturbance, a final determination of the elements by the usual methods is out of the question. They only suffice to give preliminary values which must be corrected by a species of trial and error. For this purpose, the application of your method of obtaining elements to the construction of an ephemeris and the drawing of the velocity curve or to changing these to correspond to changes in the elements has been found very useful as the labour involved therein is reduced to a minimum.

No simple elliptic orbit will give a velocity curve agreeing with a smooth curve drawn as closely as possible through the observed points, and we are forced to the conclusion, either that the differences are due to errors in the observations or to secondary disturbances in the orbit. The latter seems to be the most likely, for, although it is probable enough that two or three observations may be in error to the extent shown by the figure, it is hardly possible that for 10 or 12 days before apastron passage the residuals should be almost wholly negative, and for 10 or 12 days after almost wholly positive.

These residuals can be considerably reduced and a curve agreeing fairly well with the observations on the ascending branch may be obtained by increasing the eccentricity to about 0·82. An eccentricity of 0·80 is shown by one of the dotted curves in Fig. 5. The use of an eccentricity of even 0·80 produces much higher residuals on the rapidly descending branch and at the points of maximum and minimum velocity, than an eccentricity of 0·75 in the ascending branch. In the descending branch any errors of observation or even any moderate secondary disturbance would have very little effect on the position or inclination of the curve. It was, therefore, considered preferable to determine the eccentricity by the inclination of the curve around periastron rather than by agreement around apastron, and it was for this purpose that observations in that phase were so long awaited. A reference to the curves of oscillation, Fig. 3, for e = 0·70, 0·75 and 0·80 shows that the eccentricity can be determined to within 0·01 by the inclination of the descending branch, and it may be stated that the same criterion may be used to determine the eccentricity whatever the value of ω. Furthermore the value of ω is also closely limited by the position of the curve near apastron. A difference of 1° either way would displace the curve too far up or down for the best agreement with the observations.

The above considerations led to the final choice of the elements $e = 0{\cdot}75$ $\omega = 110°$ as the most probable, while the question of a secondary curve is left open. The observations, even taking into account their high probable error, indicate the presence of such a curve, but do not sufficiently define its position and amplitude to enable any explanation of its cause to be assigned. So far as known to the writer, previously discovered secondary disturbances have been submultiples of the main period, but such is apparently not the case here where the secondary effect persists for 10 or 12 days on each side of apastron, about three-fourths of the period. An attempt was made to establish some connection between the asymmetric nature of the lines, maximum to red or violet, and the position in the period, but nothing definite was obtained. It is evident, however, that a very slight shift of the position of the maximum, one indeed that would be scarcely noticed in the broad and diffuse lines of this spectrum, would be quite sufficient to account for residuals of the magnitude present on each side of apastron. Such a shift of the maximum might reasonably be assigned to some physical change in the star's atmosphere without the necessity of considering the secondary curve to be due to any deviations from an elliptic orbit caused by the presence of a third body. These, however, are speculations which cannot, from the data available, become anything more.

The remaining elements of the orbit are easily obtained by the well known methods when, as here, the values of e, ω, K and T are known.

$e = 0{\cdot}75$.
$\omega = 110°$.
Positive maximum = + 104.
Negative maximum = − 120.
$K = 112$.
$T = 1{\cdot}94$ days = Julian day 2,417,587·94.
γ or velocity of system = + 20·7 kms.
$a \sin i = 29{,}680{\cdot}000$ kms.

A diagram of the orbit showing the proportions of the system is given in Fig. 6.

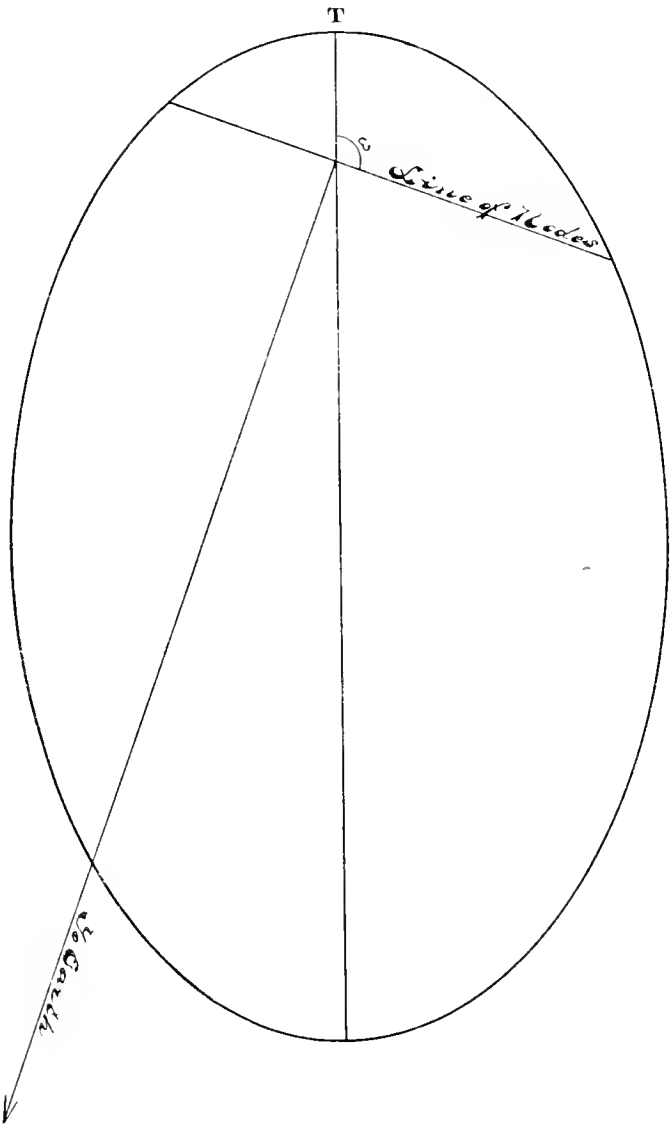

FIG. 6—Orbit of ι Orionis.

Although the agreement between the observations and the computed curve is not as good as might be wished, it is doubtful whether much improvement would be effected by continuing the observations at present. The character of the spectrum is such that there must necessarily always remain an uncertainty to the extent of 10 kilometres or so in the velocity value of any plate and, unless a great number of observations were obtained at most of the phases in the last table, the question would still remain uncertain. It would undoubtedly be of interest, in the course of a few years, to redetermine the elements to see if any definite change in the form of the curve has taken place.

Addendum.

Since the above was written, Dr. Schlesinger, Director of the Allegheny Observatory, kindly suggested to me the advisability of applying a least squares solution to this orbit, and as the result of this computation showed considerable improvement over the geometrical methods it is herewith given.

As a preliminary to this work, all the observations were again carefully gone over and weighted as consistently as possible, giving those made by the Universal spectroscope only about half the weight of the later plates. The period was considered as closely determined by the method previously described. In the grouping into normal places some of the velocities and phases were slightly changed by the new weighting and the number diminished by one, making 26, as shown in the following table of normal places and residuals. Taking as provisional values of the elements those given above, an ephemeris was computed, the residuals between the observed and computed velocities obtained, and the coefficients of the unknowns calculated from the formula of Lehmann-Filhes.*

$$\delta\frac{dz}{dl} = (\cos u + e\cos\omega)\,\delta K + \left\{\cos\omega - \frac{\sin u \sin v}{1-e^2}(2 + e\cos v)\right\} K\delta e$$
$$-(\sin u + e\sin\omega)\,K\delta\omega - \sin u\,(1+e\cos v)^2\,(t-T)\frac{K\delta\mu}{(1-e^2)^{3/2}}$$
$$+\sin u\,(1+e\cos v)^2\frac{K\mu\,\delta T}{(1-e^2)^{3/2}}$$

The coefficient of $\delta\mu$ was omitted as the period was considered final and an additional unknown of coefficient unity was introdueed as a correction for the velocity of the system.

There result the following 26 observation equations in which for homogeneity we put

$$x = \delta K$$
$$y = K\delta e = 112\cdot\,\delta e$$
$$z = K\delta\omega = 112\cdot\,\delta\omega$$
$$u = \frac{K\mu\,\delta T}{(1-e^2)^{3/2}} = 83{\cdot}46\;\delta T$$
$$v = \delta\gamma$$

* A. N. No. 3242.

OBSERVATION EQUATIONS FOR 1st SOLUTION.

x	y	z	u	v	l	Wt.
+ ·717	+ ·648	− ·933	+ ·189	+1·000	+ 4·0	7
+ ·081	+ ·612	1·646	+ ·234	+1·000	1·0	10
·415	+ ·826	1·692	− ·299	+1·000	6·7	2
1·228	−1·425	+ ·940	− ·472	−1·000	− 0·1	9
1·178	−1·396	+ ·317	·360	+1·000	+ 4·7	6
1·072	−1·955	− ·127	·372	−1·000	− 4·2	4
·838	+2·074	+ ·109	− ·270	+1·000	+ 3·0	5
·689	−1·832	+ ·197	·204	+1·000	− 8·5	3
− ·511	+1·401	+ ·262	·142	+1·000	22·5	1
− ·466	+1·279	+ ·273	− ·130	+1·000	− 6·1	5
·323	+ ·868	+ ·293	− ·098	+1·000	− 5·9	4
− ·161	+ ·384	+ ·291	− ·075	+1·000	−12·3	2
·074	+ ·124	+ ·278	− ·067	+1·000	+ 2·9	1
− ·004	− ·084	+ ·263	− ·062	+1·000	− 5·5	4
− ·084	− ·338	+ ·235	− ·059	+1·000	5·1	2
− ·173	− ·586	+ ·198	− ·058	−1·000	+ 7·2	4
− ·209	− ·685	+ ·180	− ·058	+1·000	+ 2·3	3
+ ·270	− ·842	+ ·146	− ·059	+1·000	− 0·7	4
+ ·308	− ·938	+ ·121	− ·062	+1·000	+11·2	2
+ ·358	−1·056	+ ·084	− ·065	+1·000	+ 3·9	1
+ ·496	−1·315	+ ·046	·077	−1·000	+ 4·5	3
+ ·567	−1·386	+ ·137	− ·086	+1·000	+ 5·2	1
+ ·628	−1·376	·239	− ·092	+1·000	+ 9·5	2
+ ·681	1·259	·357	− ·092	+1·000	+ 6·8	4
− ·708	1·112	− ·442	− ·085	+1·000	5·7	2
+ ·730	0·867	− ·544	− ·065	+1·000	+ 0·2	4

From these observation equations were obtained the following normal equations:—

$$+44{\cdot}968x - 29{\cdot}522y + 3{\cdot}3222z + 0{\cdot}327u - 14{\cdot}291v + 98{\cdot}606 = 0$$
$$+228{\cdot}507y - 41{\cdot}899z + 65{\cdot}630u + 39{\cdot}089v - 244{\cdot}074 = 0$$
$$+51{\cdot}724z - 53{\cdot}431u - 33{\cdot}929v - 33{\cdot}442 = 0$$
$$+76{\cdot}940u + 25{\cdot}424v - 56{\cdot}373 = 0$$
$$+95{\cdot}000v - 15{\cdot}800 = 0$$

Their solution gives

$x = -2{\cdot}084$ $\quad \delta K = -2{\cdot}084$ km.
$y = +{\cdot}5827$ $\quad \delta e = +{\cdot}0052$
$z = +6{\cdot}0337$ $\quad \delta\omega = +{\cdot}0539 \quad = 3°{\cdot}31$
$u = +4{\cdot}2237$ $\quad \delta T = +{\cdot}051$
$v = +{\cdot}6376$ $\quad \delta\gamma = +{\cdot}64$ km.

from which the corrected elements.

	Preliminary.	Corrected.
K	112·0	109·92
e	0·75	0·7552
ω	110°	113°·31
T	1·94 dys.	1·991 dys.
γ	20·7 km.	21·34 km.
Period	20·136 dys.	29·136 dys.
$a \sin i$	29,680,000 km.	28,867,000 km.

When an ephemeris was computed from these elements it was found that the residuals obtained did not agree closely enough with those obtained by substitution in the observation equations, the differences in some cases being upwards of a kilometre and a second solution became necessary. It was found that changing T from 1·99 to 2·01 days improved the agreement somewhat and this change was made for the second provisional elements, the others being those determined from the first solution.

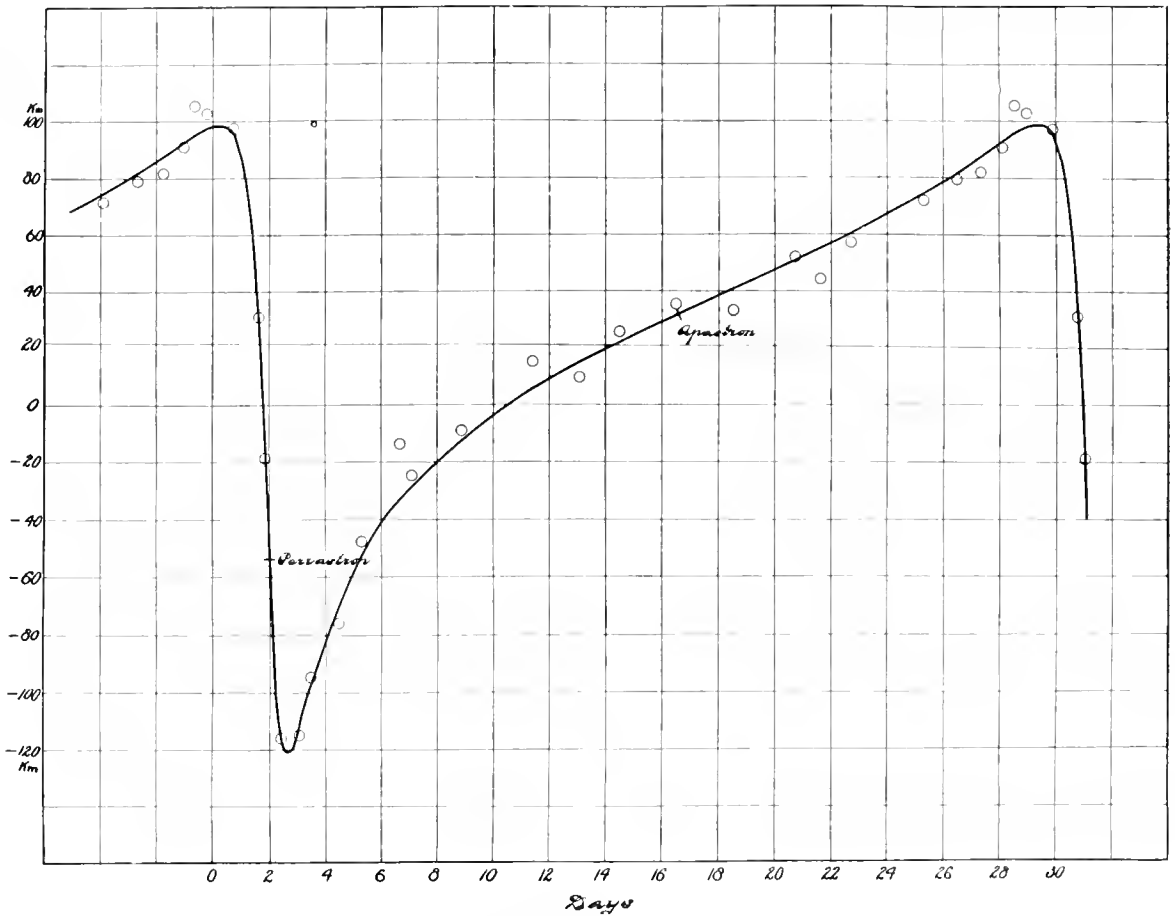

FIG. 7—Velocity Curve ι Orionis.

Making the same substitutions for homogeneity as before we get the following observation equations.

OBSERVATION EQUATIONS FOR 2ND SOLUTION.

x	y	z	u	v	l	Wt.
+ ·677	+ ·542	·914	+ 163	−1·000	— 1·29	7
+ ·124	+3·547	−1 599	+2·042	+1 000	+ 4·28	10
— ·335	+1·883	−1 693	+2·901	+1·000	+ 3 52	2
−1·263	−1 582	— ·958	+ ·572	+1·000	— 0 83	9
−1·208	+1·526	— ·277	— ·402	+1·000	+ 4·45	6
−1 088	+2 108	— ·079	— 403	+1·000	— 3 06	4
— ·833	+2·159	+ ·152	— 278	+1 000	+ 5·83	5
— ·678	+1·868	+ ·232	— ·206	+1 000	— 5·18	3
— ·495	+1·393	+ ·287	— ·141	+1 000	—19·11	1
— ·449	+1·260	+ 295	— ·128	+1·000	— 2·64	5
— ·306	+ ·829	+ ·306	— ·095	+1 000	— 2 83	4
— ·146	+ ·335	+ ·295	— 071	+1 000	— 9·71	2
— ·061	+ ·075	+ ·278	— 063	+1 000	+ 5·15	1
+ ·008	— ·133	+ ·258	— 059	+1·000	— 3·62	4
+ 093	·384	+ 227	— ·055	+1 000	— 3·77	2
+ 178	— ·625	+ 186	— ·054	+1·000	+ 7·97	4
+ 215	— ·720	+ ·166	— ·054	+1 000	+ 2·89	3
+ ·268	— ·866	+ 130	— ·055	+1·000	— 0·79	4
+ ·306	— ·961	+ ·103	— 057	+1·000	+11·01	2
+ ·354	—1 071	+ 064	— ·059	+1·000	+ 3·23	1
+ 482	—1·306	— 068	— ·069	+1 000	+ 2·57	3
+ ·547	—1·353	— ·159	— ·070	+1 000	+ 2 42	1
+ ·602	—1·342	·260	— ·080	+1·000	+ 5·73	2
+ ·649	1·223	— ·375	·078	+1·000	+ 2·47	4
+ ·672	—1 078	— ·456	— 071	+1·000	—10 44	2
+ 691	— 845	— ·553	— ·052	+1·000	— 4 98	4

Whence the normal equations

$$+45{\cdot}058x - 28{\cdot}047y + 2{\cdot}576z + 0{\cdot}726u - 14{\cdot}660v - 0{\cdot}731 = 0$$
$$+266{\cdot}994y - 45{\cdot}686z + 65{\cdot}208u + 43{\cdot}697v + 117{\cdot}502 = 0$$
$$+50{\cdot}372z - 48{\cdot}247u - 33{\cdot}053v - 70{\cdot}702 = 0$$
$$+64{\cdot}085u + 22{\cdot}897v + 95{\cdot}820 = 0$$
$$95{\cdot}000v + 34{\cdot}800 = 0$$

Their solution gives

$x = -\ {\cdot}0193$ $\quad \delta K = -\ {\cdot}0193$ km.
$y = -\ {\cdot}1014$ $\quad \delta e = -\ {\cdot}00092$
$z = -\ {\cdot}0674$ $\quad \delta\omega = -\ {\cdot}00061 \quad = -\ {\cdot}035°$
$u = -1{\cdot}4430$ $\quad \delta T = -\ {\cdot}0172$ dys.
$v = -\ {\cdot}0018$ $\quad \delta\gamma = -\ {\cdot}0018$ km.

Whence the final elements.

$K = 109{\cdot}90 \quad \pm 1{\cdot}100$ km.
$e = 0{\cdot}7543 \quad \pm\ {\cdot}0046$
$\omega = 113°{\cdot}28 \quad \pm 1°{\cdot}083$
$T = 1{\cdot}993 \quad \pm 0{\cdot}022$ dys. = Julian day 2,417,587·993.
Period=29·136 days.
$a \sin i = 28{,}907{,}000$ km.

An ephemeris computed from these elements shows that Σpvv has been reduced from 2994 to 2181, the probable error of an observation of unit weight becoming ±6·88 km., while the probable errors of the elements are those given above. The velocity curve corresponding to the final elements is given in Fig. 7. The changes from the first solution are very small but have resulted in a satisfactory agreement

of the residuals (see accompanying tables) obtained on the one hand from an ephemeris computed from the final elements, and on the other by substitution of the values of the unknowns in the observation equations.

NORMAL PLACES AND RESIDUALS.

Mean Phase.	Mean Velocity.	RESIDUALS O-C.				
		Preliminary.	1st Solution.	2nd Solution.	By Substitution.	Eph. – Eq.
0·71	+ 97·0	— 4·0	+ 1·29	+ 1·54	+ 1·52	+ ·02
1·61	+ 30·8	+ 1·0	— 4·28	— 1·23	— 1·08	— ·15
1·85	+ 19·0	+ 6·7	— 3·52	+ ·70	+ ·74	— ·04
2·44	—116·7	+ 0·1	+ 0·83	+ 1·37	+ 1·39	— ·02
3·06	—115·9	— 4·7	— 4·45	— 4·93	— 4·91	— ·02
3·44	— 95·2	+ 4·2	+ 3·06	+ 2·67	+ 2·67	·00
4·42	— 76·1	— 3·0	— 5·83	— 6·02	— 6·01	- ·01
5·27	— 48·0	+ 8·5	+ 5·18	+ 5·09	+ 5·09	·00
6·68	— 14·0	+22·5	+19·11	+19·03	+19·06	— ·03
7·12	— 25·4	+ 6·1	+ 2·64	+ 2·68	+ 2·60	+ ·08
8·83	— 9·5	+ 5·9	+ 2·83	+ 2·78	+ 2·78	·00
11·39	15·0	+12·3	+ 9·71	+ 9·64	+ 9·66	— ·02
13·05	9·5	— 2·9	— 5·15	— 5·24	- 5·21	— ·03
14·52	25·8	+ 5·5	+ 3·62	+ 3·55	+ 3·55	·00
16·48	35·3	+ 5·1	+ 3·77	+ 3·65	+ 3·67	— ·02
18·52	32·9	— 7·2	— 7·97	— 8·09	— 8·10	+ ·01
19·36	41·8	— 2·3	— 2·89	— 3·02	— 3·03	+ ·01
20·69	51·6	+ 0·7	+ 0·79	+ ·63	+ ·64	— ·01
21·58	44·0	—11·2	—11·01	—11·18	—11·17	— ·01
22·65	57·0	— 3·9	— 3·23	— 3·42	— 3·41	— ·01
25·27	71·7	— 4·5	— 2·57	— 2·89	— 2·79	— ·10
26·44	79·0	— 5·2	— 2·42	— 2·68	— 2·66	— ·02
27·37	81·8	— 9·5	— 5·73	— 6·00	— 6·00	·00
28·13	90·2	— 6·8	— 2·47	— 2·72	— 2·73	+ ·01
28·54	105·7	+ 5·7	+10·44	+10·21	+10·21	·00
28·93	102·3	— 0·2	+ 4·98	+ 4·80	+ 4·79	+ ·01

The principal change from the original elements is in K and ω, the former being diminished by 2·1 kms., and the latter increased by 3°·28. As a result of these changes, and shown by comparison of the velocity curves, the general trend of the observations is more closely followed. The probability of a secondary disturbance seems somewhat less than with the original elements, and this is further lessened by a knowledge of the fact that in the normal places with the highest residuals there are always one or more observations with the Universal spectroscope where the temperature control was poor and the spectra contained only two measurable lines. This computation has effected apparently considerable improvement in the elements and seems to justify Dr. Schlesinger's contention that the least squares solution will always, even in the case of inaccurate observations, give the best elements .

The Spectroscopic Binary ψ Orionis.

The star ψ Orionis, R. A. 5h. 21·6m. Dec. + 3° 1′ Phot. Mag. 4·5 was announced by Frost and Adams* as a spectroscopic binary in 1903, and upon learning that the discoverers were not following it up, and with their consent, it was placed under observation here on November 11, 1907, while the last plate was made on March 16, 1908. In all 37 plates have been measured for the determination of its orbit. Its spectrum is of the helium type with broad and diffuse lines, but is nevertheless much easier of measurement than the spectrum of ι Orionis above discussed. The lines though diffuse are not in general asymmetric, and the place of setting is, as a rule,

* Astrophysical Journal, Vol. XVII., p. 246.

considerably more certain than in ι Orionis. Moreover, the number of lines visible and measurable in ψ Orionis is considerably larger than in ι Orionis. To this must be added the fact that, as its orbit is nearly circular, the changes in the velocity curve which is consequently nearly a sine curve, are gradual and uniform, and its position, therefore, more easily defined than in the case of high eccentricity where the form of curve changes abruptly. For accurate determination of the elements, observations must be carefully grouped about this position of abrupt change and, as in ι Orionis, this is frequently difficult to attain. No such difficulty was met with in ψ Orionis, and the observations, taken through the winter whenever possible, seemed to group themselves suitably for the determination of the elements.

Some little difficulty was at first met with in obtaining the period. It was soon seen that it was comparatively short and, as high positive and negative values repeated themselves at intervals of 5 days, this period was first tried. No adjustment of the observations, however, could make them suit this period, and submultiples of it were then tested. When the observations were grouped into a period of $2\frac{1}{2}$ days, some signs of definite arrangement manifested themselves which a slight lengthening of the period improved. Further trials showed that a period of 2·526 days suited our own observations better than either 2·525 or 2·527 days and, on bringing up Frost and Adams'* early observations a suitable number of periods, this was finally fixed at 2·5259 days, which can not be much in error.

All the lines measured in the spectrum of ψ Orionis, both star and comparison with the micrometer readings corresponding, and the velocities per revolution are given in the following table:—

LINES USED IN MEASUREMENT OF Ψ ORIONIS.

Star Lines.				Comparison Lines.	
Element.	Wave-Length.	Micometer Reading.	Vel. per Rev.	Wave-Length.	Micrometer Reading.
H.....	4861·527	72·8648	1451·2	4864·943	73·0098
He.	4713·308	66·1879	1332·4	4851·686	72·4449
He.....	4471 676	53·4023	1143·5	4494 755	54·7419
He	4388·100	48 3107	1079·7	4482·413	54 0288
H	4340·634	45·2387	1043·7	4466·737	53·1120
He..... ...	4143·928	30·8756	898·2	4395·382	48·7700
He.....	4120·973	29·0038	881·3	4341 162	45·2736
H..	4102 000	27·4219	867·9	4143·863	30·8704
He.....	4026·352	20·7806	813·8	4099·921	27·2466
H	3970·177	15·4733	774·3	4023·508	20·5200
.....	....	.....	.....	3969·411	15·3986

The programme of observations will be followed by the detailed measures. It will be noticed that several of the plates have been remeasured by different observers. The original measures in some cases showed residuals from the curve higher than was expected and those with the largest residuals have been remeasured, without, however, in general, making much change in the velocity.

* Astrophysical Journal, Vol. XVII, p. 246.

RECORD OF SPECTROGRAMS.

Star.	No. of Negative.	Camera.	Plate.	Date.	Middle of Exposure E. S. T.	Duration.	Hour Angle at end.	Comparison Spectrum. Exposures in seconds.	Comparison Spectrum. Kind.	Temperature Centigrade. Room. Beginning.	Temperature Centigrade. Room. End.	Temperature Centigrade. Prism Box. Beginning.	Temperature Centigrade. Prism Box. End.	Slit Width.	Focal Position. Star Focus.	Focal Position. Collimator.	Focal Position. Camera.	Seeing.	Observer.
				1907.	h m	m	h m												
ψ Orionis..	1138	1L	Seed	27. Nov. 11	3 04	72	1 35 W.	6 10 6	FeV spark	− 2·0	3·0	5·5	5·5	·0014	73·5	10·8	18·2	Fair	H
" ..	1158	"	"	27. " 23	12 12	45	0 40 E.	4 7–4	"	− 0·3	0·2	6·7	6·7	·0013	74·0	10·8	18·18	"	P
" ..	1182	"	"	27. Dec. 1	2 46	45	2 35 W.	4 1 4 4	"	−12·4	−13·0	1·1	1·0	·0015	72·0	10·8	18.1	Good	P
" ..	1183	"	"	27. " 4	3 34	47	3 25 W.	4 4 4 4	"	13·4	−13·0	0·9	0·9	·0015	72·0	10·8	18·1	"	P
" ..	1195	"	"	27. " 28	11 00	40	0 20 W.	5 5 5 5	"	5·6	5·8	3·1	3·1	·0013	73·5	10·8	18·1	"	P
" ..	1196	"	"	27. " 28	11 45	40	1 05 W.	5 5 5 5	"	− 5·6	− 5·8	3 1	3 1	·0016	73·5	10·8	18 1	"	P
				1908.															
" ..	1208	"	"	27 Jan. 1	1 20	35	2 55 W.	4 4 3 3	"	− 8·0	− 7 5	5·6	− 5 7	·0013	72·5	10 8	18·1	"	P
" ..	1209	"	"	27. " 1	2 00	35	3 35 W.	4 4 3 3	"	− 7 5	− 7 8	5·7	5 7	·0013	72·5	10·8	18·1	"	P
" ..	1214	"	"	27. " 3	10 21	47	0 10 W.	3 3 3 3	"	− 7 6	− 7·4	4·4	4 4	·0013	72·6	10·8	18·1	Fair	P
" ..	1215	"	"	27. " 3	11 01	30	0 40 W.	2 2 2 2	"	− 7 5	− 8 4	− 4·4	4 4	·0013	72 6	10·8	18 1	"	P
" ..	1220	"	"	27. " 13	12 26	33	2 45 W.	2 2 2 2	"	− 9·3	− 9 5	0 0	0·0	·0013	72·5	10·8	18·12	"	P
" ..	1221	"	"	27. " 13	1 00	30	3 15 W.	1½ 1½ 1½ 1½	"	− 9·5	− 9·5	0·1	− 0·2	·0013	72 5	10·8	18·12	"	P
" ..	1227	"	"	27. " 14	8 21	43	1 12 E.	1 1 1 1	"	−11·5	−11·0	5 1	5·1	·0013	72 5	10·8	18 05	Good	H
" ..	1233	"	"	27. " 16	6 55	35	2 35 E.	1¼ 1¼ 1¼ 1¼	"	−12·0	−13 0	− 6 0	− 6 0	·0013	72 0	10·8	18 05	Unsteady.	P
" ..	1238	"	"	27. " 20	7 57	65	1 00 E.	1½ 1½ 1½ 1½	"	− 9·4	8·8	6·8	− 6·8	·0013	72·5	10·8	18·07	Very bad.	P
" ..	1239	"	"	27. " 20	8 53	43	0 15 E.	1½ 1½ 1½ 1½	"	8 8	− 7 0	− 6·8	− 6 8	·0013	72·5	10·8	18·07	Poor	P
" ..	1257	"	"	27. " 22	10 29	33	1 25 W.	2 2 2	"	− 8·0	− 8 0	0·1	0·2	·0013	72·5	10·8	18·09	Good	H
" ..	1264	"	"	27. " 23	9 03	30	0	1¼ 1¼ 1¼ 1¼	"	11·0	−12 6	− 5·3	− 5 3	·0013	72·5	10·8	18·03	Fair	P
" ..	1271	"	"	27. " 24	7 49	32	1 10 E.	1¼ 1¼ 1¼ 1¼	"	−14·8	−15·5	9·0	− 9 0	·0013	72·0	10·8	18·0	"	P
" ..	1279	"	"	27. " 27	6 42	35	2 00 E.	1¼ 1¼ 1¼ 1¼	"	−12·7	− 12 7	−11·1	−11·1	·0013	72 0	10·8	18·06	"	P
" ..	1283	"	"	27. " 27	9 21	30	0 33 W.	1¼ 1¼ 1¼ 1¼	"	−14·0	−13 0	− 11·1	11·1	·0013	72·0	10·8	18·06	Good	P
" ..	1296	"	"	27. " 29	6 00	35	2 35 E.	1½ 1½ 1½ 1½	"	−16·0	−16·6	− 8·1	− 8·1	0013	72·4	10·8	18·08	Unsteady.	P
" ..	1301	"	"	27. " 29	10 01	44	1 27 W.	1½ 1½ 1½ 1½	"	−22·0	−22·3	− 8·6	− 8·7	·0013	72·4	10·8	18·08	"	H
" ..	1304	"	"	27. " 29	12 02	42	3 26 W.	1½ 1½ 1½ 1½	"	−23·0	−23·5	− 8·6	− 8·6	·0013	72·4	10·8	18·08	Fair	H
" ..	1312	"	"	27. Feb. 3	8 21	37	0 05 W.	2 2 2 2	"	−16·5	−17·5	− 7·7	− 7·9	·0013	72·4	10·8	18 08	Good	H
" ..	1317	"	"	27. " 8	8 00	30	0 10 W.	1½ 1½ 1½ 1½	"	−16·8	−17 0	−10·0	−10 0	·0013	72·4	10·8	18 08	Fair	P
" ..	1319	"	"	27. " 8	11 15	30	3 20 W.	1½ 1½ 1½ 1½	"	−17 8	−17·5	−10·2	−10·2	·0013	72·4	10·8	18·08	"	P
" ..	1321	"	"	27. " 17	7 49	32	0 25 W.	2 2 2 2	"	− 8·5	−12·0	− 2·0	− 2·0	·0013	72·4	10·8	18·1	Good	H
" ..	1333	"	"	27. " 18	7 15	30	0 05 E.	1½ 1½ 1½ 1½	"	− 8·0	−10 0	− 3·0	− 3 0	·0013	72·5	10·8	18·1	Fair	P
" ..	1334	"	"	27. " 20	8 07	35	1 00 W.	1½ 1½ 1½ 1½	"	− 6·5	− 7·0	− 1·0	− 1·1	·0015	72·5	10·8	18·1	Good	P

"	..	1336	"	"	27.	"	21	11	00	45	3	55 W.	2	-2	-2	-2	"	.	− 3·6	− 4·0	+ 0·6	+ 0·6	·0013	72·5	10·8	18·1	Poor.....	P
"	..	1344	"	"	27.	"	22	6	58	33	0	05 E.	2	-2	-2	-2	"	.	−10·3	−10·8	− 1·8	− 1·8	·0013	72·5	10·8	18·1	Good.....	P
"	..	1347	"	"	27.	"	22	11	26	36	4	25 W.	2	-2	-2	-2	"	.	−13·3	−13·5	− 4·5	− 4·6	·0013	72·5	10·8	18·24	Fair.....	P
"	..	1349	"	"	27.	"	24	7	45	35	0	50 W.	2	-2	-2	-2	"	.	−10·0	−10·0	− 2·0	− 2·0	·0013	72·5	10·8	18·24	Good.....	P
"	..	1376	"	"	27.	Mar.	4	10	26	44	4	11 W.	1	-1	-1	-1	"	.	− 6·5	− 7·5	+ 0·6	+ 0·3	·0013	72·4	10·8	18·25	Fair.....	H
"	..	1384	"	"	27.	"	9	10	22	85	4	30 W.	1	-1	-1	-1	"	.	− 8·0	− 9·5	0·4	0·3	·0013	72·4	10·8	18·3	Hazy.....	P
"	.	1395	"	"	27.	"	16	7	15	40	1	45 W.	1	-1	-1	-1	"	.	− 4·6	− 5·8	2·5	2·4	·0014	72·5	10·8	18·35	Fair.....	P

ψ ORIONIS 1138.

1907. Nov. 11.
G. M. T. $20^h\ 04^m$

Observed by } W. E. HARPER.
Measured by }

Wt.	Mean of Settings.	Correction to Compar. Lines.	Corrected Star Setting.	Displac. in Revol.	Velocity.	Wt.	Mean of Settings.	Correction to Compar. Lines.	Corrected Star Setting.	Displac. in Revol.	Velocity.
2	73·0155	− ·0057	.....	.....	.....	1	48·3420	.....	48·3356	·0249	26·89
1½	72·8845	.....	72·8783	·0135	+19·59	2	45·2818	− ·0082	.....	.....	.....
2	72·4527	− ·0078	.....	.....	.....	1	45·2802	.....	45·2720	·0333	34·76
2	54·7465	− ·0046	.....	.....	.....	1	27·4810	.....	27·4570	·0351	30·47
2	53·4387	.....	53·4313	·0290	33·15	2	27·2711	− ·0245	.....	.....	.....
2	53·1201	− ·0081	.....	.....	.....	½	15·5256	.....	15·4896	·0163	+12·62
2	48·7761	− ·0061	.....	.....	.....	2	15·4345	− ·0359	.....	.....	.....

Weighted mean. . . . +27·73
V_a . . . . . +14·26
V_d . . . . . − ·09
Curvature . . . . . − ·28

Radial velocity. . . . . +41·6

ψ ORIONIS 1138.*

1907. Nov. 11.
G. M. T. $20^h\ 04^m$

Observed by W. E. HARPER.
Measured by J. S. PLASKETT.

Wt.	Mean of Settings.	Correction to Compar. Lines.	Corrected Star Setting.	Displac. in Revol.	Velocity.	Wt.	Mean of Settings.	Correction to Compar. Lines.	Corrected Star Setting.	Displac. in Revol.	Velocity.
2	73·0062	+ ·0036	.....	.....	.....	2	45·2712	+ ·0024	.....	.....	.....
½	72·8721	.....	72·8766	·0118	+ 17·12	½	30·9215	.....	30·9020	·0264	+ 23·71
2	72·4388	+ ·0061	.....	.....	.....	½	30·8904	− ·0200	.....	.....	.....
2	54·0186	+ ·0102	.....	.....	.....	½	29·0220	.....	29·0025	·0013	− 1·15
2	53·4330	.....	53·4420	·0397	45·40	½	27·4666	.....	27·4478	·0259	+ 22·48
2	53·1052	+ ·0068	.....	.....	.....	2	27·2652	− ·0186	.....	.....	.....
2	48·7672	+ ·0028	.....	.....	.....	¼	20·8105	.....	20·7840	·0034	+ 2·77
½	48·3138	.....	48·3166	·0059	6·37	2	20·5475	− ·0275	.....	.....	.....
1½	45·2631	.....	45·2655	·0268	27·97						

Weighted mean . . . . . + 28·00
V_a . . . . . + 14·26
V_d . . . . . − ·09
Curvature . . . . . − ·28

Radial velocity . . . . . + 41·9

Check measurement

SESSIONAL PAPER No. 25a

Ψ ORIONIS 1158.

1907. Nov. 23.
G. M. T. 17h 12m

Observed by J. S. PLASKETT.
Measured by W. E. HARPER.

Wt.	Mean of Settings.	Correction to Compar. Lines.	Corrected Star Setting.	Displac. in Revol.	Velocity.	Wt.	Mean of Settings.	Correction to Compar. Lines.	Corrected Star Setting.	Displac. in Revol.	Velocity.
2	73·0935	− ·0837	.....	....	.....	2	53·1287	− ·0167	.....	....	.....
1	72·8452	.....	72·7622	·1026	−148·87	1	48·1357	.....	48·1378	·1729	186·73
2	72·5259	− ·0810	.....	....	.....	2	45·2595	+ ·0141	.....	....	.....
2	54·7590	− ·0171	.....	....	.....	½	27·1693	.....	27·2419	·1809	−156·24
1½	53·3004	.....	53·2837	·1186	−135·56	2	27·1740	+ ·0726	.....	.....	.....

Weighted mean ..... −154·26
V_a ..... + 8·98
V_d ..... + ·09
Curvature ..... − ·28

Radial velocity ..... − 145·5

Ψ ORIONIS 1182.

1907. Dec. 4.
G. M. T. 19h 46m

Observed by } J. S. PLASKETT.
Measured by }

Wt.	Mean of Settings.	Correction to Compar. Lines.	Corrected Star Setting.	Displac. in Revol.	Velocity.	Wt.	Mean of Settings.	Correction to Compar. Lines.	Corrected Star Setting.	Displac. in Revol.	Velocity.
1	73·0102	− ·0004	.....	.....	.....	2	43·5184	+ ·0200	.....	.....	.....
1¼	72·9704	.....	72·9700	·1052	+152·67	¾	30·9904	.....	31·0084	·1328	119·28
¾	72·4474	− ·0025	.....	.....	.....	2	30·8528	+ ·0176	.....	.....	.....
1	54·0062	+ ·0226	.....	.....	.....	¾	29·1107	.....	29·1300	·1262	111·26
½	53·4920	.....	53·5110	·1087	124·84	¾	27·4963	.....	27·5233	·1014	88·00
1½	53·0934	+ ·0186	.....	.....	.....	2	27·2191	+ ·0275	.....	.....	.....
2	48·7518	+ ·0182	.....	.....	.....	¾	20·8518	.....	20·8868	·1062	86·42
1	48·4296	.....	48·4481	·1374	148·35	2	20·1846	+ ·0354	.....	.....	.....
1½	45·3413	.....	45·3633	·1246	130·05	¼	15·5887	.....	15·6317	·1584	+122·65
2	45·2506	+ ·0230	.....	.....	.....	2	15·3552	+ ·0434	.....	.....	.....

Weighted mean ..... +132·51
V_a ..... + 3·89
V_d ..... − ·20
Curvature ..... − ·28

Radial velocity ..... +135·8

Ψ ORIONIS 1183.

1907. Dec. 4.
G. M. T. 20h 31m

Observed by } J. S. PLASKETT.
Measured by }

Wt.	Mean of Settings.	Correction to Compar. Lines.	Corrected Star Setting.	Displac. in Revol.	Velocity	Wt.	Mean of Settings.	Correction to Compar. Lines.	Corrected Star Setting.	Displac. in Revol.	Velocity.
2	73·3327	− ·0477	....	....	.....	2	45·2646	+ ·0090	.....	.....	.....
1	73·0361	− ·0263	.....	....	.....	2	43·5247	+ ·0137	.....	.....	.....
2	72·9944	.....	72·9674	·1026	+148·89	½	31·0044	... .	31·0144	·1388	124·67
½	72·4727	− ·0278	.....	.....	.....	2	30·8607	+ ·0097	.....	.....	.....
½	54·0262	+ ·0026	.....	.....	.....	1	27·5337	.....	27·5487	·1268	110·05
½	53·5210	....	53·5140	·1117	127·74	2	27·2311	+ ·0155	.....	.....	.....
2	53·1204	− ·0084	.....	.....	.....	1	20·8980	....	20·9180	·1374	111·82
3	48·7672	+ ·0028	.....	.....	.....	2	20·4904	− ·0206	.....	.....	.....
½	48·4416	.....	48·4434	·1327	143·28	½	15·6127	.....	15·6367	·1634	126·52
1	45·3760	....	45·3845	·1458	152·17	2	15·3742	− ·0244	.....	.....	.....

Weighted mean ... +135·80
V_a .... + 3·80
V_d .... − ·23
Curvature..... − ·28

Radial velocity..... +139·1

Ψ ORIONIS 1195.

1907. Dec. 28.
G. M. T. 16h 00m

Observed by } J. S. PLASKETT.
Measured by }

Wt.	Mean of Settings.	Correction to Compar. Lines.	Corrected Star Setting.	Displac. in Revol.	Velocity	Wt.	Mean of Settings.	Correction to Compar. Lines.	Corrected Star Setting.	Displac. in Revol.	Velocity.
2	73·0520	− ·0422	.....	.....	.....	1	45·2050	... .	45·2250	·0137	14·30
1	72·8655	... .	72·8245	·0403	−58·48	2	30·8315	− ·0389	.....	.....	.....
2	72·4830	− ·0381	.....	.....	.....	½	28·8849	.....	28·9280	·0758	66·82
1	54·0332	− ·0044	.....	.....	.....	½	27·3468	.....	27·3928	·0289	25·08
½	53·3871	.. ....	53·3830	·0193	22·07	2	27·2001	+ ·0465	.....	.....	.....
1	53·1160	− ·0040	.....	.....	.....	½	20·7070	... .	20·7630	·0176	14·32
2	48·7578	+ ·0122	.....	.....	.....	2	20·4638	+ ·0562	.....	.....	.....
½	48·2558	....	48·2690	·0407	45·02	½	15·3461	.....	15·4115	·0588	−45·53
2	45·2538	+ ·0198	.....	.....	.....	2	15·3299	+ ·0687	.....	.....	.....

Weighted mean..... − 34·79
V_a ..... − 8·07
V_d .... 0·0
Curvature.... − ·28

Radial velocity..... − 43·1

ψ ORIONIS 1195*

1907. Dec. 28.
G. M. T. $16^h\ 00^m$

Observed by } J. S. PLASKETT.
Measured by }

Wt.	Mean of Settings.	Correction to Compar. Lines.	Corrected Star Setting.	Displac. in Revol.	Velocity.	Wt.	Mean of Settings.	Correction to Compar. Lines.	Corrected Star Setting.	Displac. in Revol.	Velocity.
2	73·0135	— 0037	.....	....	.....	2	48·7258	+ 0442	.....	....	.....
1	72·8230	.....	72·8195	·0453	—65·74	¼	48·2094	.....	48·2540	·0567	61·22
2	72·4482	— 0033	.....	....	.....	..	45·2185	+ 0551	.....	....	.....
¼	66·1545	.....	66·1640	·0239	31·84	2	45·1562	.... ..	45·2110	·0277	28·91
2	54·7088	+ 0331	.....	.... ..	.... ..	⅛	20·6678	.... .	20·7578	·0288	18·55
2	53·9958	+ 0330	.....	....	.....	2	20·4280	+ 0920	.....	....	.....
⅛	53·3452	... .	53·3800	·0223	25·50	¼	15·3196	... ..	15·4296	0437	—35·84
1½	53·0748	+ 0372	....	.....	.....	2	15·2876	+ 1110	.....	.....	.....

Weighted mean ..... — 39·75
V_a ..... — 8·07
V_d ..... 0·0
Curvature ..... — ·28

Radial velocity ..... — 47·9

* Check Measurement.

ψ ORIONIS 1196.

1907. Dec. 28.
G. M. T. $16^h\ 45^m$

Observed by } J. S. PLASKETT.
Measured by }

Wt.	Mean of Settings.	Correction to Compar. Lines.	Corrected Star Setting.	Displac. in Revol.	Velocity.	Wt.	Mean of Settings.	Correction to Compar. Lines.	Corrected Star Setting.	Displac. in Revol.	Velocity.
2	73·0046	+ 0042	....	.....	.....	1	45·1257	.....	45·1872	·0515	53·75
⅛	72·8427	....	72·8475	0173	— 25·11	2	30·7901	+ 0803	.....	.....	.....
2	72·4390	+ 0059	.....	.....	.....	⅛	28·8261	.....	28·9110	·0928	81·80
2	53·9884	+ 0404	.....	.....	.....	⅛	27·2504	.....	27·3390	·0829	71·94
¼	53·2702	.....	53·3117	·0906	103·62	2	27·1577	+ 0889	.....	.....	.....
2	53·0700	+ 0420	.....	.....	.....	¼	20·6274	.... .	20·7200	·0606	49·32
2	48·7150	+ 0550	.....	.....	.....	2	20·4270	+ 0930	.....	.....	.....
⅛	48·1743	.....	48·2305	0802	86·59	¼	15·2944	.....	15·4015	·0718	—55·59
2	45·2122	+ 0614	.....	.....	.....	2	15·2908	+ 1078	.....	.....	.....

Weighted mean ..... — 62·33
V_a ..... — 8·08
V_d ..... — ·07
Curvature ..... — ·28

Radial velocity ..... — 70·8

ψ ORIONIS 1208.

1908. Jan. 1.
G. M. T. $20^h\ 00^m$

Observed by } J. S. PLASKETT.
Measured by }

Wt.	Mean of Settings.	Correction to Compar. Lines.	Corrected Star Setting.	Displac. in Revol.	Velocity.	Wt.	Mean of Settings.	Correction to Compar. Lines.	Corrected Star Setting.	Displac. in Revol.	Velocity.
2	73·0428	— ·0330				2	45·2641	+ ·0095			
1	72·9980		72·9660	·1012	+146·86	2	30·8526	+ ·0178			
1	72·4727	— ·0278					29·1834		29·2085	·1984	174·91
1	54·0354	— ·0066					27·6044		27·6344	·2125	184·43
	53·5534		53·5494	·1471	168·22	2	27·2160	+ ·0366			
2	53·1133	— ·0013					20·9432		20·9760	·1954	159·02
2	48·7654	+ ·0046				2	20·4873	+ ·0327			
1	48·4543		48·4593	·1486	160·44		15·6603		15·7020	·2287	+177·08
1	45·3584		45·3678	·1291	134·74	2	15·3578	+ ·0418			

Weighted mean ....+156·39
V_a ..... —9·99
V_d ..... — ·02
Curvature ..... — ·28

Radial velocity.....+145·9

ψ ORIONIS 1209.

1908. Jan. 1.
G. M. T. $19^h\ 00^m$

Observed by } J. S. PLASKETT.
Measured by }

Wt.	Mean of Settings.	Correction to Compar. Lines.	Corrected Star Setting.	Displac. in Revol.	Velocity.	Wt.	Mean of Settings.	Correction to Compar. Lines.	Corrected Star Setting.	Displac. in Revol.	Velocity.
2	73·0522	— ·0424				2	15·2338	+ ·0098			
	73·0320		72·9890	·1242	+180·24	2	30·8434	+ ·0260			
2	72·4900	— ·0441					29·1760		29·2070	·2032	179·06
2	54·0314	— ·0026					27·5338		27·5708	·1489	129·23
	53·5572		53·5557	·1534	174·43	2	27·2094	+ ·0372			
2	53·1117	— ·0003					20·8970		20·9410	·1604	130·53
2	48·7632	+ ·0068				2	20·4760	+ ·0440			
	48·4613		48·4690	·1683	181·71		15·6247		15·6727	·1994	+154·39
1	45·3738		45·3836	·1449	151·23	2	15·3474	+ ·0488			

Weighted mean ....+158·46
V_a ..... —10·00
V_d ..... — ·22
Curvature ..... — ·28

Radial velocity.....+148·0

ψ ORIONIS 1214.

1908. Jan. 3.
G. M. T. $15^h\ 21^m$

Observed by } J. S. PLASKETT.
Measured by }

Wt.	Mean of Settings.	Correction to Compar. Lines.	Corrected Star Setting.	Displac. in Revol.	Velocity.	Wt.	Mean of Settings.	Correction to Compar. Lines.	Corrected Star Setting.	Displac. in Revol.	Velocity.
3	73·0580	− ·0482				1	45·2463		45 2460	·0073	+ 7·62
½	72·9394		72·8990	·0242	+35·12	2	30·8538	+ ·0166			
2	72·4976	− ·0527				¼	28·9764		28 9980	·0058	− 5·11
1½	54·0454	− ·0166				¼	27·3824		27·4084	·0135	−11·72
½	53·4241		53·4091	·0068	+ 7·78	2	27 2204	+ ·0262			
2	53·1257	− ·0137				½	20·7356		20·7700	·0106	− 8·63
2	48·7757	− ·0057				2	20·4850	+ ·0350			
¼	48·3130		48·3080	·0027	− 2·92	¼	15·3994		15·4460	·0273	−21·14
2	45·2740	− ·0004				1	15·3517	+ ·0469			

Weighted mean ..... + 4·15
V_a ..... −10·86
V_d ..... + ·02
Curvature ..... − ·28

Radial velocity ..... − 7 0

ψ ORIONIS 1215.

1908. Jan. 3.
G. M. T. $16^h\ 01^m$

Observed by } J. S. PLASKETT.
Measured by }

Wt.	Mean of Settings.	Correction to Compar. Lines.	Corrected Star Setting.	Displac. in Revol.	Velocity.	Wt.	Mean of Settings.	Correction to Compar. Lines.	Corrected Star Setting.	Displac. in Revol.	Velocity.
2	73·0242	− ·0144				¼	30·8730		30·9164	·0408	+36·64
1	72·8754		72·8615	·0033	− 4·79	1½	30·8270	+ ·0434			
2	72·4571	− ·0122				¼	28·9427		28·9906	·0138	−12·16
2	54·0183	+ ·0105				¼	27·3824		27·4330	·0111	+ 9 63
½	53·4276		53·4419	0396	+45·26	2	27·1953	+ ·0513			
1½	53·0957	+ ·0163				½	20·7092		20·7682	·0124	−10·09
2	48·7494	+ ·0296				2	20·4606	+ ·0594			
¼	48·3062		48 3262	·0155	+16 74	¼	15·3897		15·4577	·0156	−12·07
2	45·2476	+ ·0260				1	15·3298	+ ·0688			
1	45·2154		45·2414	·0027	+ 2 82						

Weighted mean ..... + 6·16
V_a ..... −10·86
V_d ..... − ·04
Curvature ..... − ·28

Radial velocity ..... − 5·0

Ψ ORIONIS 1220.

1908. Jan. 13
G. M. T. $17^h\ 26^m$

Observed by } J. S. PLASKETT.
Measured by }

Wt.	Mean of Settings.	Correction to Compar. Lines.	Corrected Star Setting.	Displac. in Revol.	Velocity.	Wt.	Mean of Settings.	Correction to Compar. Lines.	Corrected Star Setting.	Displac. in Revol.	Velocity.
2	73·0460	− ·0362				2	45·2724	+ ·0012			
½	72·9140		72·8787	·0138	+20·32	½	45·2480		45·2500	·0113	11·79
2	72·4802	− ·0341				1½	30·8588	+ ·0116			
1½	54·0471	− ·0183				½	28·9800		28·9946	·0092	8·11
½	53·4106		53·3980	·0043	4·92	½	27·3846		27·4016	·0203	17·62
1½	53·1214	− ·0094				2	27·2291	+ ·0175			
2	48·7724	− ·0024				1	20·7507		20·7700	·0106	+8·63
¼	48·3066		48·3046	·0061	6·59	2	20·5002	+ ·0198			

Weighted mean ..... +10·24
V_a ..... −15·31
V_d ..... − ·19
Curvature ..... − ·28

Radial velocity ..... −5·5

Ψ ORIONIS 1221.

1908. Jan. 13.
G. M. T. $18^h\ 00^m$

Observed by J. S. PLASKETT.
Measured by C. R. WESTLAND.

Wt.	Mean of Settings.	Correction to Compar. Lines.	Corrected Star Setting.	Displac. in Revol.	Velocity.	Wt.	Mean of Settings.	Correction to Compar. Lines.	Corrected Star Setting.	Displac. in Revol.	Velocity.
2	73·0077	+ ·0021				½	48·2640		48·3032	·0075	− 8·10
1	72·8428		72·8446	·0202	−29·31	½	45·2202		45·2632	·0245	+25·58
2	72·4437	+ ·0012				2	45·2306	+ ·0430			
2	54·7101	+ ·0318				¼	27·3822		27·4386	·0167	+14·50
2	53·3822		53·4142	·0119	+13·60	2	27·1900	+ ·0566			
2	53·0800	+ ·0320				2	20·6969		20·7580	·0226	−18·40
2	48·7314	+ ·0386				2	20·4587	+ ·0613			

Weighted mean ..... +4·25
V_a ..... −15·31
V_d ..... − ·22
Curvature ..... − ·28

Radial velocity ..... − 11·6

ψ ORIONIS 1227.

1908. Jan. 14.
G. M. T. $13^h\ 21^m$

Observed by } J. S. PLASKETT.
Measured by }

Wt.	Mean of Settings.	Correction to Compar. Lines.	Corrected Star Setting.	Displac. in Revol.	Velocity.	Wt.	Mean of Settings.	Correction to Compar. Lines.	Corrected Star Setting.	Displac. in Revol.	Velocity
2	73·0150	− ·0052				2	45·2726	+ ·0010			
$\frac{3}{4}$	72·9972		72·9900	·1252	+181·69	$\frac{1}{2}$	31·0876		31·0810	·2044	183·59
$1\frac{1}{2}$	72·4545	− ·0096				2	30·8775	− ·0071			
1	54·0252	+ ·0036				$\frac{1}{4}$	29·1706		29·1650	·1612	142·07
$\frac{3}{4}$	53·5358		53·5360	·1337	152·90	$\frac{1}{4}$	27·5845		27·5800	1581	137·22
2	53·1120					2	27·2498	− ·0032			
2	48·7702	− ·0002				$\frac{1}{4}$	20·9600		20·9500	·1694	+137·85
$\frac{3}{4}$	48·4710		48·4710	·1603	173·08	2	20·5298	− ·0098			
$\frac{3}{4}$	45·3752		45·3760	·1373	143·30						

Weighted mean ..... +156·23
V_a ..... − 15·64
V_d ..... + 15
Curvature ..... − ·28

Radial velocity ..... +140·5

ψ ORIONIS 1227.*

1908. Jan. 14.
G. M. T. $13^h\ 21^m$

Observed by J. S. PLASKETT.
Measured by W. E. HARPER.

Wt.	Mean of Settings.	Correction to Compar. Lines.	Corrected Star Setting.	Displac. in Revol.	Velocity.	Wt.	Mean of Settings.	Correction to Compar. Lines.	Corrected Star Setting.	Displac. in Revol.	Velocity.
2	73·0188	− ·0090				1	48·4800		48·4779	1663	179·60
$\frac{3}{4}$	72·9643		72·9542	·0894	+129·72	2	45·4040		45·3997	1610	168·08
2	72·4582	− ·0133				2	45·2780	− ·0044			
2	54·0325	− ·0037				$\frac{1}{2}$	27·6012		27·5974	1755	152·33
$1\frac{1}{2}$	53·5490		53·5436	·1413	161·50	2	27·2504	− ·0038			
2	53·1170	− ·0050				1	20·9720		20·9613	1807	+147·08
2	48·7724	− ·0024				2	20·5311	− ·0111			

Weighted mean ..... +160·94
V_a ..... − 15·64
V_d ..... + 15
Curvature ..... − ·28

Radial velocity ..... +145·2

* Check measurement.

ψ ORIONIS 1233.

1908. Jan. 16.
G. M. T. $11^h\ 55^m$

Observed by } J. S. PLASKETT.
Measured by }

Wt.	Mean of Settings.	Correction to Compar. Lines.	Corrected Star Setting.	Displac. in Revol.	Velocity.	Wt.	Mean of Settings.	Correction to Compar. Lines.	Corrected Star Setting.	Displac. in Revol.	Velocity.
2	73·0133	− ·0035	.....	.....	.....	½	45·3102	.....	45·3155	·0768	80·16
½	72·9294	.....	72·9240	·0592	+ 85·91	2	45·2684	+ ·0052	.....	.....	.....
2	72·4524	− ·0075	.....	.....	.....	¼	30·9514	.....	30·9474	·0718	64·49
2	54·0273	+ ·0015	.....	.....	.....	2	30·8744	− ·0040	.....	.....	.....
¼	53·4464	.....	53·4520	·0497	56·83	¼	29·0574	.....	29·0540	·0502	44·24
2	53·1053	+ ·0067	.....	.....	.....	¼	27·4774	.....	27·4744	·0525	+ 45·56
2	48·7630	+ ·0070	.....	.....	.....	2	27·2494	− ·0028	.....	.....	.....
¼	48·3717	.....	48·3785	·0678	73·20						

Weighted mean	+ 67·33
V_a	− 16·28
V_d	+ ·21
Curvature	− ·28
Radial velocity	+ 51·0

ψ ORIONIS 1238.

1908. Jan. 20.
G. M. T. $12^h\ 57^m$

Observed by } J. S. PLASKETT.
Measured by }

Wt.	Mean of Settings.	Correction to Compar. Lines.	Corrected Star Setting.	Displac. in Revol.	Velocity.	Wt.	Mean of Settings.	Correction to Compar. Lines.	Corrected Star Setting.	Displac. in Revol.	Velocity.
2	72·9824	+ ·0274	.....	.....	.....	2	45·2571	+ ·0165	.....	.....	.....
¼	72·7857	.....	72·8097	·0551	− 79·96	½	45·1368	.....	45·1530	·0857	89·44
2	72·4242	+ ·0207	.....	.....	.....	1	30·8592	+ ·0112	.....	.....	.....
2	54·0122	+ ·0166	.....	.....	.....	½	30·7522	.....	30·7650	·0906	81·38
1	53·2817	.....	53·2982	·1041	119·04	¼	27·2694	.....	27·2824	·1395	121·07
2	53·0957	+ ·0163	.....	.....	.....	2	27·2326	+ ·0140	.....	.....	.....
2	48·7532	+ ·0168	.....	.....	.....	½	20·6574	.....	20·6680	·1126	− 91·63
¼	48·2384	.....	48·2549	·0558	60·25	2	20·5096	+ ·0104	.....	.....	.....

Weighted mean	− 96·30
V_a	− 18·03
V_d	+ 0·12
Curvature	− 0·28
Radial velocity	−114·5

ψ ORIONIS 1239.

1908. Jan. 20.
G. M. T. 13h 53m

Observed by } J. S. PLASKETT.
Measured by }

Wt.	Mean of Settings.	Correction to Compar. Lines.	Corrected Star Setting.	Displac. in Revol.	Velocity.	Wt.	Mean of Settings.	Correction to Compar. Lines.	Corrected Star Setting.	Displac. in Revol.	Velocity
2	72·9948	+ ·0150	.....	.....	.....	2	45 2593	+ ·0143	.....	.....	.....
1½	72 7832	.....	72·7972	·0676	— 98·10	½	45 1530	.....	45·1670	·0717	74·83
2	72·4322	+ ·0127	.....	.....	.....	1	30 8690	+ 0114	.....	.....	.....
2	54·0140	+ ·0148	.....	.....	.....	½	30 7664	.....	30·7775	·0981	88 11
1	53·2777	.....	53 2920	·1103	126·13	¼	27·3097	.....	27·3110	·1109	96·25
2	53·0982	+ ·0138	.....	.....	.....	2	27·2476	+ ·0010	.....	.....	.....
2	48·7523	+ ·0177	.....	.....	.....	¼	20 6404	.....	20 6310	·1496	—121·74
½	48 2301	.....	48·2450	·0657	70·94	1	20 5297	— ·0097	.....	.....	.....

Weighted mean ..... — 99·04
V_a ..... — 17·88
V_d ..... + 0 04
Curvature ..... — 0·28

Radial velocity ..... —117·2

ψ ORIONIS 1257.

1908. Jan. 22.
G. M. T. 15h 29m

Observed by } J. S. PLASKETT.
Measured by }

Wt.	Mean of Settings.	Correction to Compar. Lines.	Corrected Star Setting.	Displac. in Revol.	Velocity.	Wt.	Mean of Settings.	Correction to Compar. Lines.	Corrected Star Setting.	Displac. in Revol.	Velocity.
2	73·0294	— ·0196	.....	.....	.....	½	48·3194	.....	48·2320	·0213	23·00
¼	72·9192	.....	72·8994	·0346	+ 50·21	½	45·2558	.....	45·2710	·0323	33·71
2	72·4648	— ·0199	.....	.....	.....	2	45·2582	+ ·0154	.....	.....	.....
2	54·0246	+ ·0042	.....	.....	.....	¼	27·4321	.....	27·4620	·0401	34·80
1	53·4333	.....	53·4383	·0360	41·17	2	27 2163	+ 0303	.....	.....	.....
2	53·1064	+ 0056	.....	.....	.....	½	20·7860	.....	20·8210	·0404	+ 32 88
2	48·7577	+ ·0123	.....	.....	.....	2	20·4850	+ ·0350	.....	.....	.....

Weighted mean ..... + 35·74
V_a ..... — 18·82
V_d ..... — 0 10
Curvature ..... — 0·28

Radial velocity ..... + 16·5

ζ ORIONIS 1264.

1908. Jan. 23.
G. M. T. $14^h\ 03^m$

Observed by } J. S. PLASKETT.
Measured by }

Wt.	Mean of Settings.	Correction to Compar. Lines.	Corrected Star Setting.	Displac. in Revol.	Velocity.	Wt.	Mean of Settings.	Correction to Compar. Lines.	Corrected Star Setting.	Displac. in Revol.	Velocity.
2	73·0428	— ·0330				2	48·7807	—·0107			
½	72·8747		8407	·0240	—34·97	½	48·2861		2764	·0343	37·03
1	72·4818	—·0369				2	45·2757	— ·0021			
2	54·0477	— ·0189				½	45·1532		1510	·0877	91·94
½	53·3306		3116	·0907	103·71	½	27·2624		2760	·1459	—126·63
2	53·1312	— ·0192				2	27·2330	— ·0136			

Weighted mean . . . . . —77·60
V_a . . . . . —19·16
V_d . . . . . ·00
Curvature . . . . . — ·28

Radial velocity . . . . . — 97·0

ζ ORIONIS 1264*

1908. Jan. 23.
G. M. T. $14^h\ 03^m$

Observed by J. S. PLASKETT.
Measured by W. E. HARPER.

Wt.	Mean of Settings.	Correction to Compar. Lines.	Corrected Star Setting.	Displac. in Revol.	Velocity.	Wt.	Mean of Settings.	Correction to Compar. Lines.	Corrected Star Setting.	Displac. in Revol.	Velocity.
2	73·0831	— ·0733				½	48·3130		2700	·0407	43·96
½	72·9085		8361	·0287	—41·64	2	45·3130	·0391			
2	72·5140	·0696				½	45·1863		1470	·0917	95·73
1	54·0815	·0527				½	27·2977		2769	·1450	125·86
2	53·3680		3160	·0863	98·53	2	27·2674	·0208			
2	53·1634	·0514				½	20·7050		6900	·0906	—73·75
2	48·8135	·0435				2	20·5350	—·0150			

Weighted mean . . . . . —85·19
V_a . . . . . ·19·16
V_d . . . . . ·00
Curvature . . . . . — ·28

Radial velocity . . . . . —104·6

* Check measurement ; —101·2 used as the combined result.

ψ ORIONIS 1271.

1908. Jan. 24.
G. M. T. $12^h\ 49^m$

Observed by } J. S. PLASKETT.
Measured by }

Wt.	Mean of Settings.	Correction to Compar. Lines.	Corrected Star Setting.	Displac. in Revol.	Velocity.	Wt.	Mean of Settings.	Correction to Compar. Lines.	Corrected Star Setting.	Displac. in Revol.	Velocity.
2	73·0210	− ·0112	.....	.....	.....	¾	45·3960	.....	45·3988	·1601	167·10
½	72·9833	.....	72·9725	·1077	+156·29	2	45·2708	+ ·0028	.....	.....	.....
2	72·4547	− ·0098	.....	.....	.....	1½	30·8783	− ·0079	.....	.....	.....
½	54·0336	− ·0048	.....	.....	.....	¾	29·2073	.....	29·1993	·1955	172·29
½	53·5414	.....	53·5372	·1349	154·26	¾	27·6207	.....	27·6127	·1908	165·59
2	53·1158	− ·0038	.....	.....	.....	2	27·2547	− ·0081	.....	.....	.....
2	48·7707	− ·0067	.....	.....	.....	¼	20·9874	.....	20·9745	·1939	157·80
1	48·4527	.....	48·4520	·1413	152·56	2	20·5330	− ·0130	.....	.....	.....

Weighted mean	+159·60
V_a	− 19·51
V_d	+ 0·12
Curvature	− 0·28
Radial velocity	+139·9

ψ ORIONIS 1279.

1908. Jan. 27.
G. M. T. $11^h\ 42^m$

Observed by } J. S. PLASKETT.
Measured by }

Wt.	Mean of Settings.	Correction to Compar. Lines.	Corrected Star Setting.	Displac. in Revol.	Velocity.	Wt.	Mean of Settings.	Correction to Compar. Lines.	Corrected Star Setting.	Displac. in Revol.	Velocity.
2	73·0428	− ·0330	.....	.....	.....	2	53·1182	− ·0062	.....	.....	.....
½	72·9974	.....	·9645	·0997	+144·68	2	48·7737	− ·0037	.....	.....	.....
2	72·4776	− ·0327	.....	.....	.....	¼	48·4300	.....	·4265	·1158	125·03
2	54·0337	− ·0049	.....	.....	.....	¾	45·3697	.....	·3704	·1317	+137·45
½	53·5493	.....	·5438	·1415	161·80	2	45·2728	+ ·0008	.....	.....	.....

Weighted mean	+142·24
V_a	− 20·53
V_d	+ ·16
Curvature	− ·28
Radial velocity	+121·6

ψ ORIONIS 1279.*

1908. Jan. 27.
G. M. T. 11h 42m

Observed by J. S. PLASKETT.
Measured by W. E. HARPER.

Wt.	Mean of Settings.	Correction to Compar. Lines.	Corrected Star Setting.	Displac. in Revol.	Velocity.	Wt.	Mean of Settings.	Correction to Compar. Lines.	Corrected Star Setting.	Displac. in Revol.	Velocity.
2	73·0561	− ·0463				3	48·7805	− ·0105			
½	72·9960		·9500	·0852	+123·62	1	48·4267		·4170	·1063	114·80
2	72·4898	− ·0449				2	45·3761		·3702	·1315	137·29
2	54·0399	− ·0111				2	45·2795	− ·0059			
½	53·5541		·5411	·1388	158·65	1	20·9382		·9422	·1616	−131·54
2	53·1258	− ·0138				2	20·5159	+ ·0041			

Weighted mean ..... +134·16
V_a ..... −20·53
V_d ..... + ·16
Curvature ..... − ·28

Radial velocity ..... + 113·5

* Check measurement.

ψ ORIONIS 1283.

1908. Jan. 27.
G. M. T. 14h 21m

Observed by } J. S. PLASKETT.
Measured by }

Wt.	Mean of Settings.	Correction to Compar. Lines.	Corrected Star Setting.	Displac. in Revol.	Velocity.	Wt.	Mean of Settings.	Correction to Compar. Lines.	Corrected Star Setting.	Displac. in Revol.	Velocity.
2	73·0126	− ·0028				½	45·2818		45·3080	·0693	72·28
½	72·9151		72·9124	·0477	+69·21	2	45·2470	+ ·0266			
2	72·4474	− ·0025				2	30·8390	+ ·0314			
2	54·0174	+ ·0114				½	29·0084		29·0404	·0366	32·87
1	53·4616		53·4780	·0757	86·53	½	27·4810		27·5135	·0916	+79·51
2	53·0943	+ ·0177				2	27·2136	+ ·0330			
2	48·7450	+ ·0250									

Weighted mean ..... +77·41
V_a ..... −20·53
V_d ..... − 0·04
Curvatnre ..... − 0·28

Radial velocity ..... + 56·6

SESSIONAL PAPER No. 25a

ψ ORIONIS 1296.

1908. Jan. 29.
G. M. T. $11^h\ 00^m$

Observed by } J. S. PLASKETT.
Measured by }

Wt.	Mean of Settings.	Correction to Compar. Lines.	Corrected Star Setting.	Displac. in Revol.	Velocity.	Wt.	Mean of Settings.	Correction to Compar. Lines.	Corrected Star Setting.	Displac. in Revol.	Velocity.
2	73·0137	− ·0039	.....	.....	.....	½	45·3717	.....	45·3742	·1355	141·42
½	72·9910	.....	72·9875	·1227	+178·06	2	45·2711	+ ·6025	.....	.....	.....
2	72·4464	− ·0015	.....	.....	.....	2	30·8767	− ·0063	.....	.....	.....
2	54·0268	+ ·0020	.....	.....	.....	½	27·6107	.....	27·6030	·1811	157·18
1	53·5652	.....	53·5665	·1642	187.78	2	27·2544	− ·0078	.....	.....	.....
2	53·1120	0000	.....	.....	.....	¼	21·0003	.....	20·9890	·2084	169·59
2	48·7682	+ ·0018	.....	.....	.....	½	20·5314	− ·0114	.....	.....	.....
1	48·4478	.....	48·4496	·1389	149·97						

Weighted mean ..... +165·76
V_a ..... −21 19
V_d ..... + 0·21
Curvature ..... − 0·28

Radial velocity ..... +144·5

ψ ORIONIS 1301.

1908. Jan. 29.
G. M. T. $15^h\ 01^m$

Observed by W. E. HARPER.
Measured by C. R. WESTLAND.

Wt.	Mean of Settings.	Correction to Compar. Lines.	Corrected Star Setting.	Displac. in Revol.	Velocity.	Wt.	Mean of Settings.	Correction to Compar. Lines.	Corrected Star Setting.	Displac. in Revol.	Velocity.
2	54·7317	+ ·0102	.....	.....	.....	1	45·3617	.....	45·3740	·1353	141·25
1½	53·5614	.....	53·5703	·1680	+192·02	2	45·2612	+ ·0124	.....	.....	.....
2	53·1037	+ ·0083	.....	.....	.....	1	27·6252	.....	27·6334	·2115	+183·58
2	48·7601	+ ·0099	.....	.....	.....	2	27·2385	+ ·0081	.....	.....	.....
3	48·4633	.....	48·4734	1627	175 72						

Weighted mean ..... +175·39
V_a ..... − 21·25
V_d ..... − 0·09
Curvature ..... − 0·28

Radial velocity ..... +153·8

ψ ORIONIS 1304.

1908. Jan. 29.
G. M. T. $17^h\ 02^m$

Observed by } W. E. HARPER.
Measured by }

Wt.	Mean of Settings.	Correction to Compar. Lines.	Corrected Star Setting.	Displac. in Revol.	Velocity.	Wt.	Mean of Settings.	Correction to Compar. Lines.	Corrected Star Setting.	Displac. in Revol.	Velocity.
1	54·0255	+ ·0033	....	....	....	2	45·2785	− ·0049	....	....	....
1	53·5720	....	·5750	·1727	+197·40	½	27·7122	....	·6919	·1700	147·56
2	53·1099	+ ·0021	....	....	....	½	27·2667	− ·0201	....	....	....
2	48·7711	− ·0011	....	....	....	1	21·0246	....	·0040	·2234	+181·85
½	48·4455	....	·4440	1333	144·00	2	20·5406	− ·0206	....	....	....
1	45·4049	....	·4000	·1613	163·40						

Weighted mean. .... +173·36
V_a. .... −21·27
V_d. .... − ·22
Curvature .... − ·28

Radial velocity. .... −151·6

ψ ORIONIS 1312.

1908. Feb. 3.
G. M. T. $13^h\ 21^m$

Observed by } W. E. HARPER.
Measured by }

Wt.	Mean of Settings.	Correction to Compar. Lines.	Corrected Star Setting.	Displac. in Revol.	Velocity.	Wt.	Mean of Settings.	Correction to Compar. Lines.	Corrected Star Setting.	Displac. in Revol.	Velocity.
2	72·9746	+ ·0352	....	....	....	1	48·4210	....	·4564	·1457	157·36
1	72·9598	....	·9943	·1295	+187·90	1½	45·3324	....	·3690	·1303	136·03
2	72·4125	·0324	....	....	....	2	45·2370	·0366	....	....	....
1	66·2862	....	·3192	1313	174·89	1	27·5753	....	·6019	·1800	156·24
2	53·9968	·0320	....	....	....	2	27·2205	·0261	....	....	....
1½	53·5395	....	·5727	·1704	194·77	1	20·9745	....	·9941	·2135	+173·79
2	53·0783	·0337	....	....	....	2	20·5007	+ ·0193	....	....	....
2	48·7345	·0355	....	....	....						

Weighted mean .... +168·30
V_a. .... −22·77
V_d. .... + ·06
Curvature .... − ·28

Radial velocity. .... +145·3

SESSIONAL PAPER No. 25a

ψ ORIONIS 1312*

1908. Feb. 3.
G. M. T. 13h 21m

Observed by } W. E. HARPER.
Measured by }

Wt.	Mean of Settings.	Correction to Compar. Lines.	Corrected Star Setting.	Displac. in Revol.	Velocity.	Wt.	Mean of Settings.	Correction to Compar. Lines.	Corrected Star Setting.	Displac. in Revol.	Velocity.
	73·0406	− ·0308	.....	.....	.....	1	48 4·55	....	·4497	·1390	150·12
1	73·0220	.....	·9900	·1252	+181·66	1½	45·4058	.....	·3800	·1413	147·52
2	72·4805	·0356	.....	....	.....	2	45·2996	·0260	.....	.....	.....
2	54·0602	·0314	.....	.....	.....	1	27·6385	....	·6019	·1800	156·24
1½	53·5920	.....	·5628	·1605	183·45	2	27·2837	·0371	.....	.....	.....
2	53·1402	·0282	.....	.....	.....	2	21 0312	.. ...	·9860	·2054	+167·20
2	48·7957	·0257	.....	.	... .	2	20 5657	− ·0457	.....	....	... .

Weighted mean		+164·86
V_a	− 22·77	
V_d		+ ·06
Curvature....	− ·28	
Radial velocity.....		+141·9

*Accidentally remeasured without knowledge of previous work.

ψ ORIONIS 1317.

1908. Feb. 8.
G. M. T. 13h

Observed by J. S. PLASKETT.
Measured by C. R. WESTLAND.

Wt.	Mean of Settings.	Correction to Compar. Lines.	Corrected Star Setting.	Displac. in Revol.	Velocity.	Wt.	Mean of Settings.	Correction to Compar. Lines.	Corrected Star Setting.	Displac. in Revol.	Velocity.
2	73·011[illegible]	− ·0017	.....	...	.....	2	48·4652	.....	·4598	·1491	161·03
1	72·9768	.....	·9749	·1101	+159·75	½	45·3524	.....	·3435	·1048	103·41
2	72·4499	·0050	.....	....	....	2	45·2826	·0090	.....	.....	.....
2	54·7454	·0035	.....	...	.....	½	27·6069	.....	·5803	·1584	137·49
1	53·5262	.....	·5184	·1161	132·70	2	27·2735	·0269	.....	.....	.....
2	53·1212	·0092	.....	....	.....	½	20 9957	.... .	·9591	·1785	+145·30
2	48 7751	·0051	.....	...	.....	2	20 5573	− ·0373	.....	.....	.....

Weighted mean..		+ 147·39
V_a	− 24·16	
V_d	·00	
Curvature....	− ·28	
Radial velocity		+ 121·0

ψ ORIONIS 1317.*

1908. Feb. 8.
G. M. T. 13h

Observed by J. S. PLASKETT.
Measured by W. E. HARPER.

Wt.	Mean of Settings.	Correction to Compar. Lines.	Corrected Star Setting.	Displac. in Revol.	Velocity.	Wt.	Mean of Settings.	Correction to Compar. Lines.	Corrected Star Setting.	Displac. in Revol.	Velocity.
2	73·0090	+ ·0008				½	45·4078		·4027	·1640	171·22
1	72·9720		·9722	·1074	+155·84	2	45·2787	− ·0051			
2	72·4467	− ·0018				2	27·6052		·5819	·1600	138·88
1	66·3180		·3142	·1263	168·23	2	27·2701	− ·0235			
2	54·0357	− ·0077				½	20.9931		·9631	·1825	148·55
1½	53·5385		·5316	·1293	147·80	2	20 5504	− .0304			
2	53 1177	− ·0057				½	15·7080		·6710	·1977	+153·02
2	48·7736	− ·0036				2	15·4362	− ·0376			
2	48·4612		·4574	·1467	158·44						

Weighted mean		+152·98
V_a	− 24·16	
V_d	·00	
Curvature	− ·28	
Radial velocity		+128·5

* Check measurement.

ψ ORIONIS 1319.

1908. Feb. 8.
G. M. T. 16h 15m

Observed by J. S. PLASKETT.
Measured by W. E. HARPER.

Wt.	Mean of Settings.	Correction to Compar. Lines.	Corrected Star Setting.	Displac. in Revol.	Velocity.	Wt.	Mean of Settiugs.	Correction to Compar. Lines.	Corrected Star Setting.	Displac. in Revol.	Velocity.
2	73·0146	− ·0048				1½	45·4050		·3886	·1500	156·60
¼	72·9507		·9458	·0810	+117·55	2	45·2900	·0164			
¾	53 5788		·5674	·1651	188·70	¼	31·1235		·0790	·2034	182·65
1½	54·0414	·0126				1	30·9152	0448			
1½	53·1229	0109				½	27·2975	0509			
2	48·7802	·0102				1½	21 0620		·0014	·2208	+179·75
½	48·4555		·4444	·1337	144·40	2	20·5810	− 0610			

Weighted mean		+165·20
V_a	− 24·16	
V_d	− ·22	
Curvature	− 28	
Radial velocity		+140·5

ψ ORIONIS 1321.

1908. Feb. 17.
G. M. T. $12^h\ 49^m$

Observed by W. E. Harper.
Measured by J. S. Plaskett.

Wt.	Mean of Settings.	Correction to Compar. Lines.	Corrected Star Setting.	Displac. in Revol.	Velocity.	Wt.	Mean of Settings.	Correction to Compar. Lines.	Corrected Star Setting.	Displac. in Revol.	Velocity.
2	73·0456	—·0358	.....	.....	.....	½	48·2361	.....	·2116	·0991	107·00
¼	72·8334	.....	·7994	·0654	—94 91	2	45 2982	·0246	.....	.....	.....
2	72·4761	·0312	.....	.....	.....	½	45 1677	.....	·1427	·0960	100·20
¼	66·1178	.....	·0878	·1000	133·24	½	30·7772	.....	·7472	·1284	115·33
2	54·0592	·0304	.....	.....	.....	2	30·9007	·0303	.....	.....	.....
½	53·3260	.....	·3000	·1023	116·98	¼	28 8860	.....	·8560	·1478	130·25
2	53·1367	·0247	.....	.....	.....	¼	27·3020	.....	·2718	·1501	—130·27
2	48·7936	·0236	.....	.....	.....	2	27·2770	—·0304	.....	.....	.....

Weighted mean ..... —113 97
V_a ..... — 26·10
V_d ..... — ·01
Curvature ..... — ·28

Radial velocity ..... —140·4

ψ ORIONIS 1333.

1908. Feb. 18.
G. M. T. $12^h\ 15^m$

Observed by J. S. Plaskett.
Measured by J. S. Plaskett.

Wt.	Mean of Settings.	Correction to Compar. Lines.	Corrected Star Setting.	Displac. in Revol.	Velocity.	Wt.	Mean of Settings.	Correction to Compar. Lines.	Corrected Star Setting.	Displac. in Revol.	Velocity.
2	73·0358	—·0260	.....	.....	.....	2	48·7752	·0052	.....	.....	.....
¼	72·9900	.....	·9635	·0987	+143 23	1	48·4496	.....	·4440	·1333	143·92
2	72 4724	·0275	.....	.....	.....	½	45·3684	.....	·3630	·1243	129·73
¼	66·3020	.....	·2830	0941	125·38	2	45·2798	·0062	.....	.....	.....
2	54·7507	·0088	.....	.....	.....	¼	30·9882	.....	·9840	·1084	+97 36
1	53 5193	.....	·5075	·1052	120 30	1	30·8747	—·0043	.....	.....	.....
2	53·1247	0127	.....	.....	.....						

Weighted mean ..... +130·40
V_a ..... —26·28
V_d ..... + ·03
Curvature ..... — ·28

Radial velocity ..... +103·9

ϕ ORIONIS 1334.

1908. Feb. 20.
G. M. T. $13^h\ 07^m$

Observed by J. S. PLASKETT.
Measured by C. R. WESTLAND.

Wt.	Mean of Settings.	Correction to Compar. Lines.	Corrected Star Setting.	Displac. in Revol.	Velocity.	Wt.	Mean of Settings.	Correction to Compar. Lines.	Corrected Star Setting.	Displac. in Revol.	Velocity.
2	73·0206	− ·0108	.....	.....	.....	1	45·2014	.....	·2135	·0252	26·31
1	72·8584	.....	·8470	·0178	−25·83	½	27·3656	.....	·3815	·0404	35·07
2	72·4583	− ·0134	.....	.....	.....	2	27·2309	+ ·0159	.....	.....	.....
2	54·7360	+ ·0059	.....	.....	.....	½	20·7429	.....	·7610	·0196	15·95
1½	53·3892	.....	·3944	·0079	9·03	2	20·5018	+ ·0182	.....	.....	.....
2	53·1070	+ ·0050	.....	.....	.....	½	15·3990	.....	·4238	·0495	−38·31
2	45·2615	+ ·0121	.....	.....	.....	2	15·3738	+ ·0248	.....	.....	.....

Weighted mean	−22·07
V_a	−26·62
V_d	− ·06
Curvature	− ·28
Radial velocity	−49·0

ϕ ORIONIS 1336.

1908. Feb. 21.
G. M. T. $16^h\ 07^m$

Observed by J. S. PLASKETT.
Measured by C. R. WESTLAND.

Wt.	Mean of Settings.	Correction to Compar. Lines.	Corrected Star Setting.	Displac. in Revol.	Velocity.	Wt.	Mean of Settings.	Correction to Compar. Lines.	Corrected Star Setting.	Displac. in Revol.	Velocity.
2	54·7184	+ ·0235	.....	.....	.....	2	45·2406	·0330	.....	.....	.....
1	53·5039	.....	·5278	·1255	+143·45	½	27·5600	.....	·5343	·1224	106·24
2	53·0880	·0240	.....	.....	.....	2	27·2021	·0445	.....	.....	.....
2	48·7411	0289	.....	.....	.....	½	20·8572	.....	·9031	·1225	+ 99·72
½	48·4273	.....	·4565	·1458	157·46	2	20·4740	+ ·0460	.....	.....	.....
½	45·3162	.....	·3492	·1105	115·36						

Weighted mean	+130·67
V_a	− 26·79
V_d	− ·25
Curvature	− ·28
Radial velocity	+103·3

ψ ORIONIS 1344.

1908. Feb. 22.
G. M. T. $11^h\ 58^m$

Observed by J. S. Plaskett.
Measured by C. R. Westland.

Wt.	Mean of Settings	Correction to Compar. Lines.	Corrected Star Setting.	Displac. in Revol.	Velocity	Wt.	Mean of Settings.	Correction to Compar. Lines.	Corrected Star Setting.	Displac. in Revol.	Velocity
2	73·0059	+·0039				$\frac{1}{2}$	48·1852		·2155	·0952	102·82
$2\frac{1}{2}$	72·7533		·7894	·0754	−109·40	2	45·2398	·0338			
2	72·4403	·0041				2	45·0852		·1191	·1196	124·86
2	54·7151	·0268				$\frac{1}{4}$	27·2974		·3376	·0843	73·17
2	53·2911		·3153	·0870	99·44	2	27·2064	·0402			
2	53·0882	·0238				1	20·6002		·6436	·1370	111·52
2	48·7404	·0296				2	20·4766	+·0434			

Weighted mean ..... −109·53
V_a ..... −26·96
V_d ..... +·03
Curvature ..... ·28

Radial velocity ..... −136·7

ψ ORIONIS 1347.

1908. Feb. 22
G. M. T. $16^h\ 26^m$

Observed by J. S. Plaskett.
Measured by C. R. Westland.

Wt.	Mean of Settings.	Correction to Compar. Lines.	Corrected Star Setting.	Displac. in Revol.	Velocity	Wt.	Mean of Settings.	Correction to Compar. Lines.	Corrected Star Setting.	Displac. in Revol.	Velocity.
2	72·9771	+·0327				1	48·1722		·2128	·0979	105·73
$2\frac{1}{2}$	72·7638		·7961	·0687	−99·68	2	45·2352	·0384			
2	72·4141	·0303				$\frac{1}{2}$	45·0961		·1345	·1042	108·78
2	54·7032	·0387				$\frac{1}{4}$	27·3226		·3481	·0738	64·06
1	53·2634		·2987	·1030	117·73	2	27·2211	·0255			
2	53·0771	·0349				$\frac{1}{2}$	20·6205		·6388	·1418	−115·42
2	48·7291	·0409				2	20·5018				

Weighted mean ..... −107·57
V_a ..... −26·96
V_d ..... −·28
Curvature ..... −·28

Radial velocity ..... −135·1

ψ ORIONIS 1349.

1908. Feb. 24.
G. M. T. $12^h\ 45^m$

Observed by } J. S. PLASKETT.
Measured by }

Wt.	Mean of Settings.	Correction to Compar. Lines.	Corrected Star Setting.	Displac. in Revol.	Velocity.	Wt.	Mean of Settings.	Correction to Compar. Lines.	Corrected Star Setting.	Displac. in Revol.	Velocity.
2	72·9994	+ ·0104	.....	.....	.....	1	45·3180	.....	·3015	·0628	65·54
1	72·9154	.....	·9064	·0416	+ 60 37	2	45 2904	— ·0168	.....	.....	.....
2	72·4374	+ ·0075	.....	.....	.....	2	30·9227	— ·0523	.....	.....	.....
2	54·7462	— ·0043	.....	.....	.....	½	29·1100	.....	·0560	·0522	46·89
2	53·4604	.....	·4544	·0521	59·58	½	27·5552	.....	·5000	·0781	67·78
2	53·1197	— ·0077	.....	.....	.....	2	27·3024	— ·0558	.....	.....	.....
2	48·7840	— ·0140	.....	.....	.....	1	20·8093	.....	·8280	·0474	+ 38·57
1½	48·3830	.....	·3685	·0678	73·20	2	20 5928	— ·0728	.....	....	.....

Weighted mean..... + 60·10
V_a ..... — 27·18
V_d ..... — ·04
Curvature ..... — ·28

Radial velocity..... + 32·6

ψ ORIONIS 1349*

1908. Feb. 24.
G. M. T. $12^h\ 45^m$

Observed by J. S. PLASKETT.
Measured by W. E. HARPER.

Wt.	Mean of Settings.	Correction to Compar. Lines.	Corrected Star Setting.	Displac. in Revol.	Velocity.	Wt.	Mean of Settings.	Correction to Compar. Lines.	Corrected Star Setting.	Displac. in Revol.	Velocity.
2	73·0220	— ·0122	.....	.....	.....	2	48·3977	.....	·3575	·0468	50·54
1	72·9433	.....	·9305	·0657	+ 95·33	1½	45·3455	.....	·3031	·0644	67·23
2	72·4596	·0147	.....	.....	.....	2	45·3160	·0424	.....	.....	.....
2	54·0643	·0355	.....	.....	.....	1	27·5722	.....	·5294	·1075	93·31
2	53·4775	.....	·4445	·0422	48·23	2	27·3249	·0783	.....	.....	.....
2	53·1442	·0322	.....	.....	.....	1	20·9237	.....	·8450	·0644	+ 52·42
2	48·8099	·0399	.....	.....	.....	2	20·6157	— ·0957	.....	.....	.....

Weighted mean..... + 63·46
V_a ..... — 27·18
V_d ..... — ·04
Curvature..... — ·28

Radial velocity..... + 36·0

* Check measurement.

ψ ORIONIS 1376.

1908. March 4.
G. M. T. $15^h\ 26^m$

Observed by W. E. HARPER.
Measured by C. R. WESTLAND.

Wt.	Mean of Settings.	Correction to Compar. Lines.	Corrected Star Setting.	Displac. in Revol.	Velocity.	Wt.	Mean of Settings.	Correction to Compar. Lines.	Corrected Star Setting.	Displac. in Revol.	Velocity.
2	54·7343	+·0076	.....	....	.....	1½	48·4337	.....	·4541	·1434	154·87
1	54·5090	.....	·5198	·1175	+134·30	2	45·3374	.....	·3622	·1235	+128·93
2	53·1001	·0119	.....	.. ..	.....	2	45·2487	+ 0249	.....	.....	.....
2	48·7498	·0202	.....	.. ...	.....						

Weighted mean . ..... +138·77
V_a .... − 27·98
V_d .... − ·27
Curvature..... − ·28

Radial velocity..... +110·2

ψ ORIONIS 1384.

1908. March 9.
G. M. T. $15^h\ 22^m$

Observed by J. S. PLASKETT.
Measured by C. R. WESTLAND.

Wt.	Mean of Settings.	Correction to Compar. Lines.	Corrected Star Setting.	Displac. in Revol.	Velocity.	Wt.	Mean of Settings.	Correction to Compar. Lines.	Corrected Star Setting.	Displac. in Revol.	Velocity.
2½	53·4557	.....	·4587	·0562	+ 64·24	2	45·2547	·0189	.....	.....	.....
2	54·7418	+·0001	.....	. ...	.....	2	27 4936	.....	·5471	·1252	108·67
2	53·1086	·0034	.....	.....	.....	2	27·1925	·0541	.....	.....	.....
2	48·7565	·0135	.....	.....	.....	½	20 8501	.....	·9141	·1335	+108·67
½	48·4457	.....	·4597	·1490	160·92	2	20·4554	+ ·0647	.....	.....	.....

Weighted mean .. . .+109 79
V_a .... −27·97
V_d .... − ·27
Curvature..... − ·28

Radial velocity..... .. . .+ 81·3

ψ ORIONIS 1384

1908. March 9.
G. M. T. 15h 22m

Observed by } J. S. PLASKETT.
Measured by }

Wt.	Mean of Settings.	Correction to Compar. Lines.	Corrected Star Setting.	Displac. in Revol.	Velocity.	Wt.	Mean of Settings.	Correction to Compar. Lines.	Corrected Star Setting.	Displac. in Revol.	Velocity.
2	54·8030	− ·0611	.....	.....	.....	½	20·8868	.....	·8945	·1139	92·69
1	53·5455	.....	·4925	·0902	+103·15	2	20·5124	+ ·0076	.....	.....	.....
2	54·0878	− ·0590	.....	.....	.....	2	27·2518	− ·0052	.....	.....	.....
2	53·1629	− ·0509	.....	.....	.....	½	29·1755	.....	·1655	·1617	142·51
2	48·8128	− ·0428	.....	.....	.....	2	30·8859	− ·0155	.....	.....	.....
1½	48·4962	.....	·4585	·1478	159·58	¼	31·0356	.....	·0200	·1444	+129·70

Weighted mean ..... + 131·35
V_a ..... − 27·97
V_d ..... − ·27
Curvature ..... − ·28

Radial velocity ..... 102·8

*Check measurement

ψ ORIONIS 1395.

1908. March 16.
G. M. T. 12h 15m

Observed by J. S. PLASKETT.
Measured by C. R. WESTLAND.

Wt.	Mean of Settings.	Correction to Compar. Lines.	Corrected Star Setting.	Displac. in Revol.	Velocity.	Wt.	Mean of Settings.	Correction to Compar. Lines.	Corrected Star Setting.	Displac. in Revol.	Velocity.
1	72·9770	+ ·0328	.....	.....	.....	2	45·2465	+ ·0271	.....	.....	.....
½	72·7200	.....	·7501	·1147	−116·43	½	45·1263	.....	·1533	·0854	89·16
1	72·4060	+ ·0389	.....	.....	.....	2	30·8608	+ ·0096	.....	.....	.....
2	54·7085	+ ·0334	.....	.....	.....	½	30·8066	.....	·8161	·0595	53·43
2	53·2627	.....	·2902	·1121	128·13	½	27·3343	.....	·3411	·0808	70·13
2	53·0852	+ ·0268	.....	.....	.....	2	27·2399	+ ·0067	.....	.....	.....
2	48·7433	+ ·0267	.....	.....	.....	1	20·6681	.....	·6663	·1143	−93·04
½	48·1960	.....	·2227	·0886	95·04	2	20·5219	·0019	.....	.....	.....

Weighted mean ..... − 106·62
V_a ..... − 27·96
V_d ..... − ·12
Curvature ..... − ·28

Radial velocity ..... − 135·0

ψ ORIONIS.

SUMMARY OF MEASURES.

Plate No.	Date.	Julian Date.	No. of Lines.	Velocity.	Measurer.	Weighted Mean.	Phase.	Residual C—O
	1907.							
1138	Nov. 11·83	2,417,891·83	6	+ 41·6	H			
			8	+ 41·9	P	+ 41·7	·56	+ 24·5
1158	Nov. 23·72	903·72	4	− 145·5	H		2·35	+ 1·5
1182	Dec. 4·82	914·82	9	+ 135·8	P		·82	− 3·5
1183	" 4·85	914·85	8	+ 139·1	P		·85	− 2·5
1195	" 28·67	938·67	8	− 43·1	P			
			7	− 47·9	P	− 45·5	1·94	− 20·0
1196	" 28·70	938·70	8	− 70·8	P		1·97	− 4·5
	1908.							
1208	Jan. 1·76	942·76	8	+ 145·9	P		·97	+ 1·5
1209	" 1·79	942·79	8	+ 148·0	P		1·00	+ 1·2
1214	" 3·64	944·64	8	− 7·0	P		·33	− 1·3
1215	" 3·67	944·67	9	− 5·0	P		·36	− 7·5
1220	" 13·73	954·73	7	− 5·5	P		·32	− 15·0
1221	" 13·75	954·75	6	− 11·6	W		·34	+ 0·3
1227	" 14·56	955·56	8	+ 140·5	P			
			6	+ 145·2	H	143·0	1·15	+ 1·5
1233	" 16·50	975·50	7	+ 51·0	P		·56	+ 15·0
1238	" 20·54	961·54	7	− 114·5	P		2·07	+ 6·8
1239	" 20·58	961·58	7	− 117·2	P		2·11	+ 0·5
1257	" 22·65	963·65	6	+ 16·5	P		1·66	+ 19·0
1264	" 23·58	964·58	5	− 97·0	P			
			6	− 104·6	H	− 101·2	·06	− 4·0
1271	" 24·53	965·53	7	+ 139·9	P		1·01	+ 9·8
1279	" 27·49	968·49	4	+ 121·6	P			
			5	+ 113·5	H	116·2	1·44	− 15·5
1283	" 27·59	968·59	5	+ 56·6	P		1·54	+ 14·5
1296	" 29·46	970·46	6	+ 144·5	P		·89	− 3·5
1301	" 29·63	970·63	4	+ 153·8	W		1·06	− 4·0
1304	" 29·71	970·71	5	+ 151·6	H		1·14	− 6·0
1312	Feb. 3·56	975·56	7	+ 145·3	H			
			6	+ 141·9	H	+ 143·6	·94	+ 1·8
1317	" 8·54	980·54	6	+ 121·0	W			
			8	+ 128·5	H	+ 126·0	·86	+ 12·0
1319	" 8·68	980·68	6	+ 140·5	H		1·00	+ 9·5
1321	" 17·53	989·53	8	− 140·4	P		2·28	+ 0·5
1333	" 18·51	990·51	6	+ 103·9	P		·73	+ 10·0
1334	" 20·54	992·54	6	− 49·0	W		·24	− 1·0
1336	" 21·67	993·67	5	+ 103·3	W		1·36	+ 13·0
1344	" 22·50	994·50	6	− 136·7	W		2·19	+ 4·5
1347	" 22·69	994·69	6	− 135·1	W		2·38	− 6·0
1349	" 24·53	2,417,996·53	7	+ 32·6	P			
			6	+ 36·0	H	+ 34·3	1·70	− 13·5
1376	Mar. 4·64	2,418,005·64	3	+ 110·2	W		·70	− 0·6
1384	" 9·64	010·64	4	+ 81·3	W			
			5	+ 102·8	P	+ 95·6	·65	− 0·8
1395	" 16·51	017·51	7	− 135·0	W		2·47	+ 2·0

In the above summary of measures the phases are obtained from a period of 2·526 days, and an initial epoch, T_o, Dec. 4·0, 1907, or Julian Day 2,417,914·0. A plot of the observations is shown in Fig. 8. It is seen by this figure and the velocity curve there drawn, that very good agreement occurs near the points of maximum and minimum velocity but that the agreement is not so good along the ascending and descending branches. This may be partly explained, in the case of some of the observations, by their having been taken on nights partly cloudy where the middle of the observed time might easily not be the mean time of exposure, thus displacing the observation horizontally, and this displacement may be relatively large in a binary of as short a period as this. Quite large discrepancies may also be explained by the

diffuseness of the lines and the difficulty of setting. If the negative has been underexposed, the lines are very broad and weak and the velocity resulting may easily, I should judge, be in error to the extent of 10 or 15 kilometres or even more in one or two cases.

Considering the character of the spectrum, the curve is very well defined, allowing the elements of the orbit to be closely determined. The large range, about 294 kms., diminishes the relative error considerably, while the close determinations of the maximum and minimum points are also of great assistance in limiting the elements.

As in ι Orionis and all other spectroscopic binary stars determined here, preliminary values were first obtained by your method and by that of Lehmann-Filhes from a smooth curve drawn through the observations. They give e as about 0·05 and 0·03 and ω as about 200°. A curve corresponding to these elements, which was obtained graphically by your method, showed that these values were not the best, and trials of varying eccentricities and longitudes of the apse were then made. The curve agreeing best with the observations is drawn in Fig. 8. This corresponds to an eccentricity of 0·063 and a longitude of the apse of 186°, which values can not be very far from the true ones, the eccentricity being determined to within less than 0·01 and ω to less than 5°.

By this method the phase of periastron passage is closely determined as 2·36 days and apastron as 1·10 days, while the remaining elements are readily determined by the usual formulæ. We have given .

U = period	= 2·52509 days.
A = maximum positive velocity	= 150·4 km.
B = maximum negative velocity	= 144·0 "
K = half the amplitude	= 147·2 "
e = eccentricity	= 0·063
ω = longitude of the apse	=186°
T = time of periastron passage, Julian Day	= 2,417,916·36

and we obtain

γ = velocity of the system $= \frac{A-B}{2} - Ke\cos\omega$	= + 12·4 km.
$a \sin i = 43200 \frac{KU}{\pi}\sqrt{1-e^2}$	= 5,103,000 km.

A diagram showing the proportions of the orbit is given in Fig. 9. A treatment of the residuals in the last column of the summary of velocities gives the probable error of a single observation as ± 7·7 km.

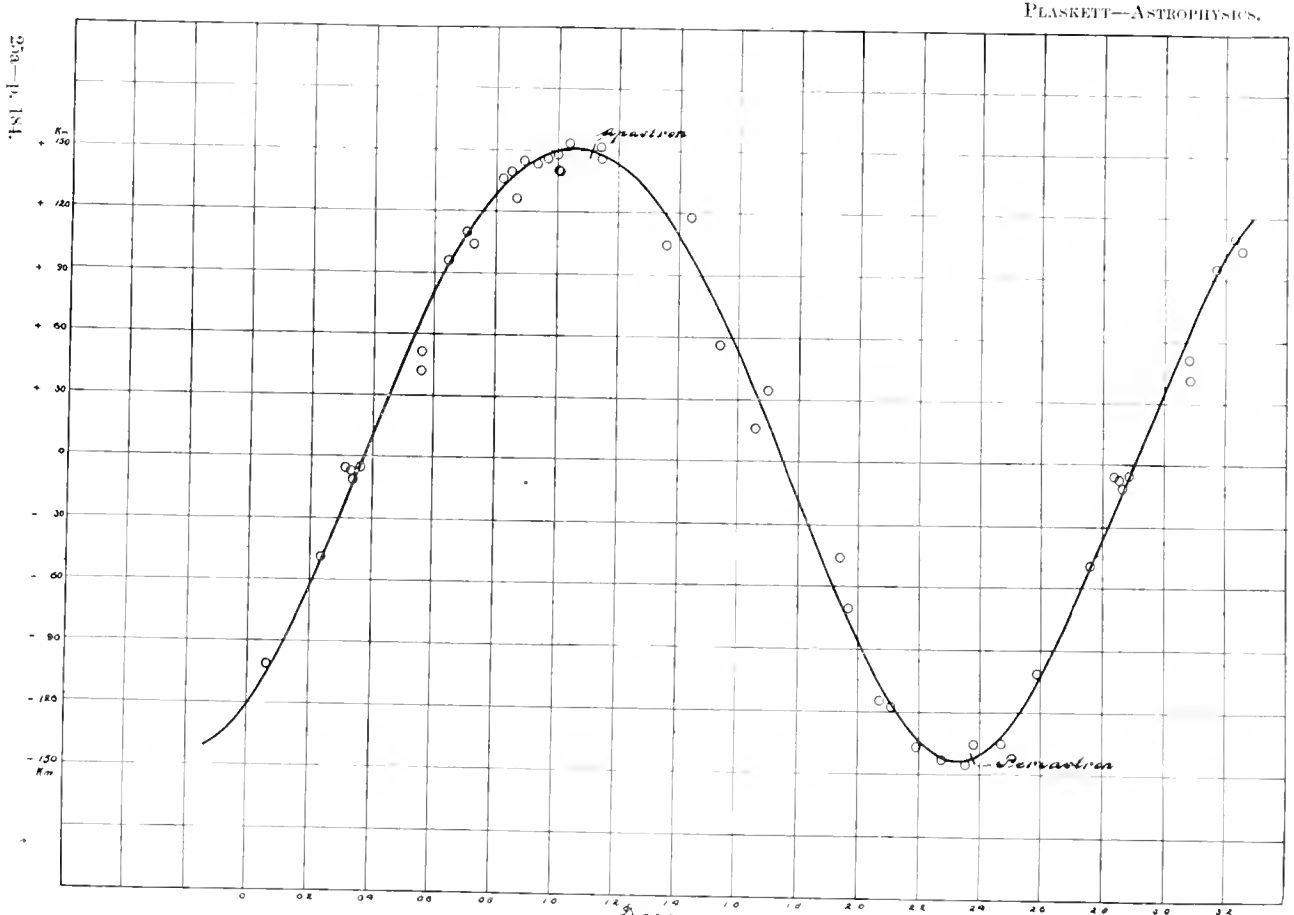

FIG. 8—Velocity Curve of ψ Orionis.

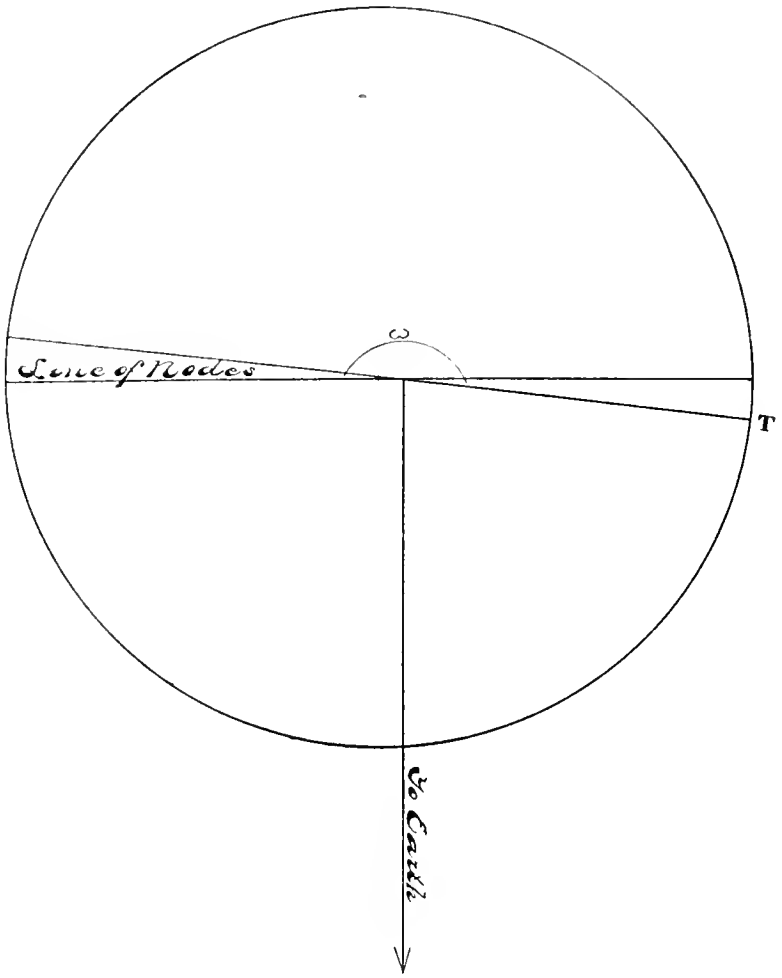

FIG. 9—Orbit of ψ Orionis.

Addendum.

A least squares solution has been applied to this orbit as to ι Orionis and has resulted in considerable improvement in the elements.

As was pointed out above the highest residuals occur in the ascending and descending branches of the curve and it was considered advisable to treat the Ottawa observations only and see if these residuals could be reduced by a change in the period. Taking as provisional elements those determined above, and reducing the 37 observations to 29 suitably weighted places by combining plates taken successively on the same nights, we obtain the observation equations below. The coefficients of the five unknowns were computed from the formulæ of Lehmann-Filhes, and a sixth unknown of coefficient unity was added as a correction to the velocity of the system.

To make the observation equations homogeneous the following substitutions were made:—

$$x = \delta K$$
$$y = K\delta e \quad = \quad 147{\cdot}2\delta e$$
$$z = K\delta\omega \quad = \quad 147{\cdot}2\delta\omega$$
$$u = \frac{100\ K}{(1-e^2)^{\frac{3}{2}}}\ \delta\mu = 14801{\cdot}7\delta\mu$$
$$v = \frac{K\mu}{(1-e^2)^{\frac{3}{2}}}\ \delta T = \quad 368{\cdot}18\delta T$$
$$\omega = \delta\gamma$$

1ST OBSERVATION EQUATIONS ψ ORIONIS.

x.	y.	z.	u.	v.	w.	s.	Wt.
−1·050	−·976	+·167	+·142	−·181	+1·000	− 6·99	1
−·978	−·740	+·410	+·454	−·453	,,	+ 3·51	1
−·802	−·173	+·680	+·358	−·743	,,	− 9·55	1
−·401	+·730	+·948	+·757	−·993	,,	+ 2·41	1
−·173	+·968	+1·001	+·392	−1·021	,,	− 4·46	2
−·135	+·988	+1·004	+·288	−1·020	,,	− 1·38	2
+·381	+·674	+·903	−·210	−·857	,,	+26·81	1
+·381	+·674	+·903	+·353	−·857	,,	+17·51	1
+·560	+·307	−·789	+·688	−·730	,,	− 0·69	1
+·647	+·081	+·711	+·580	−·650	,,	− 2·57	1
+·694	−·057	+·661	+·444	−·598	,,	+10·63	1
+·726	−·504	+·464	−·006	−·411	,,	− 4·81	2
+·851	−·597	+·413	+·233	−·364	,,	−11·67	1
+·908	−·837	+·245	+·125	−·211	,,	+ 2·55	1
+·927	−·927	+·148	+·033	−·124	,,	+ 1·93	2
+·931	−·950	+·115	+·614	−·095	,,	+ 9·04	1
+·933	−·962	+·093	+·037	−·076	,,	+10·75	1
+·936	−·982	+·049	+·020	−·037	,,	+ 0·27	3
+·913	−·945	−·213	−·756	+·193	,,	+ 3·81	1
+·711	−·313	−·627	−·440	+·569	,,	+13·73	1
+·584	+·033	−·756	−·362	+·695	,,	−17·83	1
+·392	+·478	−·884	−·434	+·830	,,	+13·59	1
+·124	+·877	−·976	−·448	+·947	,,	+14·18	1
+·028	+·955	−·989	−·779	+·972	,,	−20·53	1
−·591	+·559	−·842	−·200	+·896	,,	−15·42	2
−·859	−·016	−·599	−·299	+·662	,,	+ 1·93	2
−·993	−·614	−·360	−·326	+·409	,,	+ 2·98	1
−1·055	−·938	−·114	−·109	+·136	,,	− 2·52	1
−1·060	−·999	−·084	−·011	+·087	,,	+ 1·94	1

There result the following normal equations.

$$+20{\cdot}398x - 5{\cdot}255y + 2{\cdot}618z + {\cdot}471u - 2{\cdot}431v + 5{\cdot}297w + 85{\cdot}859$$
$$+20{\cdot}726y + 1{\cdot}446z + {\cdot}288u - 1{\cdot}687v - 5{\cdot}132w - 31{\cdot}490$$
$$+15{\cdot}514z + 7{\cdot}241u - 15{\cdot}392v + 4{\cdot}702w + 55{\cdot}912$$
$$+5{\cdot}291u - 7{\cdot}169v + 1{\cdot}401w + 13{\cdot}180$$
$$+15{\cdot}337v - 4{\cdot}291w - 54{\cdot}156$$
$$+37{\cdot}000w + 38{\cdot}800$$

It will be noticed that the normals in z and v ($\delta\omega$ and δT) are practically identical, and it will be impossible to accurately determine their values separately, owing to the smallness of the coefficients in the elimination. Consequently, $\delta\omega$ and δT were successively assumed to be zero, and we obtain the following corrected elements from these two solutions:—

	Preliminary.	For $\delta T = 0$	For $\delta\omega = 0$
K	147·2	143·843	143·799
e	0·063	0·06992	0·07012
ω	186°	183°·736	186°
Period U	2·526 dys.	2·52561 dys.	2·52563 dys.
T	2·36 "	2·36 "	2·3753 "
γ	+ 12·42 km.	12·517 km.	12·453 km.

As there is relatively less change in T than in ω in the two cases, the first set only will be considered. The change in the period is small, showing that no improvement can be effected in the Ottawa observations by any marked change in this variable, and it can now be finally determined by means of the three early observations of Frost and Adams with the aid of three additional plates kindly sent me by Prof. Frost. Two of the latter, the third being unsuitable, were carefully measured by Mr. Harper, and the use of the five measures, three of 1903, one each of 1904 and 1905, gave as the only permissible period 2·52588 days, which can not be in error more than one unit in the last place. The positions of these observations on the curve are shown by the crosses in Fig. 10. The residuals are no larger than is to be expected from spectra so uncertain and difficult of measurement as these.

In the final solution then a correction for the period was omitted. As provisional elements were taken (in round numbers) those obtained by the first solution.

Period = 2·52588 dys.	ω = 185°
K = 144·0	T = 2·36 dys.
e = 0·07	γ = 12·5 km.

The observations with their corrected phases were grouped into 19 normal places, (table of normal places and residuals), from which were obtained 19 observation equations by using the same substitutions for homogeneity as before.

2ND OBSERVATION EQUATIONS ψ ORIONIS.

x.	y.	z.	v.	w.	l.	Wt.
−1·065	− ·993	+ ·107	− 116	+1·000	− 50	2
− ·985	− ·729	+ ·409	− ·459	"	+ 5·69	1
− ·802	− ·140	+ ·687	− ·758	"	− 1·76	1
− ·400	+ ·741	+ ·950	− ·999	"	+ 3·94	1
− ·176	+ ·959	+1·000	−1·021	"	− 5·54	4
+ ·376	+ ·641	+ ·901	− ·850	"	+20·18	2
+ ·565	+ ·165	+ ·779	− ·713	"	− 1·74	1
+ ·670	− ·037	+ ·679	− ·610	"	+ 2·03	2
+ ·832	− ·571	+ ·439	− ·382	"	− 1·31	3
+ ·895	− ·822	+ ·268	− ·228	"	− 3·26	3
+ ·927	− ·972	+ ·083	− ·067	"	+ 0·43	4
+ ·913	− ·962	− ·177	+ ·158	"	− 3·27	2
+ ·654	− ·162	− ·684	+ ·616	"	− 3·00	2
+ ·401	+ ·447	− ·876	+ ·816	"	+13·60	1
+ ·104	+ ·879	− ·979	+ ·949	"	+ 2·11	2
− ·560	+ ·607	− ·865	+ ·923	"	− 9·94	2
− ·853	− ·124	− ·615	+ ·686	"	+ 5·44	2
−1·003	− ·654	− ·553	+ ·405	"	+ 4·78	1
−1·061	− ·936	− ·127	+ ·152	"	+ 0·21	1

From these observation equations result the normal equations.

$$+20.556x - 5.145y + 2.629z - 2.397v + 5.351w - 1.617 = 0$$
$$+20.106y + 1.334z - 1.600v - 5.639w + 13.118 = 0$$
$$+15.614z - 15.465v + 4.656w + 14.165 = 0$$
$$15.398v - 4.282w - 13.127 = 0$$
$$+37.000w + 16.670 = 0$$

Again the normals in z and v are nearly identical. Assuming v or $\delta T = 0$ the solution gives

$x = +\cdot1198$	$\delta K = +\cdot1198$	$\pm$ 1·582 km.
$y = -\cdot7099$	$\delta e = -\cdot00493$	$\pm$ ·01116
$z = -\cdot7225$	$\delta\omega = -\cdot005015 = -\cdot286^{\circ}$	$\pm$ 710°
$w = -\cdot4851$	$\delta\gamma = -\cdot4851$	$\pm$ 1·177 km.

giving for the final elements.

K = 144·12 $\pm$ 1·58 km.
e = 0·0651 $\pm$ ·0112
ω = 184°·71 $\pm$ ·71°
U = 2·52588 dys.
T = 2,417,916·36 Julian date.
γ = 12·015 km. $\pm$ 1·177 km.
$a \sin i$ = 4,995,100 km.

NORMAL PLACES AND RESIDUALS.

No. of Plates.	Total Difference of Phase.	Mean Phase from T.	Mean Velocity.	Wt.	C — O Prel.	C — O Final.	Eph. — Equation.
2	·036	·005	—140·3	2	— 2·7	— ·5	·00
1		·115	—135·0	1	+ 6·6	+ 5·4	+ ·18
1		·233	—101·2	1	— 2·5	— 2·7	+ ·02
1		·411	— 49·0	1	+ 4·1	+ 2·0	— ·17
4	·044	·499	— 7·3	4	— 4·6	— 7·5	— ·02
2	·013	·7285	+ 46·4	2	+22·9	+18·6	— ·05
1		·825	+ 95·6	1	+ 1·5	— 2·9	— ·08
2	·023	·8885	+107·0	2	+ 5·9	— 1·1	— ·03
3	·039	1·018	+133·6	3	— ·1	— 1·6	— ·02
3	·089	1·101	+144·7	3	+ 1·0	— 3·3	— ·01
4	·053	1·187	+145·6	4	+ 4·5	+ ·7	— ·01
2	·001	1·3075	+147·3	2	+ ·1	— 2·8	·00
2	·079	1·5705	+109·7	2	— 2·6	— 2·7	+ ·05
1		1·711	+ 56·6	1	+12·0	+13·4	— ·04
2	·050	1·844	+ 25·4	2	— 1·1	+ 1·7	+ ·01
2	·031	2·1155	— 58·2	2	—14·6	—10·3	— ·02
2	·039	2·2585	—115·8	2	+ 1·2	+ 5·4	— ·01
1		2·363	—136·7	1	+ 1·8	— 5·2	+ ·25
1		2·449	—140·4	1	— 2·7	— ·3	— ·08

A comparison of the residuals obtained on the one hand by computing an ephemeris from these elements, and on the other by substituting the values of the unknowns in the observation equations shows that the solution is satisfactory. The resulting velocity curve with the normal places plotted as circles is given in Fig. 10. Σpvv is reduced from 1970·3 to 1522·5, the probable error of an observation of weight unity from $\pm$ 7·7 km. to $\pm$ 6·8 km. The only change from the original elements of appreciable magnitude is in K, which is reduced by about 3 km. Three rather high residuals all occurring on the inclined parts of the curve may account for part of this change. As previously mentioned, part of the discrepancy in these three places, beyond that due to the character of the spectrum, may be explained, in a very short period binary, by inaccuracy in phase determination due to unsymmetrical exposure. The very large range of velocity 288 km., the highest in this type of binary known to the writer, is undoubtedly a considerable factor in obtaining satisfactory elements, which in this case may be considered as fairly closely determined. Apparently as in ι Orionis the least squares solution has improved the geometrically determined elements.

This concludes my portion of the report.

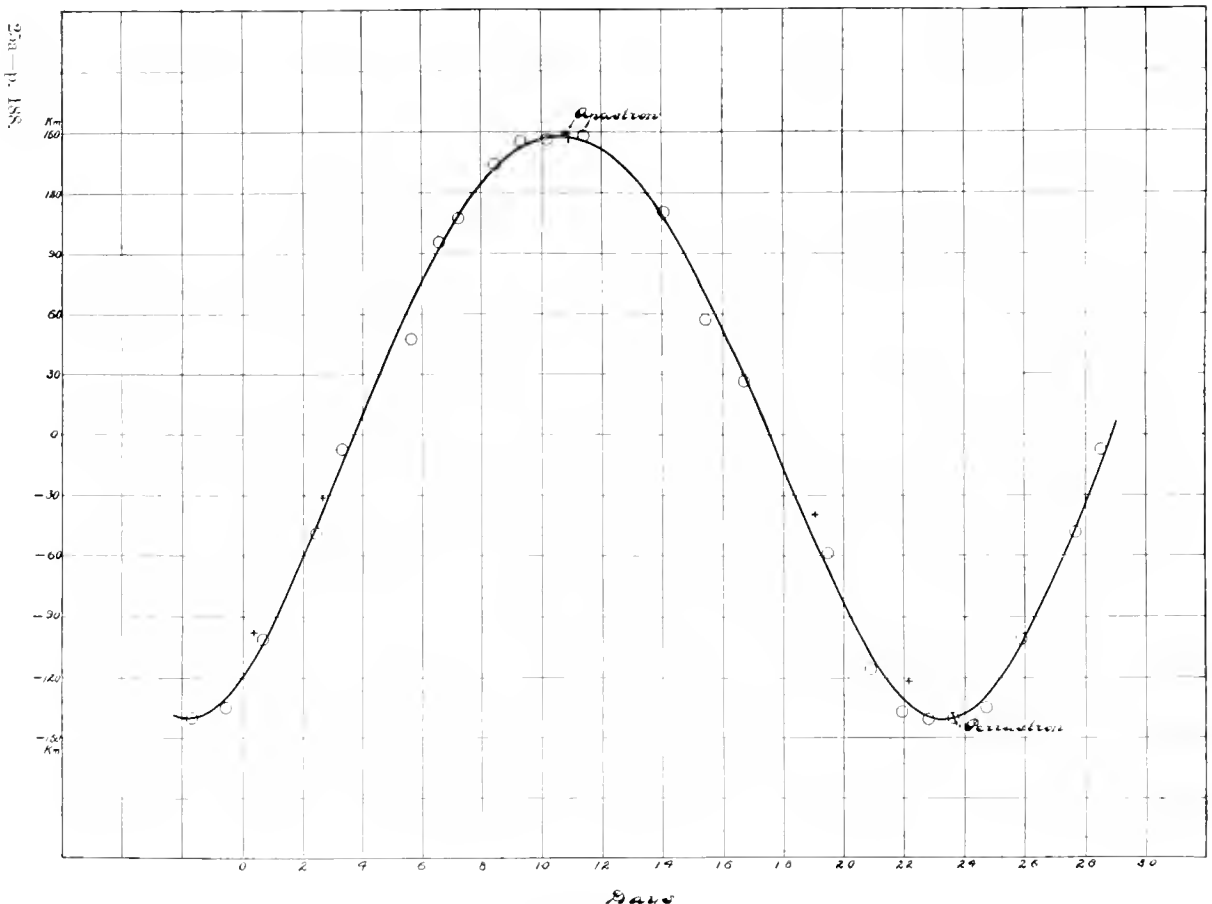

FIG. 10—Velocity Curve ψ Orionis.

In addition, as appendices, follow the reports of Mr. Harper on the spectroscopic binaries η Virginis and θ Aquilae; of Mr. Motherwell on measurements of double stars and on observed occultations of the moon; of Dr. DeLury on the wave lengths of lines in the Iron-Vanadium alloy used for the comparison spark in the spectrograph; and of Mr. Tobey on photometric work.

In conclusion, I wish to again express my appreciation of the help and encouragement you were always so willing to give in any difficulties that arose.

I have the honour to be, sir,

Your obedient servant,

J. S. PLASKETT.

APPENDIX A.

η VIRGINIS.

W. E. HARPER.

The star η Virginis $\alpha = 12^h\ 14{\cdot}8^m$, $\delta = -\ 0°\ 6'$, photographic magnitude 4·2, was announced as a spectroscopic binary in Astrophysical Journal XVII, 150, 1903, by Frost and Adams, also in L.O.B. No. 46, 1903, by Campbell and Curtiss. It has a composite spectrum, both components belonging to Vogel's type I*a*2, or Miss Maury's VIII*a*. The lines of the fainter component were, owing to their weakness, only occasionally measured in our plates and the results obtained were, therefore, derived from a consideration of the spectrum of the brighter component only.

Forty-three measurable negatives of this star were obtained between February 22 and July 5, 1907. The first thirty-two negatives were made with the Universal spectroscope as adapted for radial-velocity work, the dispersion at $H\gamma$ (λ 4340) being 18·6 tenth-metres per mm. Some five or six were made with the new three-prism spectrograph, whose linear dispersion at λ 4415 is 11·1 tenth-meters per mm. The balance were made with the new single-prism spectrograph whose linear dispersion at λ 4415 is about 32·4 tenth-meters per mm. In fair seeing the exposure time required was for the single-prism spectrograph from 35 to 40 minutes; for the Universal three-prism spectrograph from 60 to 65 minutes, while for the new three-prism spectrograph a considerably longer exposure was necessary.

The three-prism plates were all reduced by the aid of the Hartmann interpolation formula

$$\lambda = \lambda_0 + \frac{c}{s_0 - s}$$

which method was discussed in detail in the report for the year 1905-6. I may say, however, that the constants λ_0, c and s_0 were not always determined for each plate. When there were several plates made at or about the same temperature a uniform set of constants was adopted in their reduction. This can introduce no appreciable error in the final result as the formula is purely arbitrary and affects both star and comparison lines alike. The differences between the computed value of the comparison lines by the formula and their true values when plotted as ordinates, with the corresponding wave-lengths as abscissae, give us a curve from which corrections can be made to the computed values of the star lines.

Five of the later plates made with the single prism were reduced by the short method recently adopted here and described in the report for last year. The micrometer settings corresponding to the wave-lengths of the comparison and star lines are determined, and when the settings for the star lines have been corrected by means of the comparison settings, the displacement is got directly in revolutions of the micrometer head. The following tables give the settings used in these plates for the comparison and star lines, and in the case of the latter the velocity corresponding to a revolution of the micrometer head is attached.

FE. V. COMPARISON LINES.

Wave-Length.	Micrometer Setting.		Wave-Length.	Micrometer Setting.	
	20°	30°		20°	30°
4864·943	72·9636	73·0098	4482·413	54·0153	54·0288
4851·686	72·3993	72·4449	4452·180	52·2398	52·2490
4594·216	60·1873	60·2143	4404·929	49·3658	49·3676
4586·554	59·7830	59·8092	4395·382	48·7700	48·7700
4549·642	57·7979	57·8200	4325·941	44·2724	44·2593
4528·798	56·6488	56·6684	4260·656	39·7637	39·7361
4494·755	54·7266	54·7419	4202·195	35·4730	35·4302

STELLAR LINES.

Wave-Length.	20°		30°	
	Velocities per Revn.	Micrometer Reading.	Velocities per Revn.	Micrometer Reading.
4861·527	1452·8	72·8187	1451 2	72·8646
4584·018	1233·0	59·6486	1230·5	59 6745
4549·766	1206·4	57·8047	1203 8	57·8268
4534·139	1194·3	56·9453	1191·6	56·9655
4501·448	1169·1	55·1091	1166·4	55 1252
4481·400	1153·7	53·9566	1150·9	53·9698
4468·663	1144·0	53·2138	1141·2	53·2253
4437·718	1120·3	51·1732	1117·4	51·3802
4404·927	1095·4	49·3657	1092·4	49·3674
4395·286	1088·1	48·7640	1085·1	48·7640
4325·939	1035 9	44·2723	1032·7	44·2592
4271·760	995·5	40·5509	992 2	40 5259
4215·668	954·2	36·4836	950·8	36·4450

Of course the above star lines are only those which happen to be used in the plates reduced by the short method. The table which follows contains all the more important star lines which have been employed. For the sake of brevity those which have been used but rarely are not included, but the wave-lengths employed in such cases are given in column three of the detailed statement of the measures and reductions. The first column of the table signifies the element or elements to which the particular line is due, and for the sake of completeness the value of a displacement of one tenth-meter in kilometers per second for the various wave-lengths given is also included. The lines, other than the magnesium at λ 4481 and $H\gamma$ (λ 4340), are mostly all enhanced lines of iron and titanium. In this connection the 'Tables of Wave-Lengths of Enhanced Lines' issued in 1906 from the Solar Physics Observatory, South Kensington by Sir Norman Lockyer have been of material assistance.

LINES USED IN η VIRGINIS.

Elements.	Wave-Length.	No. of km. per tenth-meter.	Elements.	Wave-Length.	No. of km. per tenth-meter.
Fe	4584·018	65·41	Fe	4404·927	68·07
Ti	4572·156	65·58	Ti. V. Zr.	4395·286	68·20
Ti	4563·939	65·71	Fe	4383·720	68·41
Cr.	4558·827	65·78	Fe. Ti. Fe.	4367·840	68·66
Fe; Ti-Co.	4549·766	65·91	Cr. Mg.	4352·006	68·88
Ti-Co.	4534·139	66·13	H.	4340·634	69·07
Ti; Fe.	4522·855	66·30	Fe	4325·939	69·32
Fe?	4520·397	66·33	Fe. Ti	4315·178	69 48
–	4515·508	66·39	Ti	4313·034	69·49
Fe?	4508·455	66·52	Fe	4308·081	69·60
Ti	4501·448	66·60	Ti	4300·211	69·73
Mg	4481·400	66·91	Ti. Fe	4294·273	69·82
Ti	4468·663	67·10	Fe	4260·640	70·39
Ti	4443·976	67·48	–	4246·996	70·60
–	4416·985	67·89	Fe	4233·328	70·83
Fe	4415·293	67·90	Fe	4216·351	71·10
Ti	4411·205	67·96	Fe. Sr	4215·668	71·11

JOURNAL OF OBSERVATIONS.

The extract given below from the regular observing journal furnishes the observational data for all the plates discussed here. Most of the columns are self explanatory and need not be enlarged upon. The three cameras used were III B, three-prism, Universal spectroscope of Brashear; III L, three-prism long focus and I L, one-prism long focus. The middle of exposure is given in eastern standard or 75th meridian time. Some confusion might arise in the case of stars observed after midnight. For instance, No. 638 is recorded as February 25th 1^h 50^m, whereas to be strictly accurate it should be February 26th 1^h 50^m. In future I think it would be well on making the entry in the record of spectrograms to use Greenwich Mean Time as is used in the summary of velocities. Formerly the comparison was exposed at the beginning and end of the star exposure; lately this has been changed to four exposures of the comparison arranged so that they occur at the middle of each quarter of the exposure on the star. The slit-width is given in inches.

RECORD OF SPECTROGRAMS.

Star.	No. of Negative.	Camera.	Plate.	Date.	Middle of Exposure. E. S. T.	Duration.	Hour Angle at end.	Comparison Spectrum.			Temperature.				Slit Width.	Focal Position.			Seeing.	Observer.	Remarks.
								Beginning.	End.	Kind.	Room.		Prism Box.			Star Focus.	Collimator.	Camera.			
											Beginning.	End.	Beginning.	End.							
				1907.	h. m.	m	h. m.	s.	s.		Fahr.	Fahr.	Cent.	Cent.	m.m.						
η Virginis.	629	HIB.	Seed 27	Feb. 22	12 57	55	0 43 E	20	20	Fe. Spark.	0·8	3·8	−15·0	−15·0	·0013	20 3	15·2	5·65	Good	P	
"	638	"	" 27	" 25	1 50	55	0 20 W	20	20	"	7·5	6·3	− 9·8	− 9·8	·0013	20·5	15·2	5·67	Fair to good	P	
"	651	"	" 27	Mar. 6	11 15	60	1 40 E	20	20	"	22·0	20·5	+ 3·8	+ 3·8	·0013	20 5	15·2	5·70	Fair	P	
"	652	"	" 27	" 6	1 58	60	1 05 W	20	20	"	18·0	17·0	+ 1·5	+ 1·2	·0013	20·5	15·2	5·70	"	P	
"	656	"	" 27	" 8	11 15	70	1 25 E	20	20	"	28·5	28·0	+ 3·2	+ 3·1	·0013	20·5	15·2	5·70	"	P	
"	658	"	" 27	" 8	2 33	54	1 45 W	20	20	"	25·6	24·0	1·5	1·6	·0013	20 5	15·2	5·70	"	P	
"	663	"	" 27	" 11	11 22	55	1 10 E	20	20	"	32·0	32·2	6 8	6·8	·0013	20 5	15 2	5·72	"	P	
"	664	"	" 27	" 11	2 05	50	1 25 W	20	20	"	28·3	26·5	7 1	7 0	·0013	20·5	15 2	5·72	"	P	
"	668	"	" 27	" 20	10 43	73	1 05 E	20	20	"	31·2	30·0	3·8	3 8	·0013	20·5	15·2	5·70	Good	P	
"	671	"	" 27	" 20	2 36	60	2 40 W	20	20	"	28·3	28·0	2·9	2 9	·0013	20·5	15·2	5·70	"	P	
"	675	"	" 27	" 28	9 05	91	2 07 E	20	20	"	52·0	49 7	15·0	15·0	·0012	20 5	15·2	5·80	"	H	Clouds 15^m
"	689	"	" 27	Apr. 3	10 10	70	0 45 E	25	25	"	41·5	39·8	11·0	11·0	·0010	20·5	15 2	5·72	Hazy	P	
"	690	"	" 27	" 3	11 17	55	0 15 W	25	25	"	39·8	38·3	11 0	10·5	·0013	20·5	15·2	5·72	"	P	
"	697	"	" 27	" 5	10 58	50	0 00	25	25	"	30·6	31·0	5 7	5·7	0013	18·2	15·2	5·73	Good	P	
"	700	"	" 27	" 5	2 25	40	3 20 W	25	25	"	27·2	25·7	4·9	4 9	·0013	18·2	15·2	5·73	"	P	
"	706	"	" 27	" 11	12 13	50	1 35 W	25	25	"	38·0	37·5	8·3	8·3	·0013	18·2	15 2	5·73	"	H	
"	707	"	" 27	" 11	1 07	55	2 30 W	25	25	"	37·5	35·5	8·3	8·3	0013	18·2	15·2	5·73	Getting hazy	H	
"	710	"	" 27	" 15	8 52	57	1 25 E	25	25	"	40·0	38·6	9·9	10·0	0013	18·2	15·2	5·76	Fair	P	
"	715	"	" 27	" 18	8 07	55	2 00 E	25	25	"	41·6	40·0	9·0	9 1	·0013	18·5	15·2	5·78	Good	H	
"	722	"	" 27	" 18	11 25	60	2 20 W	25	25	"	36·4	36·4	9 0	9·0	·0011	18·5	15·2	5·78	"	H	
"	723	"	" 27	" 18	12 57	66	3 56 W	25	25	"	36·0	35·0	9·0	9·0	·0011	18·5	15·2	5 78	"	H	
"	725	"	" 27	" 19	8 19	55	1 45 E	25	25	"	44 8	43·6	11·0	11 0	·0013	18 5	15·2	5·79	"	P	
"	728	"	" 27	" 19	10 12	56	0 10 W	25	25	"	40·6	36·3	10·9	10·2	·0013	18 5	15·2	5·79	"	P	
"	729	"	" 27	" 19	11 02	35	0 50 W	25	25	"	36 0	35·0	10·2	10 2	0013	18·5	15·2	5·79	"	P	Stopped by clouds.
"	730	"	" 27	" 19	12 50	51	2 40 W	25	25	"	36·0	34·4	10·6	10 2	0013	18·5	15 2	5·79	Poor	P	Cloudy.
"	735	"	" 27	" 24	9 03	60	0 40 E	6-6-	6-6	"	48·6	47·5	14·1	14·2	0013	18·5	15·2	5·81	Clouds	P	
"	737	"	" 27	" 24	10 25	50	0 40 W	6-6-	6-6	"	48·0	46·0	14·3	14·2	·0013	18·5	15·2	5 81	Hazy	P	Underexposed.
"	738	"	" 27	" 26	11 20	50	1 45 W	6 6-	6-6	"	44·0	42·5	8·6	8·7	·0013	18·5	15·2	5 79	Fair	P	
"	740	"	" 27	" 27	11 10	40	1 30 W	6-6-	6-6	"	48·8	48·3	11·7	11·8	·0013	18·5	15·2	5·80	"	P	
"	742	"	" 27	May 2	8 22	45	1 08 E		6-10-6	"	55·4	54·0	16·7	16·7	·0013	18·5	15·2	5·79	Hazy	H	
"	748	"	" 27	" 4	11 27	45	2 15 W	6-6-	6-6	"	34·8	32·3	3·9	4 2	·0013	18 5	15·2	5·79	Fair	P	
"	751	"	" 27	" 7	8 32	65	0 15 E		6 6-12	"	55·5	50·5	16·1	16·1	·0013	18·0	15·2	5·79	"	H	
"	754	"	" 27	" 9	8 30	65	0 13 E		6-6-6-6	"	60·0	58·0	19·8	19·8	·0013	18·0	15·2	5·82	Unsteady	H	

												Centigrade									
" .	757	111L..	" 27.	"	14	10	12	90	2 06 W	4-4-4-4	Fe. V spark	12·5	12·0	15·1	15·1	·0015	44·6	10·8	18·3	Clouds......	H
" .	761	" .	" 27.	"	18	11	05	50	0 30 W	4-4-4-4	" .	15·5	15·5	17·2	17·2	·0015	44·6	10·8	18·36	Very poor ..	P
" .	763	" ..	" 27	"	20	10	07	96	2 24 W	4-4-4-4	" .	7·0	6·0	9·2	9·2	·0015	44·6	10·8	18·2	Unsteady ...	H
" .	773	1L ..	" 27.	"	23	8	36	36	0 37 W	4-4-4-4	" .	16·0	15·5	17·3	17·3	·0012	45·0	10·8	18·3	Fair	H
" .	777	" ..	" 27.	"	24	8	25	30	0 30 W	5-7-4	" .	14·5	13·6	16·4	16·4	·0010	45·0	10·8	18·4	Good.......	P
" .	789	" ..	" 27.	"	29	9	45	30	2 05 W	2-2-2-2	" .	9·0	8·9	14·5	14·5	·0010	45·0	10·8	18·46	Fair	P
" .	795	" ..	" 27	"	31	9	06	27	1 35 W	2-2-2-2	" .	15·5	15·5	19·0	19·0	·0010	45·5	10·8	18·58	Good......	P
" .	811	" .	" 27.	June	10	8	35	35	1 48 W	2-2-2-2	" .	16·6	15·6	18·2	18·0	·0009	45·6	10·8	18·61	"	P
" .	822	" .	" 27.	"	11	8	28	31	1 42 W	3-3-3-3	" .	18·2	17·6	19·4	19·4	·0010	45·6	10·8	18·68	"	H
" .	835	111L..	" 27.	"	12	9	35	55	3 05 W	6-6-6-6	" .	22·1	21·0	23·15	23·1	·0020	44·5	10·8	18·72	"	P
" .	915	1L ..	" 27.	July	5	9	02	35	3 50 W	2-5-3	" .	22·6	22·6	26·45	26·4	·0011	45·0	10·8	18·64	Poor	P

Detailed Measures and Reductions.

The following section contains the results of measures upon the plates of this star. Each plate was measured in two positions on the microscope, red end to right and red end to left, four settings being made on each line in each position. The mean of the settings is found in column 1. The second column contains the computed values for the comparison lines and the values for the star lines corrected by means of the comparison lines as previously described. The normal wave-length and the displacement in tenth-meters with the corresponding velocity follows.

The symbols V_a and V_d are employed in the reduction of the stars velocity to the sun, V_a denoting the correction due to the velocity of the earth in its orbit, and V_d the correction due to the earth's diurnal rotation. The corrections for the orbital velocity have been made with the use of Schlesinger's tables* of star constants, and the diurnal corrections are taken from a table constructed for the latitude of this observatory.

η VIRGINIS 629.

1907. Feb. 22.
G. M. T. $17^h\ 57^m$

Observed by } J. S. PLASKETT.
Measured by }

Mean of Settings.	Measured Wave Length.	Normal W. L.	Displacement.	Velocity.	Mean of Settings.	Measured Wave Length.	Normal W. L.	Displacement.	Velocity.
72·8605	4584·215	.....	.....	.....	56 7667	4404·927	.....	.....	.....
72·8181	4583·510	·018	·508	—33·12	54·6233	4383·729	.....	.....	.....
71·8508	4571·639	·156	·517	33·91	54·5796	4383·312	·720	·408	27·91
70·7572	4558·403	·827	·424	27·90	52·9317	4367·407	·841	·434	29·82
70·6215	4549·738	.....	.....	.....	51·2621	4351·611	·006	·396	27·28
69·9936	4549·276	·766	·490	32·29	50·0402	4340 254	·634	·380	26·26
68·2527	4528·922	.....	.....	.....	48·4730	4325 895	.....	.....	.....
67·7000	4522·399	·855	·456	30·23	46·4779	4308·031	.....	.....	.....
66·4465	4507 986	·455	·469	31·24	46·4204	4307·573	·081	·508	35·36
65·8133	4500·926	·448	·522	34·77	44·9061	4294·248	.....	.....	.....
65·2605	4494·813	.....	.....	.....	44 8673	4293·964	·286	·322	22·51
64·0121	4480·902	·400	·498	33·31	44 1533	4287·793	·162	·369	25·79
63·5828	4476·269	.....	.....	.....	35 3121	4215·386	·668	·282	—20·05
62·8473	4468·204	·663	·459	30·80	33·6020	4202·078	.....	.....	.....
57·7567	4414·902	·293	·391	26·55					

$\epsilon = \pm 3{\cdot}2$
$\epsilon_0 = \pm 0{\cdot}8$

Mean..... — 29·40
V_a ..... + 26·05
V_d ..... + ·06
Curvature..... — ·50

Radial velocity..... — 3·

* Astrophysical Journal, Vol. X, p. 1-13.

SESSIONAL PAPER No. 25a

η VIRGINIS 638.

1907. Feb. 25.
G. M. T. 18h 50m

Observed by } W. E. HARPER.
Measured by }

Mean of Settings.	Measured Wave Length.	Normal W. L.	Displacement.	Velocity.	Mean of Settings.	Measured Wave Length.	Normal W. L.	Displacement.	Velocity.
72·8924	4584·537	.....	.....	.....	54·6305	4383·727	.....	.....	.....
72·8843	4583·918	·018	·100	− 6·52	54·6173	4383·591	·720	·129	8·81
71·2327	4573·695	·899	·204	13·34	51·2892	4351·853	·006	·153	10·54
70·0535	4550 046	.....	.....	.....	50·0651	4340·485	·634	·149	10·30
70·0386	4549·465	·766	·301	19·84	48·4718	4325·812	.....	.....	.....
68 7083	4533·839	·139	·300	19·84	46·4732	4307·917	.....	.....	.....
68·7307	4534·100	·340	·240	15·86	46·4452	4307·744	·081	·337	23·45
68·2783	4529 145	.....	.....	.....	45·5514	4299 995	211	·217	15·12
67·1044	4515 309	·508	·199	13·21	45·4561	4299·163	·410	·247	17·24
66·4858	4508·264	·455	·191	12·72	44·8974	4294·100	.....	.....	.....
65·8585	4501·185	·448	·263	17·52	44·8763	4294·116	·301	·185	12·91
65·2810	4491 970	.....	.....	.....	40 9302	4260·408	.....	.....	.....
64·0512	4481 094	·400	·306	20 47	40·9030	4260 423	·640	·217	15·28
63·6044	4476·434	.....	.....	.....	37·5490	4233·149	·328	·179	12 67
57 9498	4416·699	·985	·286	19·42	35·2971	4215·466	·668	·202	−14·36
57·7780	4414·954	·293	·339	23·02	33·5730	4201 784	.....	.....	.....
56·7780	4404·968	.....	.....	.....					

Mean..... − 15·36
V_a ..... + 13 37
V_d . + 02
Curvature ..... − ·50

Radial velocity..... − 2·5

η VIRGINIS 651.

1907. March 6.
G. M. T. 16h 15m

Observed by } J. S. PLASKETT.
Measured by }

Mean of Settings.	Measured Wave Length.	Normal W. L.	Displacement.	Velocity.	Mean of Settings.	Measured Wave Length.	Normal W. L.	Displacement.	Velocity.
72·9885	4584·653	·018	·635	[+41·53]	54 5475	4383 075	·720	·645	44·12
72·9390	4584·388	.....	.....	.....	54·6144	4383·756	.....	.....	.....
72·8845	4583·346	·018	·672	−43·81	51·1925	4351·180	·006	·826	56·91
70·0296	4548·930	·766	·836	54·84	49·9602	4339·784	·634	·850	58·50
70·0897	4549·923	.....	.....	.....	48·4362	4325·898	.....	.....	.....
68·6938	4533·264	·139	·875	57·84	46·9251	4312·444	·034	·590	41·06
68·3052	4529·007	.....	.....	.....	46·4298	4308·006	.....	.....	.....
67·0851	4514·797	·508	·711	47·21	46·3632	4307·493	·081	·588	40·93
66·4547	4507·759	·455	·696	46·34	45·8138	4302·671	·503	·832	57·99
65·3024	4494·916	.....	.....	.....	44·7667	4293·580	·386	·706	48·93
64·0243	4480·640	·400	·760	50·84	40·9444	4261·286	·640	·646	[+45·48]
63·6163	4476·356	.....	.....	.....	37·4296	4232·841	·594	·750	53·10
57·9062	4416·308	·985	·677	45·90	35·1568	4215·023	·668	·645	45·86
56·7684	4404·971	.....	.....	.....	33·4831	4201·919	.....	.....	.....
56·7125	4404·369	927	·558	37·83	30·3001	4178·382	·025	·643	−46·17
54·7180	4384·727	·548	·821	56·16					

Mean. ..... − 49·18
V_a ..... +9·73
V_d ..... + ·17
Curvature... ..... − ·50

Radial velocity ..... −39·8

η VIRGINIS 652.

1907. Mar. 6.
G. M. T. 18h 58m

Observed by } J. S. PLASKETT.
Measured by }

Mean of Settings.	Measured Wave Length.	Normal W. L.	Displacement.	Velocity.	Mean of Settings.	Measured Wave Length.	Normal W. L.	Displacement.	Velocity.
72·9232	4584·193	.....	.....	.....	56·7622	4404·909	.....	.....	.....
72·8801	4583·487	·018	·531	− 34·62	56·8363	4405·667	·927	740	[+ 50·39]
70·7944	4558·194	·827	·633	41·52	56·7137	4404·443	·927	·516	35·14
70·5609	4555·403	·030	·627	41·13	54·7210	4384·812	·548	·736	50·34
70·0202	4548·986	·766	·780	51·35	54·5420	4383·072	·720	·648	44·32
70·0756	4549·756	.....	.....	.....	54·6087	4383·700	.....	.....	.....
68·6917	4533·435	·139	704	46·53	51·2192	4351·465	·006	·541	37·27
68·2906	4528·838	.....	.....	.....	48·4362	4325·898	.....	.....	.....
65·2891	4494·768	.....	.....	.....	47·8298	4320·491	·992	·501	34·77
64·0204	4480·727	·400	·673	45·02	46·5194	4308·845	·081	·764	[+ 53·17]
63·6046	4476·229	.....	.....	.....	46·3617	4307·456	·081	·625	43·50
62·8374	4467·888	·663	·780	52·34	46·4329	4308·029	.....	.....	.....
60·5203	4443·303	·976	·673	45·49	40·8739	4260·579	.....	.....	.....
58·0040	4417·402	·038	·636	43·18	40·7969	4259·995	·640	·645	45·41
57·8968	4416·318	·985	·667	45·29	35·1987	4215·192	·668	·476	− 33·84

Mean	− 42·84
V_o	+ 9·67
V_d	− ·04
Curvature	− ·50
Radial velocity	− 33·7

η VIRGINIS 656.

1907. Mar. 8.
G. M. T. 16h 15m

Observed by } J. S. PLASKETT.
Measured by }

Mean of Settings.	Measured Wave Length.	Normal W. L.	Displacement.	Velocity.	Mean of Settings.	Measured Wave Length.	Normal W. L.	Displacement.	Velocity.
72·9533	4584·364	.....	.....	.....	56·7196	4404·324	·927	·603	41·06
72·8747	4583·049	·018	·969	— 63·18	55·8780	4395·982	·296	·696	[+ 47·47]
71·9147	4571·366	·156	·790	51·67	55·7356	4394·578	·286	·708	48·29
70·8231	4558·233	·827	·594	39·09	54·7592	4385·023	·548	·525	35·91
70·0485	4549·036	·766	·730	48·11	54·5710	4383·196	·720	·524	35·84
70·0971	4549·815	.....	.....	.....	54·6253	4383·661	.....	.....	.....
68·7370	4533·662	·139	·677	44·82	51·2352	4351·473	·006	·533	36·73
68·3175	4528·950	.....	.....	.....	50·0081	4340·114	·634	·520	35·93
67·7530	4522·286	·855	·569	37·72	48·4513	4325·834	.....	.....	.....
65·3137	4494·842	.....	.....	.....	46·3656	4307·350	·081	·731	50·88
64·9741	4490·965	·621	·656	43·76	45·4886	4299·660	·211	·551	38·40
64·7682	4488·692	·259	·567	37·88	43·5033	4282·447	.....	.....	.....
64·0446	4480·744	·400	·656	43·89	40·9840	4261·430	·640	·790	[+ 55·62]
63·6258	4476·259	.....	.....	.....	40·8233	4260·100	·640	·540	38·02
58·0173	4417·346	·038	·692	46·99	40·8877	4260·492	.....	.....	.....
57·9135	4416·295	·985	·690	46·85	37·4506	4232·811	·328	·517	36·60
57·7454	4414·593	·293	·700	47·53	35·2002	4215·168	·668	·500	— 35·56
56·7800	4404·887	.....	.....	.....	33·5100	4201·924	.....	.....	.....
56·8555	4405·680	·927	·753	[+ 51·28]					

Mean	—42·81
V_o	+ 8·73
V_d	+ ·16
Curvature	— ·50
Radial velocity	—34·4

η VIRGINIS 658.

1907. Mar. 8.
G. M. T. 19h 33m

Observed by } J. S. PLASKETT.
Measured by }

Mean of Settings.	Measured Wave Length.	Normal W.L.	Displacement.	Velocity.	Mean of Settings.	Measured Wave Length.	Normal W.L.	Displacement.	Velocity.
72·9340	4584·226	.....	.....	.....		4351·298	·006	·708	48·78
72·8491	4583·000	·018	1·018	— 66·37	51·2078	4339·967	·634	·667	46·09
70·0825	4549·738	.....	.....	.....	49·9833	4325·842	.....	.....	.....
70·0187	4548·865	·766	·901	59 10	48·4411	4308·861	·081	·780	[+53·98]
68·3025	4528·878	.....	.....	....	46·5271	4307 400	·081	·681	47·40
65·2981	4494·769	.....	.....	....	46·3616	4307·992	.....	.....	.....
64·0112	4480·620	·400	·780	52 18	46·4396	4299·365	·211	·846	58·97
63·6150	4476·242	.....	.....	.....	45·4434	4293 582	·286	·704	49·14
62·8675	4468 118	·663	·545	36·57	44·7767	4261·248	·640	·608	[+42·70]
57·7336	4414·587	·293	·706	47 94	40·9524	4260·039	·640	·601	42·31
56·7695	4404·882	.....	.....	.....	40·8062	4260·522	.....	.....	....
56·7001	4404·234	·927	·693	47·19	40 8792	4232·720	·328	·608	—43·05
54·5250	4382·847	·720	·873	59·71	37·4332	4201·970	.....	.....	....
54·6150	4383·664	.....	.....	.....	33·5028				

Mean..... — 50·34
V_a ..... + 8·66
V_d ..... — ·11
Curvature ..... — ·50

Radial velocity..... — 42 3

η VIRGINIS 663.

1907. March 11.
G. M. T. 16h 22m

Observed by } J. S. PLASKETT.
Measured by }

Mean of Settings.	Measured Wave Length.	Normal W.L.	Displacement.	Velocity.	Mean of Settings.	Measured Wave Length.	Normal W.L.	Displacement.	Velocity.
72·9560	4·84·034	.....	.....	.....	53 6481	4374·448	·103	·655	44·93
72·9015	4583·350	·018	·668	−43·55	49 9837	4340·084	·634	·550	38·00
70·0476	4548·950	·766	·816	53·53	48·4276	4325·918	.....	.....	.....
70·0966	4549 535	.....	.....	.....	48·3513	4325·251	·939	·688	47·68
68·7283	4543·480	·139	·659	43·56	46·3495	4307·460	·081	·621	43·22
68·3248	4528·820	.....	.....	.....	46·4206	4308·061	.....	.....	.....
67·7359	4522·024	·855	·831	55·09	15·4650	4299·730	·211	·481	33·57
65·8590	4500·774	·448	·674	44·89	44·7810	4293 800	·273	·473	33·02
65·3158	4494·742	.....	.....	.....	44·3135	4289·780	·377	·597	41·73
64·0407	4480 687	·400	·713	47·70	42·3240	4272·890	·482	·592	41·38
63·6289	4476·226	.....	.....	.....	42·1426	4271·220	·934	·714	49·91
62·8520	4467·805	·663	·858	57·57	40·9262	4261·250	640	·610	(+42·94)
56·8198	4405·430	·927	·503	(+34·25)	40·7890	4260·120	·640	·520	36·61
56·7688	4404·881	.....	.....	.....	40·8534	4260·658	.....	.....	.....
54·7205	4384·790	·548	·758	51·85	37·4056	4232·760	·328	·568	40·21
54·5417	4383·060	·720	·660	45·14	35·1485	4215·060	·668	·608	−43·05
54·6087	4383 658	.....	....	.....	33·4655	4202 164	.....	.....	.....

Mean .. .. — 44·25
V_a ..... + 7·22
V_d ..... + 14
Curvature ..... — ·50

Radial velocity..... — 37·4

η VIRGINIS 664.

1907. March 11.
G. M. T. 19h 05m

Observed by } J. S. PLASKETT.
Measured by }

Mean of Settings.	Measured Wave Length.	Normal W. L.	Displacement.	Velocity.	Mean of Settings.	Measured Wave Length.	Normal W. L.	Displacement.	Velocity.
72·9515	4583·979	.....	.....	.....	56·2301	4399·532	·935	·403	27·48
72·9212	4583·645	·018	·373	−24·32	55·7459	4394·749	·286	·537	36·62
71·9285	4571·520	·156	·636	41·72	54·7514	4385·020	·548	·528	36·01
71·2620	4563·470	·939	·469	30·77	54·5660	4383·220	·720	·500	34·10
70·0711	4549·265	·766	·501	32·98	54·6180	4383·745	.....	.....	.....
70·1014	4549·592	.....	.....	.....	51·2308	4351·534	·006	·472	32·52
68·7499	4543·778	·139	·361	23·90	48·4367	4326·000	.....	.....	.....
68·3199	4528·764	.....	.....	.....	46·3836	4307·679	·081	·402	27·98
67·1052	4514·874	·508	·634	42·15	46·4296	4308·143	.....	.....	.....
65·8844	4501·099	·448	·349	23·28	45·4915	4299·875	·211	·336	23·45
65·3052	4494·624	.....	.....	.....	45·0790	4296·295	·761	·462	32·25
64·0522	4480·842	·490	·558	37·40	44·7972	4293·850	·241	·391	27·29
63·6294	4476·224	.....	.....	.....	40·8615	4260·725	.....	.....	.....
56·7130	4404·321	·927	·606	41·27	35·1946	4215·340	·668	·328	−23·32
56·7745	4404·939	.....	.....	.....	33·4760	4202·224	.....	.....	.....

Mean	−31·50
V_a	− 7·17
V_d	− ·09
Curvature	− ·50
Radial velocity	−24·9

η VIRGINIS 668.

1907. March 20.
G. M. T. 15h 43m

Observed by } J. S. PLASKETT.
Measured by }

Mean of Settings.	Measured Wave Length.	Normal W. L.	Displacement.	Velocity.	Mean of Settings.	Measured Wave Length.	Normal W. L.	Displacement.	Velocity.
72·9307	4584·286	.....	.....	.....	54·6192	4383·822	·720	·102	+ 6·98
72·9280	4583·996	·018	·022	− 1·43	54·6085	4383·698	.....	.....	.....
71·9823	4572·435	·156	·279	−18·30	51·2747	4351·980	·006	·026	− 1·79
70·8415	4558·702	·827	·125	− 8·22	50·0492	4340·630	·634	·004	− 0·27
70·6417	4556·316	·306	·010	− 0·66	48·4396	4325·972	·939	·033	+ 2·29
70·0832	4549·686	·766	·080	− 5·27	48·4360	4325·896	.....	.....	.....
70·0791	4549·799	.....	.....	.....	46·4305	4308·078	·081	·003	− 0·21
68·7612	4534·154	·139	015	+ 0·99	46·4307	4308·014	.....	.....	.....
68·2992	4528·937	.....	.....	.....	45·9036	4303·453	·503	·050	− 3·48
67·7907	4522·935	·855	·080	+ 5·30	45·5332	4300·216	·211	·005	+ 0·35
65·2940	4494·823	.....	.....	.....	45·1340	4296·742	·761	·019	− 1·33
64·0849	4481·373	·400	·027	− 1·81	44·8508	4294·290	·286	·004	+ 0·28
63·6111	4476·299	.....	.....	.....	44·1324	4288·105	·129	·024	− 1·68
60·6076	4444·163	·976	·193	+13·05	40·8648	4260·600	·640	·040	− 2·82
58·0730	4418·083	·038	·047	+ 3·19	40·8699	4260·545	.....	.....	.....
57·8009	4415·330	·293	·037	+ 2·51	37·5322	4233·603	·594	·009	+ 0·64
56·7605	4404·881	·927	·041	+ 2·79	35·2560	4216·373	·351	·022	+ 1·56
56·7651	4404·938	.....	.....	.....	33·5024	4202·250	·198	·052	+ 3·71
55·7895	4395·262	·286	·024	− 1·64	33·4954	4202·013	.....	.....	.....

Mean	+1·00
V_a	+2·64
V_d	+ ·12
Curvature	− ·50
Radial velocity	+3·3

η VIRGINIS 671.

1907. March 20.
G. M. T. 19h 36m

Observed by J. S. PLASKETT.
Measured by N. B. McLEAN.

Mean of Settings.	Measured Wave Length.	Normal W. L.	Displacement.	Velocity.	Mean of Settings.	Measured Wave Length.	Normal W. L.	Displacement.	Velocity.
72·9325	4584·273	.....	.....	.....	51·2977	4352·191	·006	·185	12·75
72·9571	4584·357	·018	·339	+ 22 17	48·4334	4325·847	.....	.....	.....
70·1095	4549·966	·766	·200	13 18	46·4312	4307·993	.....	.....	.....
70·0790	4549·763	.....	.....	.....	46 4506	4308·264	·081	·183	12·74
68·7671	4534·480	·139	·341	22 54	44·8953	4294·698	·273	·425	29·66
68·3050	4528·973	.....	.....	.....	44·8507	4294·192	.....	.....	.....
67·1688	4515 794	·508	·286	18·99	37·5183	4233·518	·328	·190	12·74
65·2975	4494 831	.....	.....	.....	36·7753	4227·435	.....	.....	.....
64·0993	4481·512	·400	·112	7·49	35·2586	4215·768	·668	·100	+ 7·11
63·6115	4476·273	.....	.....	.....	33·4896	4201·948	.....	.....	.....
56·7679	4404·938	.....	.....	.....					

Mean.....	+15·94
V_a	+ 2·56
V_d	− ·17
Curvature.	− ·50
Radial velocity.....	+ 17·8

η VIRGINIS 671.*

1907. March 20.
G. M. T. 19h 36m

Observed by J. S. PLASKETT.
Measured by J. S. PLASKETT.

Mean of Settings.	Measured Wave Length.	Normal W. L.	Displacement.	Velocity.	Mean of Settings.	Measured Wave Length.	Normal W. L.	Displacement.	Velocity.
72·9357	4584·117	.....	.....	.....	54·6192	4383·742	·720	·022	1·50
72·9454	4584·127	·018	·109	+7·11	54·6187	4383·825	.....	.....	.....
70·1102	4549·924	766	·158	10·41	51·3052	4352·212	·006	·206	14·19
70·0852	4549·684	.....	.....	.....	48·4524	4326·040	·939	·101	7·07
68·7818	4534·322	·139	·183	12·10	48·4412	4326·041	.....	.....	.....
68·3057	4528·855	.....	.....	.....	46·4454	4308·142	·081	061	4·24
67·1606	4515·652	·508	·144	9·56	46·4368	4308·221	.....	.....	.....
65·3031	4494·811	.....	.....	.....	40·8805	4260·680	·640	·040	2·82
64·1040	4481·520	·400	·120	8·03	40·8762	4260·771	.....	.....	.....
63·6173	4476·280	.....	.....	.....	37 5236	4233·490	·328	·162	11·45
57·8165	4415·416	·293	·123	8·35	35·2637	4215·741	·668	·073	+5·19
56·7841	4405·054	·927	·127	8·40	33·4936	4202·238	.....	.....	.....
56·7689	4404·979	.....	.....	.....					

Mean.....	+ 7·87
V_a	+ 2·56
V_d	− 0·17
Curvature...	− 0·50
Radial velocity.....	+ 9·8

*Check measurement. : +12 0 accepted as result.

η VIRGINIS 675.

1907. March 28.
G. M. T. $14^h\ 05^m$

Observed by W. E. HARPER.
Measured by J. S. PLASKETT.

Mean of Settings.	Measured Wave Length.	Normal W.L.	Displacement.	Velocity.	Mean of Settings.	Measured Wave Length.	Normal W.L.	Displacement.	Velocity.
72·9778	4584·134	.....	.....	.....	56·7710	4404·957	.....	.....	.....
73·0001	4584·288	·018	·170	+11·08	54·8227	4385·770	·548	·222	15·18
72·0180	4572·321	·156	·165	10·82	54·6327	4383·920	·720	·200	13·68
71·3500	4564·238	·939	·299	19·64	54·6122	4383·760	.....	.....	.....
70·6728	4556·179	·030	·149	9·80	52·9684	4367·964	·841	·123	8·45
70·1407	4549·877	·766	·111	7·31	51·2952	4352·230	.....	.....	.....
70·1170	4549·667	.....	.....	.....	48·4190	4325·930	.....	.....	.....
68·8290	4534·498	·139	·359	23·73	48·4376	4326·079	·939	·140	9·70
68·3370	4528·883	.....	.....	.....	46·4296	4308·235	·081	·154	10·72
67·8353	4523·040	·855	·185	12·27	46·4120	4308 081	.....	.....	.....
65·3222	4494·782	.....	.....	.....	40·8766	4260 988	·640	·348	24·50
64·1318	4481·695	·400	·295	19·71	37·4956	4233·635	·328	·307	21·74
63·6320	4476·242	.....	.....	.....	35·2312	4215·870	·668	·202	14·36
56·7882	4405·098	·927	·171	11·64	33·4357	4202·105	.....	.....	.....

Mean	+14·43
V_a	−1·31
V_d	+ 0·22
Curvature	−0·50
Radial velocity	+12 8

η VIRGINIS 689.

1907. April 3.
G. M. T. $15^h\ 10^m$

Observed by J. S. PLASKETT.
Measured by J. S. PLASKETT.

Mean of Settings.	Measured Wave Length.	Normal W. L.	Displacement.	Velocity.	Mean of Settings.	Measured Wave Length.	Normal W. L.	Displacement.	Velocity.
72·9649	4584·144	.....	.....	.....	54·6258	4383·844	·720	·124	8·27
70·1340	4549·875	·766	·109	+ 7·14	54·6128	4383·698	.....	.....	.....
70 1159	4549·764	.....	.....	.....	51·2895	4352·166	·006	·160	10·70
68·8212	4534·500	·139	·361	23·72	48 4234	4325 880	.....	.....	.....
68·3261	4528·836	.....	.....	.....	46·4446	4308·335	·081	·254	17·12
65·3175	4494·761	.....	.....	.....	46·4160	4308·023	.....	.....	.....
64·1263	4481·608	·400	·208	13·71	45·9125	4303·675	·503	·172	11·63
63·6300	4476·230	.....	.....	.....	45·5570	4300·575	·211	·364	24·64
56·8090	4405 284	·927	·357	23·60	44·8586	4291·511	·273	·238	16·18
56·7731	4404·924	.....	.....	.....	40·8698	4260·872	·640	·232	+15·87
55·8058	4395·362	·286	·076	5·05	40·8417	4260·561	.....	.....	.....

Mean	+14·80
V_a	− 4 51
V_d	+ ·11
Curvature	− ·50
Radial velocity	+ 9·9

η VIRGINIS 690.

1907. April 3.
G. M. T. $16^h\ 17^m$

Observed by } J. S. PLASKETT.
Measured by }

Mean of Settings.	Measured Wave Length.	Normal W. L.	Displacement.	Velocity.	Mean of Settings.	Measured Wave Length.	Normal W. L.	Displacement.	Velocity.
72·9592	4584·173	.....	.....	.....	56·7639	4404·932	.....	.....	.....
72·9960	4584·471	·018	·453	+ 29·55	55·8482	4395·857	·286	·571	38·94
71·0286	4560·617	·233	·384	25·12	50·0825	4341·042	·634	·408	28·19
70·1388	4550·033	·766	·267	17·60	48·4841	4326·503	·939	·564	39·08
70·1069	4549·758	.....	.....	.....	48·4215	4325·963	.....	.....	.....
68·3186	4528·848	.....	.....	.....	47·2800	4315·750	·255	·495	34·44
65·3118	4494·798	.....	.....	.....	47·1651	4314·732	255	·523	[− 36·35]
64·1427	4481·855	·400	·455	30·43	46·4111	4308·081	.....	.....	.....
63·6230	4476 255	.....	.....	.....	45·9200	4303·775	·337	·438	30·53
57·8479	4415·778	·293	·485	32 93	44·1608	4288·550	·129	·421	29 43
56·8081	4405·367	·927	·440	30·24	40·8736	4260 916	·640	·276	+ 19·01
56·6936	4404·227	·927	·700	− 47·67]	40·8402	4260·648	.....	.....	.....

Mean	+ 29·65
V_a	− 4·55
V_d	+ ·03
Curvature	− ·50
Radial velocity	+ 24·6

η VIRGINIS 697.

1907 April 5.
G. M. T. $15^h\ 58^m$.

Observed by } J. S. PLASKETT.
Measured by }

Mean of Settings.	Measured Wave Length.	Normal W. L.	Displacement.	Velocity.	Mean of Settings.	Measured Wave Length.	Normal W. L.	Displacement.	Velocity.
72·9470	4583·923	.....	.....	.....	54·6175	4383·744	.....	.....	.....
70·9202	4559·402	·827	·575	+37·60	51·3312	4352·463	·006	·457	31·53
70 1463	4550·179	·766	·413	27·05	50·1042	4341·108	·634	·474	32·75
70·1012	4549·590	.....	.....	.....	48·4357	4325·987	.....	.....	.....
68·8295	4534·710	·139	·570	37·80	47·2927	4315·705	·255	·450	31·27
68·3217	4528·784	.....	.....	.....	47·1937	4314·826	·255	·429	[−29·81]
65·3176	4494·762	.....	.....	.....	46·4779	4308·496	·081	·415	28·88
64 1482	4481·880	·400	·480	32·11	46·4326	4308·169	.....	.....	.....
63·6242	4476·167	.....	.....	.....	45·5922	4300·740	·211	·529	36·92
56·8127	4405·284	·927	·643	43·79	44·8984	4294·722	·273	·449	31·34
56 7772	4404·965	.....	.....	.....	37·5545	4233·854	·328	·626	44·32
55·8460	4395·709	·286	·423	28·97	33·5356	4202·602	·198	·404	+29·80
54·6681	4384·296	·720	·576	39·46	33·4808	4202·281	.....	.....	.....

Mean	+35·57
V_a	−5·53
V_d	+ ·04
Curvature	− ·50
Radial velocity	+29·6

η VIRGINIS 709.

1907. April 5.
G. M. T. $19^h\ 25^m$

Observed by J. S. PLASKETT.
Measured by N. B. McLEAN.

Mean of Settings.	Measured Wave Length	Normal W. L.	Displacement.	Velocity.	Mean of Settings.	Measured Wave Length.	Normal W. L.	Displacement.	Velocity.
72·9795	4584·007	.....	.....	.....	47·2780	4315·199	·178	·021	1·46
70·6955	4556·376	·202	·174	+11·45	46·4723	4308·062	.....	.....	.....
70·1586	4549·999	·766	·233	15·35	45·6324	4300·696	·211	·485	33·80
67·8734	4523·349	·855	·494	32·75	44·8952	4294·300	.....	.....	.....
67·2244	4515·934	·508	·426	32·80	44·4880	4290·792	·432	·360	25·16
65·3385	4494·673	.....	.....	.....	43·5241	4282·526	.....	.....	.....
64·1583	4481·666	·400	·266	17·80	39·2956	4247·432	·996	·436	30·78
56·8578	4405·406	·927	·479	32·57	37·5965	4233·782	·328	·454	32·15
56·8097	4404·919	.....	.....	.....	34·6504	4210·711	·494	·217	15·45
54·6545	4383·717	.....	.....	.....	34·4688	4209·318	·766	·552	+39·30
50·1316	4340·992	·634	·358	24·74	33·5334	4202·086	.....	.....	.....

Mean..... ...	+24·67
V_a	−5·61
V_d	− ·04
Curvature.....	− ·50
Radial velocity.....	+18·5

η VIRGINIS 706.

1907. April 11.
G. M. T. $17^h\ 13^m$

Observed by W. E. HARPER.
Measured by N. B. McLEAN.

Mean of Settings.	Measured Wave Length.	Normal W.L.	Displacement.	Velocity.	Mean of Settings.	Measured Wave Length.	Normal W.L.	Displacement.	Velocity.
73·0252	4584·009	.....	.....	.....	54·6829	4383·697	.....	.....	.....
73·0563	4584·400	·018	·382	+24·91	51·3729	4352·266	·006	·260	17·91
70·2033	4549·936	·766	·170	11·21	50·1578	4341·034	·634	·400	27·64
70·1766	4549·650	.....	.....	.....	48·4969	4325·852	.....	.....	.....
68·8928	4534·539	·139	·400	26·44	46·5327	4308·461	·081	·380	26·45
68·3993	4528·874	.....	.....	.....	46·4914	4308·038	.....	.....	.....
66·0257	4501·812	·448	·364	24·24	44·5012	4290·688	·273	·415	28·97
64·2117	4481·744	·400	·344	23·01	40·9230	4260·593	.....	.....	.....
63·7004	4476·242	.....	.....	.....	39·3010	4247·386	·996	·390	27·53
56·8923	4405·417	·927	·490	26·52	37·6057	4233·788	·328	·460	32·57
56·8424	4404·920	.....	.....	.....	36·7918	4227·354	·904	·450	31·90
56·7860	4404·357	·927	570	[−38·76]	35·4373	4216·072	·668	·404	+28·72
55·9167	4395·766	·286	·480	25·92	33·5337	4202·043	.....	.....	.....

Mean.....	+25·60
V_a	−8·51
V_d	− ·10
Curvature	− ·50
Radial velocity.	+16·5

η VIRGINIS 707.

1907. April 11.
G. M. T. $18^h\ 07^m$

Observed by W. E. HARPER.
Measured by N. B. McLEAN

Mean of Settings.	Measured Wave Length.	Normal W. L.	Displacement.	Velocity.	Mean of Settings.	Measured Wave Length.	Normal W. L.	Displacement.	Velocity.
72·9643	4583·714	.....	.....	.....	54·3304	4352·509	·006	·503	34 66
70·1047	4549·274	.....	.....	.....	50 0992	4341·122	·634	·488	33·72
68·8355	4534·747	·139	·608	+40 19	48·4287	4326·034	.....	.....	.....
68·3225	4528·477	.....	.....	.....	46·4243	4308·243	.....	.....	.....
67·8441	4523 290	·974	·316	20 95	44·8994	4294 832	·273	559	39·02
65·3154	4494·487	.....	.....	.....	44·8392	4294·466	.....	.....	.....
64 1454	4481·832	·400	·432	28 90	40·8493	4260 880	.....	.....	.....
63·6286	4476 002	.....	.....	.....	35 2821	4216 174	·668	·506	+35·98
56·7723	4404·850	.....	.....	.....	33·4581	4202·503	.....	.....	.....
54·6722	4384 277	720	·557	38 10					

Mean	+ 33 94
V_a	- 8·51
V_d	- ·16
Curvature	- ·50
Radial velocity	+ 24 8

η VIRGINIS 710.

1907. Apl. 15.
G. M. T. $13^h\ 52^m$

Observed by J. S. PLASKETT.
Measured by N. B. McLEAN.

Mean of Settings.	Measured Wave Length.	Normal W. L.	Displacement.	Velocity.	Mean of Settings.	Measured Wave Length.	Normal W. L.	Displacement.	Velocity.
72·9756	4584 259	·018	·285	+ 18·58	54·5966	4383·764	.....	.....	.....
72·9562	4584·064	.....	.....	.....	51·2851	4352·306	006	·500	20·67
70·1322	4550·046	·766	·280	18·45	50·0696	4341·085	634	·449	31·02
70·0986	4549·632	.....	.....	.....	48·4016	4325·934	.....	.....	.....
68·8294	4534·780	·139	·641	42·37	47·2672	4315·797	·255	·542	37 18
68·3115	4528·765	.....	.....	.....	46 3939	4308·085	.....	.....	.....
64·1287	4481·791	·400	·391	26 15	40·8240	4260·680	.....	.....	.....
63·6156	4476·226	.....	.....	.....	35·2488	4216·152	668	·484	+34·41
62·9515	4469·024	·663	·361	24·42	33·4250	4202·121	.....	.....	.....
56 7555	4404·958	.....	.....	.....					

Mean	+28·36
V_a	—10·37
V_d	+ ·14
Curvature	— ·59
Radial velocity	+17·6

η VIRGINIS 715.

1907. April 18.
G. M. T. $13^h\ 07^m$

Observed by W. E. HARPER.
Measured by N. B. McLEAN.

Mean of Settings.	Measured Wave Length.	Normal W. L.	Displacement.	Velocity.	Mean of Settings.	Measured Wave Length.	Normal W. L.	Displacement.	Velocity.
73·0413	4583·808	.....	.....	.....	54·7087	4383·732	.....	.....	.....
70·2330	4550·099	·766	·333	−21·94	48·5285	4326·037	.....	.....	.....
70·1987	4549·475	.....	.....	.....	46·5245	4308·221	.....	.....	.....
68·9173	4534·656	·139	·517	34·17	45·6859	4300·737	·081	·656	45·72
68·4144	4528·686	.....	.....	.....	44·9433	4294·456	.....	.....	.....
65·4041	4494·618	.....	.....	.....	40·9521	4260·802	.....	.....	.....
64·2393	4481·871	·400	·471	31·51	37·6396	4233·929	·328	·601	+42·55
56·8673	4404·927	.....	.....	.....	33·5617	4202·331	.....	.....	.....
54·9478	4386·040	·548	·492	33·65					

Mean	+34·92
V_a	−11·83
V_d	+ ·12
Curvature	− ·50
Radial velocity	−22·7

η VIRGINIS 722.

1907. April 18.
G. M. T. $16^h\ 25^m$

Observed by W. E. HARPER.
Measured by N. B. McLEAN.

Mean of Settings.	Measured Wave Length.	Normal W.L.	Displacement.	Velocity.	Mean of Settings.	Measured Wave Length.	Normal W.L.	Displacement.	Velocity.
72·9273	4583·916	.....	.....	.....	57·9653	4417·166	·985	181	12·29
71·9864	4572·502	156	·346	+ 22·70	56·7445	4404·927	.....	.....	.....
70·1087	4549·974	·766	·208	13·71	50·0411	4340·871	·634	·237	16·38
70·0793	4549·574	.....	.....	.....	48·4003	4325·989	.....	.....	.....
68·3004	4528·789	.....	.....	.....	43·4360	4282 607	.....	.....	.....
65·2903	4494·718	.....	.....	.....	40·8143	4260·678	.....	.....	.....
64·1017	4481·642	·400	·242	16·19	37·4789	4233·651	·328	·323	+ 22·87
63·6110	4476·289	.....	.....	.....	33·4294	4202·259	.....	.....	.....

Mean	+ 17·36
V_a	− 11·83
V_d	− ·16
Curvature	− 50
Radial velocity	+ 4·9

η VIRGINIS 722.*

1907. April 18.
G. M. T. $16^h\ 25^m$.

Observed by } W. E. HARPER.
Measured by }

Mean of Settings.	Measured Wave Length.	Normal W. L.	Displacement.	Velocity.	Mean of Settings.	Measured Wave Length.	Normal W. L.	Displacement.	Velocity.
70·1299	4549·969	·766	·203	+13·38	56·7685	4404·997	·927	·070	4·77
70·0937	4549·227	.....	.....	.....	56·7614	4404·950	.....	.....	.....
68·7838	4534·291	·139	·157	10·38	50·0566	4340·893	·634	259	14·70
65·3070	4494·531	.....	.....	.....	48·4118	4326·137	.....	.....	.....
64·1147	4481·547	·400	·147	9·83	48·4383	4326·177	·939	·238	16·49
63·6260	4476·126	.....	.....	.....	46·4327	4308·320	·081	·259	+16·70

Mean		+11·84
V_a	−11·83	.....
V_d	— ·16	.....
Curvature....	— ·50	.....
Radial velocity...	— 0·6	.....

* Check measurement : + 2 accepted as result.

η VIRGINIS 723.

1907. April 18.
G. M. T. $17^h\ 57^m$

Observed by W. E. HARPER.
Measured by N. B. MCLEAN.

Mean of Settings.	Measured Wave Length.	Normal W.L.	Displacement.	Velocity.	Mean of Settings.	Measured Wave Length.	Normal W.L.	Displacement.	Velocity.
73·0024	4584·404	·018	·386	+25·24	50·1038	4341·065	·634	·431	29·78
72·9705	4583·994	.....	.....	.....	48·4397	4326·012	.....	.....	.....
70·1535	4550·061	·766	·295	19·44	47·3011	4315·763	·255	·508	34·82
70·1204	4549·625	.....	.....	.....	46·4301	4308·148	.....	.....	.....
68·8313	4534·568	·139	·429	28·36	44·8928	4294·672	·273	·399	27·85
68·3309	4528·715	.....	.....	.....	44·8485	4294·380	.....	.....	.....
65·9716	4501·939	·448	·491	32·70	43·4794	4282·663	.....	.....	.....
64·1510	4481·824	·400	·424	28·37	40·8601	4260·752	.....	.....	.....
56·8119	4405·231	·927	·304	20·70	36·7279	4227·418	·021	·397	28·15
56·7813	4404·927	.....	.....	.....	35·2742	4216·088	·668	·420	+29·86
54·6267	4383·771	.....	.....	.....	33·4616	4202·224	.....	.....	.....
51·3158	4352·273	·006	·227	15·64					

Mean.....		+26 74
V_a	−11·85	
V_d	— ·24	
Curvature ...	— ·50	
Radial velocity.....		+14·2

η VIRGINIS 725.

1907 April 19.
G. M. T. 13h 19m

Observed by J. S. Plaskett.
Measured by N. B McLean.

Mean of Settings.	Measured Wave Length.	Normal W. L.	Displacement.	Velocity.	Mean of Settings.	Measured Wave Length.	Normal W. L.	Displacement.	Velocity.
72·9673	4584·018	.....	.....	.....	54·6157	4383·714	.....	.....	.....
72·9967	4584·378	·018	·360	+23·47	51·3238	4352·451	·006	·445	30·66
72·0482	4572·796	·156	·640	41·92	50·1015	4341·154	·634	·520	35·88
70·1663	4550·244	·766	·478	30·97	48·4257	4325·932	.....	.....	.....
70·1130	4549·597	.....	.....	.....	47·9344	4321·510	·992	·518	35·95
68·8427	4534·719	·139	·580	38·34	46·4782	4308·600	·081	·519	36·12
68·3352	4528·823	.....	.....	.....	46·4207	4308·116	.....	.....	.....
67·8487	4523·235	·855	·380	25·19	45·1786	4297·257	·761	·496	34·62
67·2263	4516·116	·508	·608	40·37	44·8859	4294·729	·273	·456	31·83
65·3221	4494·719	.....	.....	.....	43·4654	4282·589	.....	.....	.....
64·1620	4481·928	·400	·528	35·32	40·8422	4260·647	.....	.....	.....
63·6368	4476·224	.....	.....	.....	39·2184	4247·396	·996	·400	28·24
56·8423	4405·585	·927	·658	44·74	37·5362	4233·814	·328	·486	34·41
56·7762	4404·927	.....	.....	.....	36·2807	4227·514	·904	·610	+43·25
55·8375	4395·640	·286	·354	24·14	33·4474	4202·155	.....	.....	.....

Mean		+34·19
V_a	−12·22	
V_d		·17
Curvature	− ·50	
Radial velocity		+ 21·6

η VIRGINIS 728.

1907. April 19.
G. M. T. 15h 12m

Observed by J. S. Plaskett.
Measured by N. B. McLean.

Mean of Settings.	Measured Wave Length.	Normal W.L.	Displacement.	Velocity.	Mean of Settings.	Measured Wave Length.	Normal W.L.	Displacement.	Velocity.
72·9499	4584·202	.....	.....	.....	54·5814	4383·696	.....	.....	.....
70·1477	4550·385	·766	·619	+40·79	51·2893	4352·464	·006	·458	31·56
70·0854	4549·655	.....	.....	.....	50·0690	4341·190	·634	·556	38·42
68·8057	4534·638	·139	·499	32·98	48·4471	4326·456	·939	·517	35·83
68·3004	4528·796	.....	.....	.....	48·3888	4325·892	.....	.....	.....
67·8300	4523·365	·855	·510	33·81	47·0176	4313·699	·034	·665	46·22
67·1722	4515·852	·508	·344	22·84	46·3814	4308·049	.....	.....	.....
65·2989	4492·822	.....	.....	.....	44·8594	4294·836	·273	·563	39·30
64·1192	4481·811	·400	·411	27·50	44·7978	4294·267	.....	.....	.....
62·9397	4469·020	·663	·357	23·95	40·8055	4260·612	.....	.....	.....
60·6358	4444·510	·976	·534	36·04	37·5116	4234·011	·328	·683	48·35
56·8096	4405·581	·927	·654	44·54	35·2493	4216·278	·668	·610	+ 43·38
56·7438	4404·927	.....	.....	.....	33·4070	4202·093	.....	.....	.....

Mean		+36·37
V_a	−12·26	
V_d		+ ·02
Curvature	− ·50	
Radial velocity		+23·6

η VIRGINIS 729.

1907. April 19.
G. M. T. $16^h\ 02^m$

Observed by J. S. PLASKETT.
Measured by N. B. McLEAN.

Mean of Settings.	Measured Wave Length.	Normal W.L.	Displacement.	Velocity.	Mean of Settings.	Measured Wave Length.	Normal W.L.	Displacement.	Velocity.
72·9587	4584·013	.....	.....	.....	68·3198	4528·740	.....	.....	.....
72·0028	4572·356	·156	·200	+13·12	65·3089	4494·664	.....	.....	.....
71·3442	4564·407	939	·468	30·75	64·1332	4481·759	·400	·359	·24·02
70·1502	4550·179	766	·413	27·22	63·6253	4476·188	.....	.....	.....
70·1032	4549·579	.....	.....	.....	56·7680	4404·927	.....	.....	.....
68·8224	4534·619	139	·480	31·73	40·8339	4260·646	.....	.....	.....

Mean	+25·78
V_o	−12·29
V_d	−·04
Curvature	−·50
Radial velocity	+13·0

η VIRGINIS 730.

1907. April 19.
G. M. T. $17^h\ 50^m$

Observed by J. S. PLASKETT.
Measured by N. B. McLEAN.

Mean of Settings.	Measured Wave Length.	Normal W.L.	Displacement.	Velocity.	Mean of Settings.	Measured Wave Length.	Normal W.L.	Displacement.	Velocity.
72·9837	4584·121	.....	.....	.....	56·7842	4404·927	.....	.....	.....
70·1866	4550·350	·766	·584	+38·49	50·1312	4341·364	·634	·730	50·44
70·1261	4549·657	.....	.....	.....	48·5071	4326·623	·939	·684	47·40
68·3413	4528·801	.....	.....	.....	48·4332	4325·928	.....	.....	.....
67·2666	4516·481	·508	·973	64·61	46·4196	4308·030	.....	.....	.....
65·3326	4494·747	.....	.....	.....	40·8505	4260·650	.....	.....	.....
64·1822	4482·074	·400	·674	45·09	37·5470	4233·942	·328	·614	+43·47
63·6521	4476·303	.....	.....	.....	33·4532	4202·138	.....	.....	.....

Mean	+46·39
V_o	−12·31
V_d	−·17
Curvature	−·50
Radial velocity	−33·4

η VIRGINIS 735.

1907. April 24.
G. M. T. $14^h\ 03^m$

Observed by J. S. PLASKETT.
Measured by W. E. HARPER.

Mean of Settings.	Measured Wave Length.	Normal W.L.	Displacement.	Velocity.	Mean of Settings.	Measured Wave Length.	Normal W.L.	Displacement.	Velocity.
73·4020	4588·733	·381	·352	+22·95	56·8059	4404·873	.....	.....	.....
73·0530	4584·430	·018	·412	26·94	55·8631	4395·608	·286	·322	21·96
73·0195	4584·023	.....	.....	.....	54·6456	4383 671	.....	.....	.....
70·1890	4549·943	·766	·177	11·66	51·3431	4352·412	006	·406	27·97
70·1620	4549·608	.....	.....	.....	47·9577	4321·563	·992	·571	39·57
68·8716	4534·521	·139	·382	25·25	46·4768	4308·268	·081	·187	12·50
68·3750	4528·752	.....	.....	.....	46·4355	4307·956	.....	.....	.....
67·8740	4523·016	·855	·161	10·01	40·9017	4261·041	·640	·401	28·23
66·0020	4501·835	·448	·387	25·77	40·8580	4260·561	.....	.....	.....
65·3651	4494·721	.....	.....	.....	37·5298	4233·800	·328	·472	33·43
64·1840	4481·755	·400	·355	23·75	35·2690	4216·089	·668	·421	+29·97
63·6714	4476·154	.....	.....	.....	33·4569	4202·034	.....	.....	.....
56·8306	4405·170	·927	·243	16·55					

Mean ..... +21·55
V_r ..... −14·50
V_Σ ..... + ·09
Curvature..... − ·50

Radial velocity..... + 6·6

η VIRGINIS 737.

1907. Apr. 24.
G. M. T. $15^h\ 25^m$

Observed by J. S. PLASKETT.
Measured by N. B. MCLEAN.

Mean of Settings.	Measured Wave Length.	Normal W. L.	Displacement.	Velocity.	Mean of Settings.	Measured Wave Length.	Normal W. L.	Displacement.	Velocity.
73·0344	4584·252	.....	.....	.....	54·6567	4383·665	.....	.....	.....
72 0830	4572·435	·156	·279	+18·27	51 3386	4352·251	·006	·245	16·88
70·2079	4550·026	·766	·260	17·13	48·4585	4325·791	.....	.....	.....
70·1753	4549·781	.....	.....	.....	46·4978	4308·517	·081	·436	30·34
68·3884	4528 904	.....	.....	.....	46·4490	4307·923	.....	.....	.....
64·2125	4481·940	·400	·540	36·13	42·2980	4272·508	·760	·748	+52·51
63·6839	4476·243	.....	.....	.....	42·1963	4271 660	·760	·100	[− 7·02]
56·8200	4404·909	.....	.....	.....	40·8687	4260·425	.....	.....	.....
55·8670	4395·510	·286	·224	15·28					

Mean..... +26·65
V_a..... −14·50
V_d..... — ·02
Curvature..... — ·50

Radial velocity..... +11 6

η VIRGINIS 738.

1907. April 26.
G. M. T. $16^h\ 20^m$

Observed by J. S. PLASKETT.
Measured by N. B. McLEAN.

Mean of Settings.	Measured Wave Length.	Normal W. L.	Displacement.	Velocity.	Mean of Settings.	Measured Wave Length.	Normal W. L.	Displacement.	Velocity.
72·9932	4584·254	·018	·236	+15·39	63·6407	4476·189	.....	.....	.....
72·9740	4583·970	.....	.....	.....	56·8273	4405·316	·927	·389	26·45
70·1509	4550·011	·766	·245	16·15	56·7879	4404·971	.....	.....	.....
70·1180	4549·552	.....	.....	.....	50·1028	4341·021	·634	·387	26·74
68·8416	4534·661	·139	·522	34·50	48·4443	4326·009	.....	.....	.....
68·3345	4528·721	.....	.....	.....	35·7289	4219·538	.....	.....	.....
67·8650	4523·375	·855	·520	34·48	35·2678	4215·938	·668	·270	+19·20
65·3336	4494·765	.....	.....	.....	33·4759	4202·199	.....	.....	.....
64·1513	4481·740	·400	·340	22·75					

Mean	+24·46
V_a	−15·38
V_d	− ·11
Curvature	− ·50
Radial velocity	+ 8·5

η VIRGINIS 740.

1907. April 27.
G. M. T. $16^h\ 40^m$

Observed by J. S. PLASKETT.
Measured by N. B. McLEAN.

Mean of Settings.	Measured Wave Length.	Normal W.L.	Displacement.	Velocity.	Mean of Settings.	Measured Wave Length.	Normal W.L.	Displacement.	Velocity.
72·9961	4584·101	.....	.....	.....	51·3341	4352·388	·006	·382	26·32
72·0653	4572·679	·156	·523	+34·31	50·1063	4341·049	·634	·415	28·68
70·1788	4550·094	·766	·328	21·62	48·4782	4326·219	·939	·280	19·40
68·8587	4534·628	·139	·489	32·32	48·4440	4325·861	.....	.....	.....
68·3549	4528·812	.....	.....	.....	46·4694	4308·365	·081	·284	19·77
67·8736	4523·258	·855	·403	26·72	44·8795	4294·571	·273	·298	20·80
67·2342	4515·957	·508	·449	29·81	44·8482	4294·171	.....	.....	.....
65·3458	4494·758	.....	.....	.....	37·5356	4233·800	·328	·472	33·42
64·1676	4481·778	·400	·378	25·29	36·7527	4227·414	.....	.....	.....
63·6566	4476·325	.....	.....	.....	35·2891	4216·215	·668	·547	+38·89
56·8341	4405·271	·927	·344	23·39	33·4568	4201·909	.....	.....	.....
56·7958	4404·905	.....	.....	.....					

Mean	+ 27·20
V_a	− 15·80
V_d	− ·10
Curvature	− ·50
Radial velocity	+ 10·8

η VIRGINIS 742.

1907. May 2.
G. M. T. $13^h\ 22^m$.

Observed by W. E. HARPER.
Measured by N. B. McLEAN.

Mean of Settings.	Measured Wave Length.	Normal W. L.	Displacement.	Velocity.	Mean of Settings.	Measured Wave Length.	Normal W. L.	Displacement.	Velocity.
72·9620	4584·009	.....	.....	.....	67·8535	4523·440	·855	·585	38·78
70·1570	4550·259	·766	·493	+32·49	65·3062	4494·683	.....	.....	.....
70·1027	4549·570	.....	.....	.....	64·1340	4481·814	·400	·414	27·70
69·4723	4542·201	·690	·511	33·73	62·9622	4469·109	·663	·446	+29·93
68·8251	4534·654	139	·514	33·97	56·7616	4404·974	.....	.....	.....
68·3217	4528·782	.....	.....	.....					

Mean		−32·77
V_a	−17·80	.....
V_d		+ ·12
Curvature	− ·50	.....
Radial velocity		−14·6

η VIRGINIS 742*

1907. May 2.
G. M. T. $13^h\ 22^m$

Observed by } W. E. HARPER.
Measured by }

Mean of Settings.	Measured Wave Length.	Normal W.L.	Displacement.	Velocity.	Mean of Settings.	Measured Wave Length.	Normal W.L.	Displacement.	Velocity.
71·1942	4550·274	·766	·508	+33·48	65·1712	4481·843	·400	·443	29·64
71·1408	4549·664	.....	.....	.....	63·9916	4469·074	·663	·411	27·58
69·8567	4534·624	·139	·485	32·06	63·7725	4466·734	.....	.....	.....
69·3531	4528·797	.....	.....	.....	46·1631	4297·293	·861	·432	+30·15
68·8787	4523·325	·855	·470	31·11	45·8362	4294·269	.....	.....	.....
66·3483	4494·817	.....	.....	.....					

Mean		+30·67
V_a	−17·80	
V_d		+ ·12
Curvature	− ·50	
Radial velocity		+12·5

* Check measurement: the mean of the two measurements, +13·5, used.

η VIRGINIS 748.

1907. May 4.
G. M. T. 16h 27m

Observed by J. S. Plaskett.
Measured by N. B. McLean.

Mean of Settings.	Measured Wave Length.	Normal W.L.	Displacement.	Velocity.	Mean of Settings.	Measured Wave Length.	Normal W.L.	Displacement.	Velocity.
73·0098	4584·081	.....	.....	.....	54·6824	4383·758	.....	.....	.....
68·8588	4534·429	·139	·290	+19·17	46·4974	4308·126	.....	.....	.....
68·3712	4528·741	.....	.....	.....	45·9942	4303·634	·337	·297	20·49
64·8913	4489·419	·258	·161	10·75	45·5125	4299·508	.....	.....	.....
64·1808	4481·603	·400	·203	13·58	37·9108	4236·170	.....	.....	.....
63·6888	4476·254	.....	.....	.....	37·5937	4233·569	·328	·241	17·06
56·8664	4405·231	·927	·304	20·67	35·8133	4219·623	.....	.....	.....
56·8352	4404·927	.....	.....	.....	35·3564	4215·997	·668	·329	+23·39
55·8807	4395·460	·286	·174	11·87	33·5589	4202·259	.....	.....	.....

Mean	+17·12
V_a	−18·64
V_d	·15
Curvature	·50
Radial velocity	− 2·2

η VIRGINIS 751.

1907. May 7.
G. M. T. 13h 32m

Observed by W. E. Harper.
Measured by N. B. McLean.

Mean of Settings.	Measured Wave Length.	Normal W. L.	Displacement.	Velocity.	Mean of Settings.	Measured Wave Length.	Normal W. L.	Displacement.	Velocity.
73·0992	4584·317	·018	·299	+19·49	55·8200	4395·554	·286	·268	18·28
72·9749	4584·024	.....	.....	.....	54·6325	4383·971	·720	·251	17·17
70·1475	4549·956	·766	·190	12·52	54·6052	4383·706	.....	.....	.....
68·8403	4534·641	·139	·502	33·18	50·0804	4341·094	·634	·460	31·79
68·3355	4528·798	.....	.....	.....	48·4210	4326·034	·939	·095	6·58
67·8631	4523·365	·855	·510	33·81	46·4297	4308·241	·081	·160	11·14
65·9582	4501·800	·448	·352	23·44	46·3983	4308·053	.....	.....	.....
65·3236	4494·752	.....	.....	.....	45·5256	4300·440	·211	·229	15·96
64·1351	4481·660	·400	·260	17·39	44·8198	4294·323	.....	.....	.....
63·6380	4476·258	.....	.....	.....	42·2118	4272·177	·934	·243	17·06
60·6275	4444·222	·976	·246	16·60	40·8218	4260·640	.....	.....	.....
56·8231	4405·472	·927	·545	37·06	35·2347	4216·038	·668	·370	+26·31
56·7683	4404·927	.....	.....	.....	33·4168	4202·180	.....	.....	.....

Mean	+19·98
V_a	−19·72
V_d	− ·04
Curvature	− ·50
Radial velocity	− 0·2

η VIRGINIS 754.

1907. May 9.
G. M. T. 13h 30m

Observed by W. E. HARPER.
Measured by N. B. McLEAN.

Mean of Settings.	Measured Wave Length.	Normal W. L.	Displacement.	Velocity.	Mean of Settings.	Measured Wave Length.	Normal W. L.	Displacement.	Velocity.
72·9904	4584·037	.....	.....	.....	62·7514	4466·739	.....	.....	.....
70·1663	4550·108	·766	332	+21·85	56·7613	4404·981	.....	.....	.....
68·8184	4534·337	·139	·198	13 09	46·3866	4308·213	081.	·132	9·19
68·3378	4528·775	.....	.....	.....	46·3754	4308·089	.....	.....	.....
66·5761	4508·699	·455	·244	16 25	44 3601	4290·622	·432	190	+13·28
65·3283	4494·794	.....	.....	.....	40·7874	4260·643	.....	.....	.....
64·1314	4481·614	·400	·214	14·32					

Mean	+14·66
V_o	−20·45
V_d	+ ·07
Curvature....	− ·30
Radial velocity...	− 6·2

η VIRGINIS 757.

1907. May 14.
G. M. T. 15h 12m

Observed by W. E. HARPER.
Measured by N. B. McLEAN.

Mean of Settings.	Measured Wave Length.	Normal W. L.	Displacement.	Velocity.	Mean of Settings.	Measured Wave Length.	Normal W. L.	Displacement.	Velocity.
78·1657	4594·216	.....	.....	.....	56·4492	4452·156	.....	.....	.....
77·0834	4586·476	.....	.....	.....	50·3683	4416·856	·985	·129	8·76
76·7190	4583·947	·018	·071	−3·98	50·0908	4415 269	.....	.....	.....
76·2366	4580·472	.....	.....	.....	48·2477	4404·927	.....	.....	.....
68·6518	4528·671	.....	.....	.....	29·5592	4308·081	.....	.....	.....
67·7526	4522·847	·855	·008	0·53	26·6367	4294·149	·273	·124	−8·66
63·3913	4494·710	.....	.....	.....	26·6690	4294·294	.....	.....	.....
61·2339	4481·243	·400	·157	10·50					

Mean	− 6·49
V	−22 17
V_d	− 11
Curvature.....	− 50
Radial velocity.....	− 29·3

η VIRGINIS 757.*

1907. May 14.
G. M. T. 15h 12m

Observed by W. E. HARPER.
Measured by J. S. PLASKETT.

Mean of Settings.	Measured Wave Length.	Normal W. L.	Displacement.	Velocity.	Mean of Settings.	Measured Wave Length.	Normal W. L.	Displacement.	Velocity.
76·6347	4583·989	·018	·629	− 1·89	50·0070	4415·336	.....	.....	.....
76·6343	4583·826	.....	.....	.....	46·5463	4395·976	·286	·689	[+46·99]
76·9997	4586·424	.....	.....	.....	46·4122	4395·237	·286	·049	− 3·34
74·9497	4572·135	·156	·021	− 1·38	46·4407	4395·482	.....	.....	.....
71·6953	4549·730	·766	·036	− 2·37	44·6292	4385·509	·548	·039	− 2·67
71·0828	4545·437	.....	.....	.....	44·4397	4384·482	·720	·762	[+52·12]
69·3866	4534·212	·168	·044	+ 2·91	44·2474	4383·443	·720	·277	− 18·95
68·5673	4528·654	.....	.....	.....	44·2077	4383·810	.....	.....	.....
67·8573	4524·103	·855	1·248	+[82·74]	38·2630	4351·874	·006	·132	− 9·09
67·6547	4522·774	·855	·081	− 5·37	33·1184	4325·877	·939	·062	− 4·30
65·4297	4508·320	·455	·135	− 8·98	33·1323	4326·082	.....	.....	.....
63·3016	4494·685	.....	.....	.....	29·4489	4307·954	·081	·127	− 8·84
62·7656	4491·371	·570	·199	−13·29	27·6261	4299·235	·410	·155	−11·50
61·1506	4481·283	·400	·117	− 7·83	26·7665	4295·164	·273	·891	[+62·19]
60·3275	4476·163	.....	.....	.....	26·5533	4294·156	·273	·117	− 8·17
54·9935	4444·063	·976	·087	+ 5·87	26·5828	4294·428	.....	.....	.....
54·6148	4441·859	.....	.....	.....					

Weighted mean ..... − 6·00
V_a ..... −22·50
V_d ..... − ·11
Curvature ..... − ·28

Radial velocity ..... −28·9

* Check measurement.

η VIRGINIS 761.

1907. May 18.
G. M. T. 16h 05m

Observed by J. S. PLASKETT.
Measured by W. E. HARPER.

Mean of Settings.	Measured Wave Length.	Normal W. L.	Displacement.	Velocity.	Mean of Settings.	Measured Wave Length.	Normal W. L.	Displacement.	Velocity.
74·9488	4572·070	·156	·086	− 5·62	61·1405	4481·265	·400	·135	9·03
74·9323	4571·940	.....	.....	.....	58·7736	4466·641	.....	.....	.....
72·3285	4553·974	·211	·237	15·57	49·2489	4411·068	·205	·137	9·29
71·6942	4549·687	.....	.....	.....	46·4223	4394·909	.....	.....	.....
71·6790	4549·554	·766	·212	13·97	46·3646	4395·063	·286	·223	−15·25
63·2955	4494·706	.....	.....	.....					

Weighted mean ..... −11·35
V^a ..... −23·40
V^d ..... − ·00
Curvature ..... − ·28

Radial velocity ..... −35·0

η VIRGINIS 763.

1907. May 20.
G. M. T. 15h 07m

Observed by W. E. HARPER.
Measured by N. B. McLEAN.

Mean of Settings.	Measured Wave Length.	Normal W. L.	Displacement.	Velocity.	Mean of Settings.	Measured Wave Length.	Normal W. L.	Displacement.	Velocity.
79·8946	4594·216	.....	.....	.....	51·8724	4415·266	.....	.....	.....
78·8148	4586·552	.....	.....	.....	50·0330	4404·927	.....	.....	.....
73·5214	4549·697	·766	·069	− 4·50	45·3789	4379·438	.....	.....	.....
71·1940	4534·031	·168	·137	9·07	40·1355	4351·743	·006	·263	−18·13
70·4030	4528·728	.....	.....	.....	35·0304	4325·992	.....	.....	.....
69·5012	4522·833	·855	·022	− 1·46	31·3760	4308·108	.....	.....	.....
69·1025	4520·219	·397	·178	−11·81	28·9327	4296·365	·761	·396	−27·65
65·1443	4494·697	.....	.....	.....	28·4542	4294·103	·273	·170	−11·87
62·9966	4481·283	·400	·117	7·83	21·1660	4260·640	.....	.....	.....
60·6345	4466·712	.....	.....	.....	21·1248	4260·455	·640	·185	−13·03
51·8818	4415·341	·293	·048	− 3·26					

Mean	−10·21
V_a	−24·00
V_d	− ·12
Curvature	− ·28
Radial velocity	−34·6

η VIRGINIS 773.

1907. May 23.
G. M. T. 13h 36m

Observed by W. E. HARPER.
Measured by N. B. McLEAN.

Mean of Settings.	Measured Wave Length.	Normal W. L.	Displacement.	Velocity.	Mean of Settings.	Measured Wave Length.	Normal W. L.	Displacement.	Velocity.
72·9936	4864·545	.....	.....	.....	43·0822	4308·047	.....	.....	.....
72·8570	4861·327	·527	·200	− 12·32	42·5373	4300·114	·211	·097	6·76
58·6518	4564·749	.....	.....	.....	42·1351	4294·241	.....	.....	.....
57·8328	4549·666	·766	·100	6·59	35·4807	4202·183	.....	.....	.....
56·6824	4528·829	.....	.....	.....	35·4691	4202·042	·198	·156	− 11·12
47·7827	4376·104	.....	.....	.....	20·6201	4023·563	.....	.....	.....
44·2879	4325·892	.....	.....	.....					

Mean.	− 9·20
V_a	− 24·80
V_d	− ·03
Curvature	− ·28
Radial velocity	− 34·3

η VIRGINIS 777.

1907. May 24.
G. M. T. $13^h\ 25^m$

Observed by J. S. Plaskett.
Measured by N. B. McLean.

Mean of Settings.	Corrected Star Settings.	Displacement in revns.	Velocity.	Mean of Settings.	Corrected Star Settings.	Displacement in revns.	Velocity.
73·0048				54·7557			
72·8872	72·8468	·0281	+ 40·82	53·9982	53·9698	·0132	15·23
60·2271				51·4108	51·3860	·0128	14·34
59·8224				50·5182			
57·8581	57·8225	·0178	21·48	48·7955	48·7747	·0107	+ 11·64
57·8352				48·7910			
56·6806				44·2817			

Mean	+ 20·70
V_a	− 25·13
V_d	− ·02
Curvature	− ·28
Radial velocity	4·7

η VIRGINIS 789.

1907. May 29.
G. M. T. $14^h\ 45^m$

Observed by J. S. Plaskett.
Measured by W. E. Harper.

Mean of Settings.	Measured Wave Length.	Normal W.L.	Displacement	Velocity.	Mean of Settings.	Measured Wave Length.	Normal W.L.	Displacement	Velocity.
73·2041	4871·453				52·6800	4460·462			
72·8070	4862·067	·527	·540	+33·32	49·3193	4405·014			
59·7478	4586·786				48·7302	4395·496	·286	·210	14·32
59·6227	4584·208	·018	·190	12·39	45·2385	4311·270			
58·5574	4564·299	·939	·360	23·62	43·0317	4308·246	·081	·165	11·42
58·1392	4556·587	·202	·385	25·33	42·5029	4300·504	·211	·293	20·30
57·7835	4550·056	·766	·290	19·11	42·0766	4294·384			
57·7609	4549·855				40·5180	4271·967	·760	·207	14·50
56·9279	4534·529	·139	·390	25·82	39·7122	4260·657			
56·6078	4528·947				37·7766	4233·828	·328	·500	35·40
55·0829	4501·748	·448	·300	19·90	36·4552	4215·948	·668	·280	19·91
54·6890	4494·977				35·4233	4202·198			
53·9235	4481·640	·400	·240	16·06	29·6175	4128·302	·862	·440	31·42
53·1959	4469·200	·668	·532	35·60	24·1875	4064·079	·759	·320	+22·91

Mean	+23·26
V_a	26·26
V_d	− ·16
Curvature	− ·28
Radial velocity	− 3·

η VIRGINIS 789.*

1907. May 29.
G. M. T. 14h 45m.

Observed by J. S. Plaskett.
Measured by N. B. McLean.

Mean of Settings.	Corrected Star Settings.	Displacement in Revns.	Velocity.	Mean of Settings.	Corrected Star Settings.	Displacement in Revns.	Velocity.
72·8699				53·2538	53·2400	·0262	29·97
72·8630	72·8574	·0367	−53·32	49·3755			
72·4028				48·7827			
59·6769	59·6657	·0171	21·08	47·7691			
57·8398	57·8271	·0124	14·96	45·3031	45·2979	·0492	51·51
57·8117				44·2755			
56·9991	56·9847	·0394	47·05	40·9177			
56·6622				40·5689	40·5677	·0168	+16·72
55·1265	55·1121	·0030	3·51	39·7652			
53·9787	53·9651	·0085	9·81	35·4743			

Mean		+27·55
V_a	−26·26	
V_d	− ·16	
Curvature	− ·28	
Radial velocity		+0·8

* Measured for trial of short method of reduction; result not used.

η VIRGINIS 795.

1907. May 31.
G. M. T. 14h 06m.

Observed by J. S. Plaskett.
Measured by N. B. McLean.

Mean of Settings.	Corrected Star Settings.	Displacement in Revns.	Velocity.	Mean of Settings.	Corrected Star Settings.	Displacement in Revns.	Velocity.
72·9422				53·9722	53·9948	·0382	44·07
72·8177	72·8370	·0183	+26·59	51·7537	51·7785	·0289	32·51
60·1767				49·3373			
59·7646				48·7461			
57·8116	57·8284	·0237	28·59	45·2552	45·2876	·0389	+40·72
56·9534	56·9698	·0245	29·26	44·2407			
56·6308				39·7275			
54·7038				35·4363			

Weighted Mean		+34·40
V_a	−26·68	
V_d	− ·11	
Curvature	− ·28	
Radial velocity		+7·3

η VIRGINIS 811.

1907. June 10.
G. M. T. $13^h\ 37^m$

Observed by J. S. Plaskett.
Measured by N. B. McLean.

Mean of Settings.	Corrected Star Settings.	Displacement in revns.	Velocity.	Mean of Settings.	Corrected Star Settings.	Displacement in revns.	Velocity.
72·9337				52·2473			
72·8114	72·8414	·0227	+32·98	48·7827			
72·3689				45·2927			
60·1912				45·3105	45·2985	·0498	52·14
59·7814				44·2834			
57·8175	57·8130	·0083	10·01	36·5500	36·5364	0351	+33·50
56·6554				35·4900			
54·0050	53·9962	·0396	45·69	35·5658			

Weighted mean ..... +37 15
V_a ..... —28·31
V_d ..... — ·12
Curvature..... — ·28

Radial velocity. ..... + 8·4

η VIRGINIS 822.

1907. June 11.
G. M. T. $13^h\ 28^m$

Observed by W. E. Harper.
Measured by N. B. McLean.

Mean of Settings.	Corrected Star Settings.	Displacement in revns.	Velocity.	Mean of Settings.	Corrected Star Settings.	Displacement in revns.	Velocity.
60·1977				52·2517			
59·7904				48·7796			
57·8416	57·8328	·0281	+33·90	44·3095	44·2991	·0268	+27·76
56·6525				44·2830			
54·0072	53·9972	0406	+46·84				

Weighted mean..... +36·17
V_a ..... —28·44
V_d ..... — ·12
Curvature..... — ·28

Radia velocity..... + 7·3

η VIRGINIS 835.

1907. June 12.
G. M. T. $14^h\ 35^m$

Observed by J. S. PLASKETT.
Measured by W. E. HARPER.

Mean of Settings.	Measured Wave Length.	Normal W. L.	Displacement.	Velocity.	Mean of Settings.	Measured Wave Length.	Normal W. L.	Displacement.	Velocity.
71·8486	4550·456	·766	·690	+45·47	63·3303	4494·789	.....	.....	.....
71·7286	4549·267	.....	.....	.....	61·3025	4482·094	·400	·694	46·43
69·5323	4534·900	·139	·761	50·45	58·7945	4466·891	.....	.....	.....
68·6035	4528·549	.....	.....	.....	55·1215	4444·790	·976	·814	+54·94
66·5010	4515·000	·508	·508	.....	50·0100	4415·643	.....	.....	.....

Weighted mean..... +48·52
V_o ..... −28·46
V_d ..... − ·20
Curvature..... − ·28

Radial velocity..... +19·6

η VIRGINIS 915.

1907. July 5.
G. M. T. $14^h\ 02^m$

Observed by J. S. PLASKETT.
Measured by N. B. MCLEAN.

Mean of Settings.	Corrected Star Settings.	Displacement in revns.	Velocity.	Mean of Settings.	Corrected Star Settings.	Displacement in revns.	Velocity.
60·2351	.....	.....	.....	54·7528	.....	.....	.....
59·8251	.....	.....	.....	54·0197	53·9941	·0243	27·97
57·8818	57·8578	·0310	+37·32	52·2756	.....	.....	.....
56·6911	.....	.....	.....	49·4425	49·4125	·0451	+49·27
55·1902	55·1638	·0386	45·02	48·8002	.....	.....	.....

Mean..... +39·89
V_o ..... −28·38
V_d ..... − ·25
Curvature..... − ·28

Radial velocity ..... +11·0

SESSIONAL PAPER No. 25a

SUMMARY OF MEASURES OF η VIRGINIS.

Plate Number.	Date.	G.M.T.	Julian Day.	Phase.	Velocity.	Plate Number.	Date.	G.M.T.	Julian Day.	Phase.	Velocity.
	1907.	h m					1907.	h m			
629	Feb. 22	17 57	2,417,629·75	0·75	− 4	728	Apr. 19	15 12	685·63	56·63	+27
638	" 25	18 50	632·78	3·78	− 3	729	" 19	16 02	685·67	56·67	+13
651	Mar. 6	16 15	641·67	12·67	−10	730	" 19	17 50	685·75	56·75	+33
652	" 6	18 58	641·79	12·79	−34	735	" 24	14 03	690·59	61·59	+ 7
656	" 8	16 15	643·67	14·67	−34	737	" 24	15 25	690·64	61·64	+12
658	" 8	19 33	643·81	14·81	−42	738	" 26	16 20	692·68	63·68	+ 9
663	" 11	16 22	646·68	17·68	37	740	" 27	16 10	693·67	64·67	+11
664	" 11	19 05	646·79	17·79	25	742	May 2	13 22	698·56	69·56	+13*
668	" 20	15 43	655·65	26·65	− 3	748	" 4	16 29	700·69	71·69	− 2
671	" 20	19 36	655·82	26·82	+12*	751	" 7	13 22	703·56	2·66	0
675	" 28	14 05	663·58	34·58	+13	754	" 9	13 30	705·56	4·66	− 6
689	Apr. 3	15 10	669·63	40·63	−10	757	" 14	15 12	710·63	9·73	−29*
690	" 3	16 17	669·67	40·67	−25	761	" 18	16 05	714·67	13·77	−35
697	" 5	15 58	671·66	42·66	−30	763	" 20	15 07	716·63	15·73	−35
700	" 5	19 25	671·81	42·81	+19	773	" 23	13 36	719·57	18·67	−34
706	" 11	17 13	677·72	48·72	+17	777	" 24	13 25	720·56	19·66	− 5
707	" 11	18 07	677·75	48·75	+25	789	" 29	13 48	725·58	24·68	− 3
710	" 15	13 52	681·58	52·58	+18	795	" 31	14 06	727·59	26·69	+ 7
715	" 18	13 07	684·54	55·54	+23	811	June 10	13 35	737·57	36·66	+ 8
722	" 18	15 01	684·62	55·62	+ 2*	822	" 11	13 28	738·56	37·66	+ 7
723	" 18	17 57	684·75	55·75	+14	835	" 12	14 35	739·61	38·71	+20
725	" 19	13 19	685·55	56·55	+22	915	July 5	14 02	2,417,762·58	67·68	+11

* Mean of two or more measurements.

PREVIOUS OBSERVATIONS OF η VIRGINIS.

Date.	Julian Day.	Phase.	Velocity.	Residuals C—O.	Date.	Julian Day.	Phase.	Velocity.	Residuals C—O.
1903.					1903.				
Jan. 14	2,416,129·7	10·6	−28	− 2	Feb. 5	150·6	31·5	+ 3	+ 1
" 16	131·7	12·6	−31	− 5	May 17	251·7	60·7	+17	0
Feb. 4	149·7	30·6	+ 1	+ 2	" 24	2,416,258·7	67·7	+ 4	+ 6

In September the last of the plates was measured and approximate values of the elements were obtained from the oscillation curve. Some of the larger residuals are probably due to the low dispersion, as it does not permit of the resolution of the spectral lines of the two components unless they differ in velocity by about 70 km. per sec. In cases where there was not this difference in velocity the centre of intensity of the line would be shifted and an error would consequently be introduced in the setting. Then, too, there were certain gaps in the curve and, taking all things into consideration it was felt that more spectrograms would have to be secured before a rigid determination of the elements could be made.

The appearance of Naozo Iehinohe's article in the Astrophysical Journal for November, 1907, and the marked similarity of the oscillation curve there given to that obtained here decided us to review the data already secured. Some of the plates where the velocities for the different lines were not in good agreement with one another were remeasured, and a new determination of the elements was made. Preliminary values were obtained by the methods of Russell and Lehmann-Filhés as described in the report for last year and by a series of trials the values of the elements which

gave a curve most in accord with the observations was finally accepted. These values differed very little from the former ones; the period of $71{\cdot}9^{d}$ was found to suit the previous observations better than our value of $71{\cdot}7^{d}$, and it was accepted. A table of the previous observations known to the writer prior to the publication of the above article is given after the summary of the velocities.

The velocity curve (Fig. 11) computed from the following elements with the observed points is shown, as is also a graph of the orbit, Fig. 12.

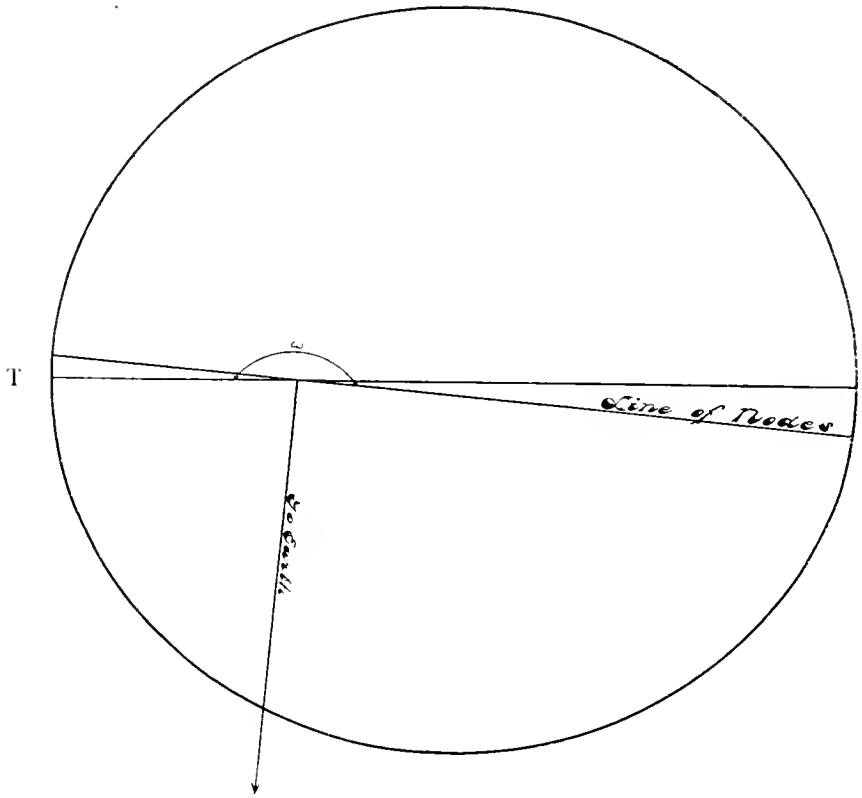

FIG. 12—Orbit of η Virginis.

It would be advisable, I think, to obtain a number of spectrograms of this star at selected epochs in its orbit with the new three-prism spectrograph whose dispersion is so much greater than those used before, and use these in conjunction with those already obtained to determine more accurate values of the elements, particularly the eccentricity.

These spectrograms would show the spectrum of the fainter component, and it might be possible to get sufficient measurements of its velocity to get an idea of the relative masses of the components.

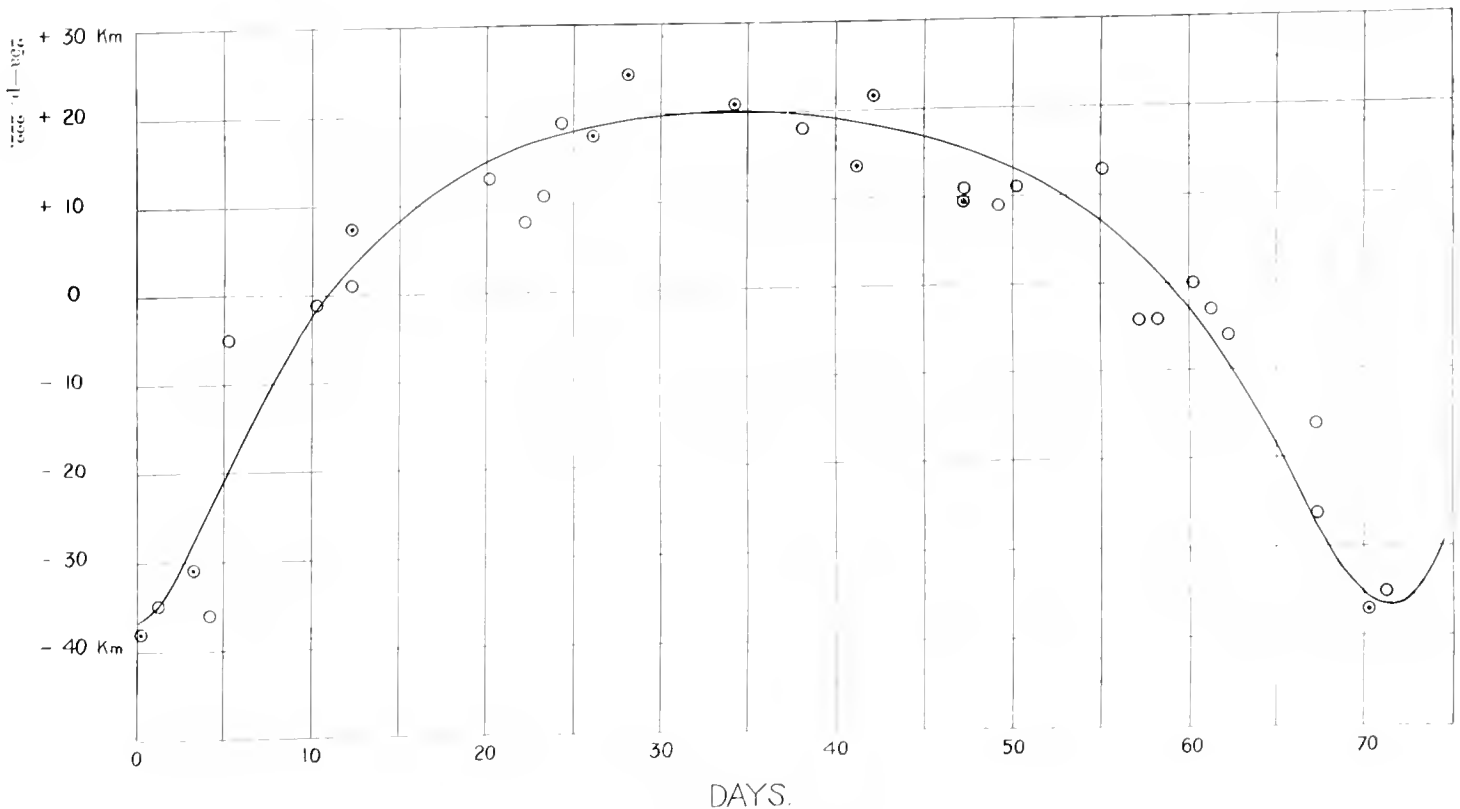

FIG. 11—Velocity Curve of η Virginis.

The elements for the brighter component, which should be regarded as provisional only, are shown in the following table. For purposes of comparison the Yerkes results are attached.

ELEMENTS OF ORBIT OF η VIRGINIS.

Elements.	Ottawa.	Yerkes.	Elements.	Ottawa.	Yerkes.
P	71·9 d.	71 9 d.	Velocity of System	+2.2 km. per sec.	—0·4 km. per sec.
e	0 40	0 254	T	J.D. 2,417,643.50	J.D. 2,417,644.93
ω	185°	180°	$a \sin i$	25,750,000 km.	25,290,000 km.

APPENDIX B.

θ AQUILÆ.

W. E. HARPER.

The star θ Aquilæ, $\alpha = 20^h\ 6{\cdot}2^m$, $\delta = -1^\circ\ 7'$, photographic magnitude 3·6, was one of the early-type stars selected for observation when the single-prism spectrograph was ready for use, about the middle of May of last year. Owing to lack of help the early spectrograms were not measured until the latter part of August. It was then noted that there was a rapid change at the time of maximum positive velocity and that this condition repeated itself about every 17 days. Attempts were, therefore, made to secure spectrograms of the star grouped around this critical phase, but in this we were only partially successful, as cloudy weather prevented us making all the observations we required at this particular epoch. Pending the securing of these the coming summer, it is well, I think, to give the provisional elements. Where two or more spectrograms were secured on one night the weighted mean of the velocities is used.

The spectrum of the star is of the type VII*a*, the four hydrogen lines H_β, $H\gamma$, H_δ and H_ϵ along with the magnesium line λ 4481 and the *K* line λ 3933, being well adapted for measurement.

The plates were all reduced by the short method previously mentioned, the tables following giving all the required data in regard to micrometer settings and velocity per revolution. In the detailed statement of measures it would be advisable in future to have a column following 'Mean of Settings' entitled 'Corrections to Comparison Lines,' which would show the amounts that the settings on the comparison lines differ from the standard settings according to the tables. This would show at a glance how the corrected star settings were obtained from the corresponding lines in the mean of settings.

FE V COMPARISON LINES.

Wave-Length.	Micrometer Readings.		Wave-Length.	Micrometer Readings.	
	20	30		20	30
4864·943	72·9636	73·0098	4341·162	45·2836	45·3736
4851·686	72·3993	72·4449	4325·941	44·2724	44·2593
4494·755	54·7266	54·7419	4099·921	27·3219	27·2466
4482·413	54·0153	54·0288	3969·411	15·2592	15·3986
4466·737	53·1007	53·1120	3930·450	11·6580	11·5072

STELLAR LINES IN θ AQUILÆ.

Wave-Length.	20		30		Wave-Length.	20		30	
	Vel. per rev.	Micr. Setting.	Vel. per rev.	Micr. Setting.		Vel. per rev.	Micr. Setting.	Vel. per rev.	Micr. Setting.
4861·527	1452·8	72·8187	1451·2	72·8648	4102·000	871·6	27·4965	867·9	27·4219
4481·400	1153·7	53·9566	1150·9	53·9698	3970·177	778·2	15·6035	774·3	15·4733
4340·634	1046·9	45·2487	1043·7	45·2387	3933·825	753·0	12·0004	749·0	11·8514

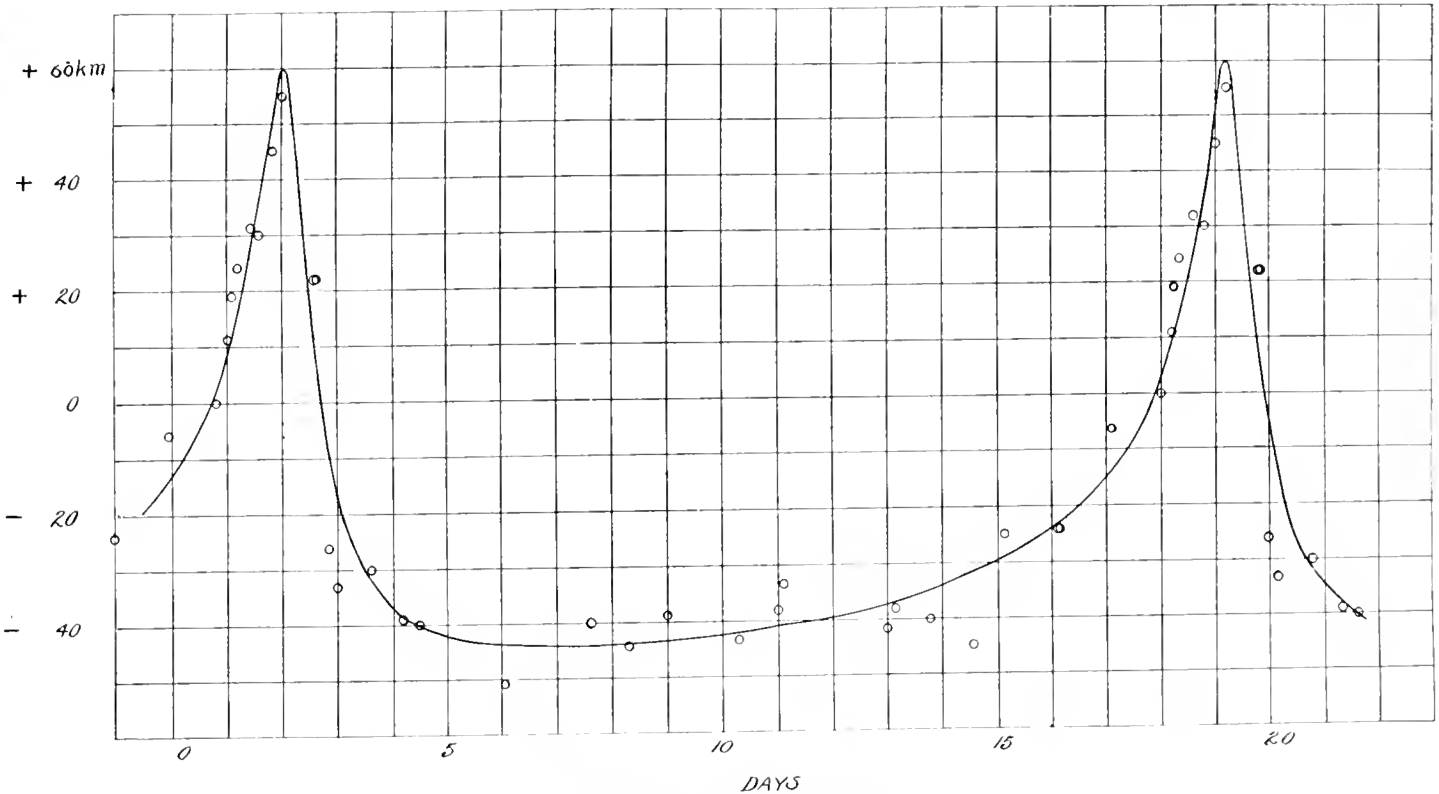

Fig. 13 - Velocity Curve of θ Aquilæ.

In obtaining the period reference was made to Deslandres' observations* on this same star, but the residuals from the best curve that can be drawn through them are exceptionally large, and hence they were not taken into consideration. The period which suited our own observations best and which was finally decided upon was 17·17 days.

The elements which gave a curve most in accord with the observations were the following:—

P	=	17·17 days
Velocity of system	=	− 26·7 km. per sec.
e	=	− 0·725
ω	=	20° (measured from ascending node)
T	=	1907, Oct. 2·15 G.M.T.
	=	Julian Day 2,417,851·15
$a \sin i$	=	8,455,500 km.

The curve shown in the accompanying figure (Fig. 13) is computed from these elements, and with the exception of one or two cases the agreement is all that could be expected. A graph of the orbit is also shown (Fig. 14).

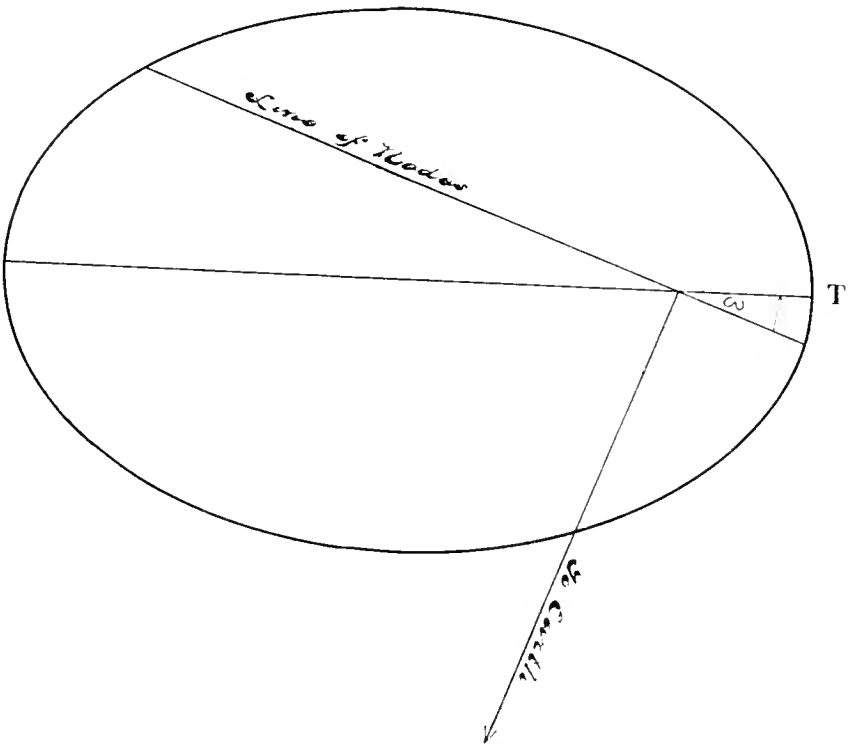

FIG. 14—Orbit of θ Aquilæ.

* Bull. Astr. 20, 129, 1903.

RECORD OF SPECTROGRAMS.

Star.	No. of Negative.	Camera.	Plate.	Date.	Middle of Exposure. E. S. T.		Duration	Hour Angle at end.		Comparison Spectrum. Exposure in Seconds.	Comparison Spectrum. Kind.	Temperature Centigrade. Room. Beginning.	Room. End.	Prism Box. Beginning.	Prism Box. End.	Slit Width.	Focal Position. Star Focus.	Collimator.	Camera.	Seeing.	Observer.	Remarks.
				1907.	h.	m.	m.	h.	m.													
θ Aquilae	803	1L	Seed 27	May 31	2	04	25	0	35 E	2 2 2 2	Fe V spark	12·6	12·6	18·7	18·75	·001	45·8	10·8	18·58	Good	P	
"	819	"	" 27	June 10	2	40	20		0	1½ 3 1½	"	12·0	11·9	17·8	17·8	·0012	45·6	10·8	18·61	"	P	
"	832	"	" 27	" 11	1	53	23	0	47 E	3 3 3 3	"	13·5	12·5	18·9	18·8	·001	45·6	10·8	18·68	Fair	H	
"	841	"	" 27	" 12	3	05	20	0	25 W	2 4 2	"	14·5	14·2	18·9	18·8	·001	45·2	10·8	18·6	"	P	
"	854	"	" 27	" 14	2	36	20	0	20 W	2 5 2	"	19·4	19·3	23·0	23·0	·0012	45·2	10·8	18·7	Good	P	
"	865	"	" 27	" 20	1	40	20	0	25 E	3 6 3	"	19·5	19·5	25·4	25·4	·0013	44·5	10·8	18·68	Getting hazy	H	
"	873	"	" 27	" 21	2	20	20	0	15 W	6 12 6	"	22·3	22·2	29·0	29·0	·0013	46·0	10·8	18·63	Fair	P	
"	905	"	" 27	July 2	1	38	20	0	20 W	4 4 5	"	14·0	13·0	17·0	17·0	·0014	45·0	10·8	18·60	Good	H	
"	924	"	" 27	" 8	1	37	25	0	45 W	2 5 2	"	20·1	20·1	22·2	22·2	·0012	45·0	10·8	18·63	Poor to fair	P	
"	931	"	" 27	" 9	12	05	21	0	47 E	5 5 5	"	20·9	...	25·0	.	·0014	45·0	10·8	18·63	Good	T	
"	942	"	" 27	" 13	11	53	26	0	40 E	4 8 4	"	17·8	17·3	25·0	25·0	·0012	45·0	10·8	18·72	Fair to poor.	T	
"	946	"	" 27	" 16	12	07	26	0	17 E	5 7 5	"	21·0	23·4	26·6	26·6	·0014	45·0	10·8	18·7	Hazy	H	
"	959	"	" 27	" 20	1	19	22	1	13 W	4 8 4	"	17·6	17·5	21·4	21·4	·0012	45·0	10·8	18·7	Good	P	
"	969	"	" 27	" 27	1	15	30	1	42 W	4 5 5 4	"	19·6	19·4	22·3	22·3	·0012	45·0	10·8	18·74	Fair	P	
"	1001	IIIL	" 27	Aug. 10	10	50	50	0	20 W	11 10 10 11	"	23·1	22·1	28·8	28·7	·002	45·0	10·8	2·9	"	P	
"	1012	1L	" 27	" 13	11	37	35	1	00 W	8 8 8	"	17·0	16·8	24·2	24·2	·0014	45·0	10·8	18·75	Light clouds	T	
"	1013	"	" 27	" 15	8	45	80	1	10 E	8 10 6	"	22·3	19·5	26·3	26·3	·0014	45·0	10·8	18·75	Very poor.	H	Seen thro. thick haze
"	1023	"	" 27	" 23	11	10	60	1	15 W	8 10 8	"	20·0	18·6	27·0	27·0	·0012	73·0	10·8	18·49	Hazy	T	
"	1027	"	" 27	" 27	11	04	52	1	40 W	11 11	"	15·0	14·0	20·0	19·7	·0012	73·0	10·8	18·2	Fair	T	
"	1028	"	" 27	" 27	10	07	55	0	45 W	7 10 8	"	16·5	15·0	20·1	20·0	·0012	73·0	10·8	18·2	"	T	
"	1033	"	" 27	Sept. 6	9	41	72	1	15 W	8 8 8	"	18·3	18·2	21·0	21·0	·0012	73·0	10·8	18·5	Cloudy	T	
"	1038	"	" 27	" 12	10	15	41	1	55 W	8 8 8	"	16·8	15·7	20·9	20·9	·0012	73·0	10·8	18·6	Good	T	
"	1043	"	" 27	" 14	11	10	50	2	50 W	6 5 5	"	20·7	20·1	21·1	21·0	·0011	73·0	10·8	18·6	Poor	P	Thick haze.
"	1050	"	" 27	" 18	9	45	37	1	40 W	8 8 8	"	12·5	11·7	17·1	17·0	·0014	44·5	10·8	18·41	Fair	T	
"	1072	"	" 27	" 30	8	02	20	0	40 W	6 5 5 6	"	9·4	8·8	13·4	13·4	·0011	73·0	10·8	18·18	Good	P	
"	1073	"	" 27	" 30	8	25	20	1	00 W	5 10 5	"	8·8	8·6	13·3	13·2	·0011	73·0	10·8	18·18	"	P	
"	1074	"	" 27	" 30	9	08	24	1	45 W	5 6 6 5	"	8·6	8·1	13·2	13·2	·0011	73·0	10·8	18·18	"	P	
"	1080	"	" 27	Oct. 1	7	03	26	0	15 E	5 6 6 5	"	12·5	11·5	14·5	14·3	·0012	73·0	10·8	18·2	Fair	H	
"	1081	"	" 27	" 1	7	32	31	0	15 W	6 10 6	"	11·5	12·0	14·3	14·3	·0012	73·0	10·8	18·2	Steadier	H	
"	1082	"	" 27	" 1	8	09	41	0	57 W	6 10 6	"	12·0	10·5	14·3	14·2	·0012	73·0	10·8	18·2	"	H	
"	1085	"	" 27	" 1	9	43	35	2	28 W	6 12 6	"	10·2	10·0	14·1	14·1	·0014	73·0	10·8	18·2	Hazy	H	
"	1086	"	" 27	" 1	10	24	42	3	13 W	6 12 6	"	10·0	9·0	14·1	14·1	·0014	73·0	10·8	18·2	"	H	
"	1089	"	" 27	" 2	7	41	26	0	20 W	11–11	"	14·0	13·2	15·1	15·1	·0012	72·0	10·8	18·28	"	T	
"	1091	"	" 27	" 2	8	40	25	1	19 W	11–11	"	13·2	12·0	15·0	15·0	·0012	72·0	10·8	18·28	Fairly good	T	
"	1092	"	" 27	" 2	9	08	26	1	50 W	6 10 6	"	12·0	11·2	15·0	15·0	·0012	72·0	10·8	18·28	Fair	T	

"	..	1093	" ..	"	27	"	2	9	36	27	2	19 W	6-10- 6	"		11·2	10·0	15·0	15·0	·0012	72·0	10·8	18·28	"	T	
"	..	1094	" .	"	27	"	2	9	59	12	2	11 W	6-10 6	"	.	11·0	11·0	15·0	15·0	·0012	72·0	10·8	18·28	"	T	Stopped: rain.
"	.	1100	111L.	"	27	"	18	7	15	60	1	19 W	8- 8 8-10	"		6·5	1·5	10·8	10·7	·0018	72·0	10·8	25·7	Fair (?). ..	H	New Camera Tube.
"	..	1101	" ..	"	27	"	18	8	46	12	3	16 W	8 8- 8- 4-10	"	..	4·5	3·0	10·7	10·4	·0018	72·0	10·8	25·7	Poor.......	H	Clouds.
"	..	1106	" ..	"	27	"	25	7	52	58	2	30 W	12-12-12-12	"	..	4·5	...	8·0	8·0	·0015	72·5	10·8	25·67	Cloudy. ...	P	
"	..	1128	1L.	"	27	Nov.	4	5	28	20	0	20 W	4- 4 4- 4	"	..	3·7	4·1	8·1	8·1	·0012	72·5	10·8	18·27	Good	P	
"	..	1129	" ..	"	27	"	4	5	51	18	0	40 W	4- 4- 4- 4	"	..	4·1	3·5	8·1	8·1	·0012	73·4	10·8	18·27	"	P	
"	..	1146	" ..	"	27	"	16	7	00	30	2	40 W	7-10- 7	"	..	1·3	1·3	1·7	1·7	·0013	73·5	10·8	18·18	Fair	P	
"	..	1149	" ..	"	27	"	18	5	45	10	1	30 W	10- 8	"	..	4·6	4·5	5·1	5·1	·0013	74·0	10·8	18·18	Hazy.	P	Stopped.
"	..	1150	" .	"	27	"	18	7	37	35	3	30 W	8-10- 8	"	..	4·3	4·9	5·0	5·0	·0013	74·0	10·8	18·18	"	P	
"	..	1154	" .	"	27	"	19	5	41	17	1	30 W	5- 6- 6- 5	"	..	3·0	2·3	7·0	7·0	·0013	74·0	10·8	18·18	Fair to good	P	
"	..	1155	" ..	"	27	"	19	6	00	16	1	50 W	5-10- 5	"	..	2·3	2·3	7·0	7·0	·0013	74·0	10·8	18·18	" .	P	
"	..	1157	" ..	"	27	"	23	7	42	25	3	50 W	4 7- 4	"	..	2·6	2·5	7·0	6·9	·0013	74·0	10·8	18·18	Fair......	P	

θ AQUILAE. 803

1907. May 31.
G. M. T. 19h 04m

Observed by J. S. PLASKETT.
Measured by J. N. TRIBBLE.

Wt.	Mean of Settings.	Corrected Star Settings.	Displacement in Revolutions.	Velocity.	Wt.	Mean of Settings.	Corrected Star Settings.	Displacement in Revolutions.	Velocity.
1	72·9587				2	45·2775			
2	72·7821	72·7877	·0310	—45·04	1	45·1980	45·2062	·0425	—44·50
½	72·3927				1½	44·2609			
1	54·7196				1½	30·9144			
2	53·9103	53·9155	·0411	—47·42	¼	27·4088	27·4336	·0629	—54·82
1	53·6928				2	27·2933			

Weighted mean.... ....— 46·31
V_a ..... ± 22·75
V_d .. .. ± ·09
Curvature..... ... .— ·28

Radial velocity..... . ..— 23·7

θ AQUILAE. 819

1907. June 10.
G. M. T. 19h 40m

Observed by J. S. PLASKETT.
Measured by J. N. TRIBBLE.

Wt.	Mean of Settings.	Corrected Star Settings.	Displacement in Revolutions.	Velocity.	Wt.	Mean of Settings.	Corrected Star Settings.	Displacement in Revolutions.	Velocity.
2½	72·9497				2	45·3075			
1	72·7530	72·7662	·0525	—76·27	2	45·2115	45·1915	·0562	—58·84
1¾	72·3880				2	44·2883			
2	54·7395				1½	30·9602			
2	53·9247	53·9099	·0467	—53·88	¼	27·4324	27·4620	·0345	—30·07
2	53·1164				1½	27·3512			

Weighted mean ..... — 58·71
V_a ..... + 20·06
V_d .... 0·0
Curvature..... .. .— ·28

Radial velocity.....— 38·9

θ AQUILAE 841.

1907. June 12.
G. M. T. 20h 05m

Observed by J. S. PLASKETT.
Measured by J. N. TRIBBLE.

Wt.	Mean of Settings.	Corrected Star Settings.	Displacement in Revolutions.	Velocity.	Wt.	Mean of Settings.	Corrected Star Settings.	Displacement in Revolutions.	Velocity.
1½	72·9574				1¾	45·2946			
2	72·7739	72·7779	·0408	—59·27	2	45·2019	45·1925	·0562	—58·83
1½	72·3986				1½	44·2799			
1	54·7404				1½	30·9462			
3	53·9214	53·9122	·0444	—51·22	¼	27·4602	27·3882	·1083	—94·39
2	53·1075				1½	27·3344			

Weighted mean ..... —57·02
V_a .... + 19·02
V_d ..... 0·0
Curvature..... — ·28

Radial velocity .. .... —38·3

AQUILAE 854.

1907. June 14
G. M. T. $19^h\ 36^m$

Observed by J. S. PLASKETT.
Measured by J. N. TRIBBLE.

Wt.	Mean of Settings.	Corrected Star Settings.	Displacement in Revolutions.	Velocity.	Wt.	Mean of Settings.	Corrected Star Settings.	Displacement in Revolutions.	Velocity.
2	72·9719	.....	.....	.....	2	45·2778	.....	.....	.....
2	72·7903	72·7807	·0380	—55·20	2	45·1867	45·1835	·0652	—68·25
2	72·4093	.....	.....	.....	1½	44·2598	.....	.....	.....
2	54·7313	.....	.....	.....	1	30·9014	.....	.....	.....
3	53·9121	53·9109	·0157	—52·72	½	27·3800	27·3442	·1523	—132·74
1½	53·0980	.....	.....	.....	2	27·2826	.....	.....	.....

Weighted mean ..... — 58·94
V_a ..... + 18·33
V_d ..... 0·0
Curvature ..... — ·28

Radial velocity ..... — 41·9

AQUILAE 865.

1907. June 29.
G. M. T. $18^h\ 40^m$

Observed by W. E. HARPER.
Measured by J. N. TRIBBLE.

Wt.	Mean of Settings.	Corrected Star Settings.	Displacement in Revolutions.	Velocity.	Wt.	Mean of Settings.	Corrected Star Settings.	Displacement in Revolutions.	Velocity.
2	54·7079	.....	.....	.....	2	53·0799	.....	.....	.....
2	53·9698	53·9874	·0308	+35·53					

Velocity ..... +35·53
V_a ..... +16·12
V_d ..... + ·04
Curvature ..... — ·28

Radial velocity ..... +51·4

AQUILAE 865*

1907. June 29.
G. M. T. $18^h\ 40^m$

Observed by W. E. HARPER.
Measured by J. N. TRIBBLE.

Wt.	Mean of Settings.	Corrected Star Settings.	Displacement in Revolutions.	Velocity.	Wt.	Mean of Settings.	Corrected Star Settings.	Displacement in Revolutions.	Velocity.
2	54·7570	.....	.....	.....	2	53·1294	.....	.....	.....
2	54·0117	53·9941	·0243	+27·97					

Velocity ..... +27·97
V_a ..... +16·12
V_d ..... + ·04
Curvature ..... — ·28

Radial velocity ..... +43·8

* Check measurement.

θ AQUILAE 865*

1907. June 20.
G. M. T. 18h 40m

Observed by } W. E. Harper.
Measured by }

Wt.	Mean of Settings.	Corrected Star Settings.	Displacement in Revolutions.	Velocity.	Wt.	Mean of Settings.	Corrected Star Settings.	Displacement in Revolutions.	Velocity.
2	27·0238	..	....	....	1	27·0055	27·0110	·0221	+25·50

Velocity . . +25·50
V_a . . . . . +16·12
V_d . . . . . — ·04
Curvature . . . . . ·28

Radial velocity . . +41·4

* Second check measurement : Accepted result 44·7.

θ AQUILAE 873

1907. June 21.
G. M. T. 19h 20m

Observed by J. S. Plaskett.
Measured by J. N. Tribble.

Wt.	Mean of Settings.	Corrected Star Settings.	Displacement in Revolutions.	Velocity.	Wt.	Mean of Settings.	Corrected Star Settings.	Displacement in Revolutions.	Velocity.
2	73·0071	.. ....	.	....	$1\frac{1}{2}$	45·2815	.. ....	....	....
2	72·8333	72·8349	·0299	—43·39	2	45·2132	45·2060	·0327	—34·12
2	72·4446	.	. ....	.	$\frac{1}{2}$	44·2586	.....	..	.....
$1\frac{1}{2}$	54·7358	.. ....	....	....	$\frac{1}{2}$	30·8942	.. ....	..	.....
$1\frac{1}{2}$	53·9063	53·9107	·0591	68·61	$\frac{1}{2}$	27·3968	27·3638	·0581	—50·42
1	53·1084	.....	.....	... ...	$1\frac{1}{2}$	27·2815	.. .	.	....

Weighted mean . . . . . —47·04
V_a . . . . . —15·73
V_d . . . . . 0·0
Curvature . . . . . — ·28

Radial velocity . . . . . —31·6

θ AQUILAE 873*

1907. June 21.
G. M. T. 19h 20m

Observed by J. S. Plaskett.
Measured by J. N. Tribble.

Wt.	Mean of Settings.	Corrected Star Settings.	Displacement in Revns.	Velocity.	Wt.	Mean of Settings.	Corrected Star Settings.	Displacement in Revns.	Velocity.
$1\frac{1}{2}$	73·0948	.....	....	....	$1\frac{1}{2}$	54·8292	.....	....	....
2	72·9181	72·8328	·0320	—46·43	$1\frac{1}{2}$	54·6185	53·9320	0378	—43·51
2	72·5309	.. ....	.. ....	....	1	53·1977	.. .. .	.....	....
1	57·9187	.....	.....	.....	2	45·3701	.....	... .	....
$\frac{1}{4}$	57·8835	57·7848	·0420	—50·56	2	45·3099	45·2134	·0253	—26·41

Weighted mean . . . . . —38·16
V_a . . . . . +15·73
V_d . . . . . 0·0
Curvature . . . . . — ·28

Radial velocity . . . . . —22·7

* Check measurement : Accepted result —26·0

AQUILAE 905

1907. July 2.
G. M. T. 18h 12m

Observed by W. E. HARPER.
Measured by J. N. TRIBBLE.

Wt.	Mean of Settings.	Corrected Star Settings.	Displacement in Revns.	Velocity.	Wt.	Mean of Settings.	Corrected Star Settings.	Displacement in Revns.	Velocity.
2	72·9584				1½	53·1104			
1½	72·7668	72·7706	·0481	−69·88	2	45·2928			
2	72·3976				1	45·2075	45·1983	·0504	−52·76
2	57·8100				1	44·2803			
¼	57·7946	57·7826	·0221	−26·66	1	30·9505			
2	54·7359				1	27·4657	27·4493	·0472	−41·14
2	53·9277	53·9181	·0385	−54·42	1½	27·3353			

Weighted mean . . . . . −51·17
V_a . . . . . −11·04
V_d . . . . . − ·04
Curvature . . . . . − ·28

Radial velocity . . . . . −40·1

AQUILAE 924.

1907. July 8.
G. M. T. 18h 37m

Observed by J. S. PLASKETT.
Measured by J. N. TRIBBLE.

Wt.	Mean of Settings.	Corrected Star Settings.	Displacement in Revns.	Velocity.	Wt.	Mean of Settings.	Corrected Star Settings.	Displacement in Revns.	Velocity.
1½	72·9555				1½	53·0880			
1½	72·8062	72·8126	·0061	− 8·86	2	45·2631			
2	72·3933				2	45·2533	45·2733	·0246	+25·75
2	57·7936				1	44·2544			
1½	57·8051	57·8095	·0048	+ 5·80	1½	30·8929			
1½	54·7202				¼	27·4617	27·4993	·0028	+ 2·44
1½	53·9617	53·9685	·0119	−13·72	3	27·2836			

Weighted mean . . . +11·21
V_a . . . . . + 8·40
V_d . . . . . − ·09
Curvature . . . . . − ·28

Radial velocity . . . . . +19·2

AQUILAE 924*

1907. July 8.
G. M. T. 18h 37m

Observed by J. S. PLASKETT.
Measured by W. E. HARPER.

Wt.	Mean of Settings.	Corrected Star Settings.	Displacement in Revns.	Velocity.	Wt.	Mean of Settings.	Corrected Star Settings.	Displacement in Revns.	Velocity.
2	72·9278	.....	.....	.....	2½	45·2272	45·2774	·0287	+30·05
2	72·7749	72·8100	·0087	−12·64	2½	29·6211	30·8930	·0226	+20·11
2	72·3660	.....	.....	.....	2	21·5985	.....	.....	.....
2	54·6897	.....	.....	.....	½	27·4500	27·5161	·0196	−17·09
1½	53·9352	53·9742	·0176	−20·31	2	27·2558	.....	.....	.....
2	53·0594	.....	.....	.....	1	11·9297	12·0382	·0378	−28·35
2	45·2334	.....	.....	.....	2	11·5495	.....	.....	.....

Weighted mean..... −15·90
V_a ..... + 8·40
V_d ..... — ·09
Curvature..... — ·28

Radial velocity..... −23·9

*Check measurement: Accepted result −22·5.

AQUILAE 931.

1907. July 9.
G. M. T. 17h 05m

Observed by J. N. TRIEBLE.
Measured by J.

Wt.	Mean of Settings.	Corrected Star Settings.	Displacement in Revns.	Velocity.	Wt.	Mean of Settings.	Corrected Star Settings.	Displacement in Revns.	Velocity.
2	73·4571	.....	.....	.....	2	53·1141	.....	.....	.....
2	73·0042	.....	.....	.....	2	45·2822	.....	.....	.....
2	72·8455	·8523	0125	−18·14	2	45·2091	2011	·0376	39·24
2	72·4370	.....	.....	.....	1	44·2666	.....	.....	.....
2	57·8287	.....	.....	.....	2	27·2910	.....	.....	.....
1	57·7855	·7762	·0506	60·91	½	27·4191	3759	0560	48·21
2	54·7475	.....	.....	.....	2	29·6336	.....	.....	.....
2	54·0332	.....	.....	.....	½	29·6000	·5653	0346	30·69
2	53·9400	9356	·0342	39·56	½	29·8200	·7857	·0452	−39·09

Weighted mean..... −37·80
V_a ..... + 8·80
V_d ..... − ·04
Curvature..... — ·28

Radial velocity..... −29·2

θ AQUILAE 942.

1907. July 13.
G. M. T. 16h 53m

Observed by } J. N. TRIBBLE.
Measured by }

Wt.	Mean of Settings.	Corrected Star Settings.	Displacement in Revns.	Velocity.	Wt.	Mean of Settings.	Corrected Star Settings.	Displacement in Revns.	Velocity.
1½	72·9882	.....	.....	.....	1½	45·3032	.....	.....	.....
1	72·8082	72·8298	·0350	—50·79	2	45·2277	45·1989	·0308	42·57
1	72·4244	.....	.....	.....	1	44·2829	.....	.....	.....
1½	54·7572	.....	.....	.....	1	30·9164	.....	.....	.....
1½	53·9366	53·9214	·0484	55·70	½	27·4847	27·3943	·0276	—23·96
1½	53·1282	.....	.....	.....	1½	27·3376	.....	.....	.....

Weighted mean..... —47·72
V_a ..... + 6·52
V_d ..... + ·04
Curvature ..... — ·28

Radial velocity..... —41·4

θ AQUILAE 942*

1907. July 13.
G. M. T. 16h 53m

Observed by } J. N. TRIBBLE.
Measured by }

Wt.	Mean of Settings.	Corrected Star Settings.	Displacement in Revns.	Velocity.	Wt.	Mean of Settings.	Corrected Star Settings.	Displacement in Revns.	Velocity.
1½	73·4241	.....	.....	.....	1½	53·1067	.....	.....	.....
1½	72·9724	.....	.....	.....	1½	45·2826	.....	.....	.....
1	72·7909	72·8293	·0355	—51·51	2	45·2066	45·1978	·0409	42·68
1	72·4062	.....	.....	.....	1	44·2613	.....	.....	.....
1½	54·7351	.....	.....	.....	½	27·4545	27·3805	·0414	—35·93
1½	53·9383	53·9393	·0305	35·10	1½	27·3296	.....	.....	.....

Weighted mean ..... 41·85
V_a ..... + 6·52
V_d ..... + ·04
Curvature..... — ·28

Radial velocity..... — 35·6

*Check measurement: Accepted result = 38·5

θ AQUILAE 946.

1907. July 16.
G. M. T. 17h 07m

Observed by W. E. HARPER.
Measured by J. N. TRIBBLE.

Wt.	Mean of Settings.	Corrected Star Settings.	Displacement in Revns.	Velocity.	Wt.	Mean of Settings	Corrected Star Settings.	Displacement in Revns.	Velocity.
2	73·4087	.....	.....	.....	1½	53·8869	53·9285	·0413	47·53
1½	72·9526	.....	.....	.....	2	53·0710	.....	.....	.....
1	72·7737	72·8305	·0343	—49·77	2	45·2437	.....	.....	.....
1½	72·3863	.....	.....	.....	½	45·1664	45·1964	·0423	—44·15
2	54·7003	.....	.....	.....	1	44·2312	.....	.....	.....

Weighted mean ..... —47·71
V_a ..... + 4·88
V_d ..... 0·0
Curvature ..... — ·28

Radial velocity ..... —43·1

θ AQUILAE 959.

1907. July 20.
G. M. T. 18h 19m

Observed by J. S. PLASKETT.
Measured by J. N. TRIBBLE.

Wt.	Mean of Setting	Corrected Star Settings.	Displacement in Revns.	Velocity.	Wt.	Mean of Settings.	Corrected Star Settings.	Displacement in Revns.	Velocity.
2	72·9119	.....	.....	.....	2	45·2369	.....	.....	.....
1½	72·7329	·7833	·0354	- 51·43	1½	45·1626	·2094	·0393	41·14
2	72·3508	.....	.....	.....	2	44·2224	.....	.....	.....
2	54·6814	.....	.....	.....	2	27·2722	.....	.....	.....
1½	53·9721	.....	.....	.....	1/10	27·3751	·4247	·0718	62·64
2	53·8684	·9132	·0434	50·07	2	29·6149	.....	.....	.....
1½	53·0549	.....	.....	.....	½	29·5662	·5502	0487	- 43·20

Weighted mean ..... —47·80
V_a ..... + 3·26
V_d ..... — ·12
Curvature ..... — ·28

Radial velocity ..... —45·0

θ AQUILAE 969.

1907. July 27.
G. M. T. $18^h\ 15^m$

Observed by J. S. PLASKETT.
Measured by J. N. TRIBBLE.

Wt.	Mean of Settings.	Corrected Star Settings.	Displacement in Revns.	Velocity.	Wt.	Mean of Settings.	Corrected Star Settings.	Displacement in Revns.	Velocity.
1½	73·4342	.....	.....	.....	2	53·1138	.....	.....	.....
1½	72·9853	.....	.....	.....	1½	45·2891	.....	.....	.....
1½	72·8185	72·7985	·0202	−29·54	1	45·2132	45·1980	·0507	53·07
1	72·4147	.....	.....	.....	1	44·2780	.....	.....	.....
2	54·7455	.....	.....	.....	2	27·3001	.....	.....	.....
2	53·9410	53·9250	·0316	36·57	1	27·4208	27·4426	·0539	−46·98

Weighted mean	−39 54
V_a	− ·38
V_d	− ·16
Curvature	− ·28
Radial velocity	−40 4

θ AQUILAE 1001.

1907. August 10.
G. M. T. $15^h\ 50^m$

Observed by J. S. PLASKETT.
Measured by J. N. TRIBBLE.

Mean of Settings.	Measured Wave Length.	Normal W. L.	Displacement.	Velocity.	Mean of Settings.	Measured Wave Length.	Normal W. L.	Displacement.	Velocity.
91·9339	.....	.....	.....	.....	48·8913	.....	.....	.....	.....
91·6041	4861·849	·527	·322	+19·86	41·5033	.....	.....	.....	.....
90·5151	.....	.....	.....	.....	41·4103	4481·847	·400	·447	29·90
52·0883	.....	.....	.....	.....	15·9546	.....	.....	.....	.....
52·1325	4549·934	·642	·292	19·23	15·9417	4341·097	·634	·463	+31·97
49·7977	4534·650	·139	·511	33·79					

Mean	+26·35	
V_a		− 6·99
V_d		− ·09
Curvature		− ·50
Radial velocity	−18·7	

θ AQUILAE 1012.

1907. August 13.
G. M. T. 16h 37m

Observed by } J. N. TRIBBLE.
Measured by }

Wt.	Mean of Settings.	Corrected Star Settings.	Displacement in Revns.	Velocity.	Wt.	Mean of Settings.	Corrected Star Settings.	Displacement in Revns.	Velocity.
2	73·3276				2	53·9312	53·9328	·0238	27·46
2	72·8801				2	53·0999			
½	72·7022	72·7858	·0329	−47·80	2	45·3077			
1½	72·3198				1½	45·2467	45·2227	·0260	27·22
1½	54·7199				1½	27·3844			
1	54·0126				½	27·5058	27·4133	·0532	−46·36

Weighted mean ..... −30·67
V_a ..... − 8·14
V_d ..... − ·10
Curvature ..... − ·28

Radial velocity ..... −39·2

θ AQUILAE 1013.

1907. Aug. 15.
G. M. T. 13h 45m

Observed by W. E. HARPER.
Measured by J. N. TRIBBLE.

Wt.	Mean of Settings.	Corrected Star Settings.	Displacement in Revns.	Velocity.	Wt.	Mean of Settings.	Corrected Star Settings.	Displacement in Revns.	Velocity.
2	73·4972				2	53·1509			
2	72·8749	·8385	·0263	−38·17	2	45·3155			
2	72·4827				½	45·2329	·1910	·0177	49·79
1	57·8689				1½	27·3231			
1	57·8453	·7964	·0304	36·60	1½	27·4570	·3805	·0414	35·93
2	54·7839				2	29·6705			
2	54·0753				2	29·6300	·5584	·0415	36·81
2	53·9743	·9303	·0395	45·46	2	29·8453	·7737	·0572	−50·74

Weighted mean ..... −42·88
V_a ..... − 9·09
V_d ..... + ·02
Curvature ..... − ·28

Radial velocity ..... −52.2

θ AQUILAE 1013.*

1907. Aug. 15.
G. M. T. 13h 45m

Observed by W. E. HARPER.
Measured by C. R. WESTLAND.

Wt.	Mean of Settings.	Corrected Star Settings	Displacement in Revns.	Velocity.	Wt.	Mean of Settings.	Corrected Star Settings.	Displacement in Revns.	Velocity.
2	72·9861	.....	.....	.....	2	53·0973	.....	.....	.....
1½	72·8133	72·8358	·0290	—42·08	2	45·2600	.....	.....	.....
2	72·4265	.....	.....	.....	2	45·1777	45·1912	·0475	49·59
2	54·7309	.....	.....	.....	1½	27·4140	27·3969	·0250	—21·70
2	53·9212	53·9340	·0358	40·92	2	27·2640	.....	.....	.....

Weighted mean..... —39·50
V_a ..... — 9·09
V_d ..... + ·02
Curvature. ..... — ·28

Radial velocity. ..... —48·8

*Check measurement.

θ AQUILAE 1013 *

1907. Aug. 15.
G. M. T. 13h 45m

Observed by } W. E. HARPER.
Measured by }

Wt.	Mean of Settings.	Corrected Star Settings.	Displacement in Revns.	Velocity.	Wt.	Mean of Settings.	Corrected Star Settings.	Displacement in Revns.	Velocity.
2	57·8190	.....	.....	.....	2	53·1012	.....	.....	.....
1½	57·7872	57·7882	·0386	—46·47	2	45·2678	.....	.....	.....
2	54·7343	.....	.....	.....	1	45·1805	45·1863	·0524	—54·70
3	53·9288	53·9383	·0316	36·37					

Weighted mean ..... —42·40
V_a ..... — 9·09
V_d ..... + ·02
Curvature ..... — ·28

Radial velocity... ..... —51·7

*2nd check measurement: accepted result—51·0.

θ AQUILAE 1023.

1907. Aug. 23.
G. M. T. 16h 10m

Observed by } J. N. TRIBBLE.
Measured by }

Wt.	Mean of Settings.	Corrected Star Settings.	Displacement in Revns.	Velocity.	Wt.	Mean of Settings.	Corrected Star Settings.	Displacement in Revns.	Velocity.
1½	73·5028	.....	.....	.....	1½	54·0172	.....	.....	.....
1½	73·0477	.....	.....	.....	2	53·9494	53·9606	·0092	—10·58
2	72·9054	72·8689	·0041	+ 5·95	2	45·2485	.....	.....	.....
2	54·7393	.....	.....	.....	½	45·1963	45·2214	·0173	—18·05

Weighted mean..... — 9·07
V_a ..... —12·54
V_d ..... — ·11
Curvature ..... — ·28

Radial velocity..... —22·0

θ AQUILAE 1027.

1907. Aug. 27.
G. M. T. 16h 04m

Observed by } J. N. TRIBBLE.
Measured by }

Wt.	Mean of Settings.	Corrected Star Settings.	Displacement in Revolutions.	Velocity.	Wt.	Mean of Settings.	Corrected Star Settings.	Displacement in Revns.	Velocity.
2	73·5058	....	.....	....	2	54·0181	53·9796	0230	25·54
2	73·0592	.....	.....	....	2	45·2866	.....	.....	.....
¼	72·9186	72·8260	·0083	+12·06	¼	45·2893	45·2863	0376	39·36
2	54·0540	.. ..	.....	... .					

Weighted mean..... + 25·57
V_a ..... —14·64
V_d ..... — ·14
Curvature..... — ·28

Radial velocity..... +10·5

θ AQUILAE 1027*

1907. Aug. 27.
G. M. T. 16h 04m

Observed by J. N. TRIBBLE.
Measured by W. E. HARPER.

Wt.	Mean of Settings.	Corrected Star Settings.	Displacement in Revns.	Velocity.	Wt.	Mean of Settings.	Corrected Star Settings.	Displacement in Revns.	Velocity.
2	73·0842	.....	.....	... .	2	45·3156	.....	.....	.....
1	72·9458	72·8726	·0078	+11·32	1	45·3100	45·2680	·0293	30·59
2	72·5146	.....	....	....	2	11·9111	11·8870	·0356	+26·70
2	54·0800	.....	.....	....	2	11·5313	.....	.....	.....
3	54·0478	53·9966	·0268	30 85					

Weighted mean..... +26·84
V_a ..... —14·64
V_d ..... — 14
Curvature..... — ·28

Radial velocity..... +11·8

* Check measurement: Accepted result +11·0

θ AQUILAE 1028.

1907. Aug. 27.
G. M. T. 15h 07m

Observed by } J. N. TRIBBLE.
Measured by }

Wt.	Mean of Settings.	Corrected Star Settings.	Displacement in Revns.	Velocity.	Wt.	Mean of Settings.	Corrected Star Settings.	Displacement in Revns.	Velocity.
1½	54·1520	....	.....	....	2	45·3914	.....	.....	.....
2	54·1201	53·9834	·0268	+30·92	½	45·3592	45·2514	·0027	+ 2·82

Weighted mean..... + 25·3.....
V_a .....— 14·64
V_d .....— ·14
Curvature.....— ·28

Radial velocity.....+ 10·2

θ AQUILAE 1033.

1907. Sept. 6.
G. M. T. 14h 41m

Observed by } J. N. TRIBBLE.
Measured by }

Wt.	Mean of Settings.	Corrected Star Settings.	Displacement in Revns.	Velocity.	Wt.	Mean of Settings.	Corrected Star Settings.	Displacement in Revns.	Velocity.
1½	73·5147	.....	.....	.....	2	53·9767	53·9465	·0101	11·65
1½	73·0689	.....	.....	.....	2	45·2635	.....	.....	.....
½	72·8971	72·7915	·0272	—39·51	1½	45·2185	45·2386	·0101	10·57
1½	54·7499	.....	.....	.....	1	27·3399	27·4699	·0266	—23·18
2	54·0455	.....	.....	.....	2	27·1967	.....	.....	.....

Weighted mean ..... —16 42
V_a ..... —16·70
V_d ..... — ·14
Curvature. ..... — ·28

Radial velocity..... —33·5

θ AQUILAE 1033*.

1907. Sept. 6.
G. M. T. 14h 41m

Observed by J. N. TRIBBLE.
Measured by C. R. WESTLAND.

Wt.	Mean of Settings.	Corrected Star Settings.	Displacement in Revns.	Velocity.	Wt.	Mean of Settings.	Corrected Star Settings.	Displacement in Revns.	Velocity
2	72·9980	.....	.....	.....	2	45·1915	.....	.....	.....
1½	72·8333	72·8458	·0190	—27·57	1½	27·2830	27·3899	·0320	27·78
2	72·4309	.....	.....	.....	2	27·1395	.....	.....	.....
2	54·6784	.....	.....	.....	1½	11·6990	11·8364	·0150	—11·24
1½	53·9075	53·9403	·0295	33·72	2	11·3692	.....	.....	.....
2	53·0469	.....	.....	.....					

Weighted mean ..... —25·08
V_a ..... —16·70
V_d ..... — ·14
Curvature.. ..... — ·28

Radial Velocity..... —42· 2

* Check measurement ; Accepted result —37·0.

θ AQUILAE 1038

1907. Sept. 12.
G. M. T. 15h 15m

Observed by } J. N. TRIBBLE.
Measured by }

Wt.	Mean of Settings.	Corrected Star Settings.	Displacement in Revns.	Velocity.	Wt.	Mean of Settings.	Corrected Star Settings.	Displacement in Revns.	Velocity.
1½	54·0454	.....	.....	.....	1	45·2527	45·2704	0217	22·71
½	53 9962	53·9661	·0095	+10·96	½	27·3854	27·5003	·0038	+ 5·31
2	45·2659	.....	.....	.....	1½	27·2070	.....	.....	.....

Weighted mean..... + 6.58
V_a ..... —20·23
V_d ..... — ·14
Curvature ..... — ·28

Radial velocity ..... —14·1

θ AQUILAE 1038.*

1907. Sept. 12.
G. M. T. 15h 15m

Observed by J. N. TRIBBLE.
Measured by J. N. TRIBBLE.

Wt.	Mean of Settings.	Corrected Star Settings.	Displacement in Revns.	Velocity.	Wt.	Mean of Settings.	Corrected Star Settings.	Displacement in Revns.	Velocity.
1½	73·5342	.....	.....	.....	2	45·2734	.....	.....	.....
1½	73·0844	.....	.....	.....	1	45·2544	45·2646	·0159	+16·64
1	72·9261	72·8091	·0096	—13·95	2	27·2135	.....	.....	.....
1½	54·0557	.....	.....	.....	½	27·3818	27·4898	·0067	— 5·84
½	54·0120	53·9720	·0154	+17·76					

Weighted mean..... + 1·90
V_a ..... —20·23
V_d ..... — ·14
Curvature ..... — ·28

Radial velocity..... —18·7

*Check measurement: Accepted result — 16·4.

θ AQUILAE 1043.

1907. Sept. 14.
G. M. T. 16h 10m

Observed by J. S. PLASKETT.
Measured by J. N. TRIBBLE.

Wt.	Mean of Settings.	Corrected Star Settings.	Displacement in Revns.	Velocity.	Wt.	Mean of Settings.	Corrected Star Settings.	Displacement in Revns.	Velocity.
2	54·0505	.....	.....	.....	2	45·2726	.....	.....	.....
1½	54·0762	54·0412	·0846	+98·06	1½	45·2981	45·3091	·0604	+63·23

Weighted mean ..... +80·64
V_a ..... —20·91
V_d ..... — ·21
Curvature..... — ·28

Radial velocity..... +59·2

θ AQUILAE 1043.*

1907. Sept. 14.
G. M. T. 16h 10m

Observed by J. S. PLASKETT.
Measured by J. N. TRIBBLE.

Wt.	Mean of Settings.	Corrected Star Settings.	Displacement in Revns.	Velocity.	Wt.	Mean of Settings.	Corrected Star Settings.	Displacement in Revns.	Velocity.
2	54·0608	.....	.....	.....	2	45·2820	.....	.....	.....
1	54·0745	54·0290	·0724	+83·52	1	45·2992	45·3008	·0521	+54·54

Weighted mean..... +70·00
V_a ..... —20·91
V_d ..... — ·21
Curvature..... — ·28

Radial velocity..... +48·6

* Check measurement.

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θ AQUILAE 1043.‡

1907. Sept. 14.
G. M. T. 16h 10m

Observed by J. S. PLASKETT.
Measured by W. E. HARPER.

Wt.	Mean of Settings.	Corrected Star Settings.	Displacement in Revns.	Velocity.	Wt.	Mean of Settings.	Corrected Star Settings.	Displacement in Revns.	Velocity.
2	73·0962	.....	.....	.....	1½	45·3255	45·3144	·0757	79·03
2	72·9696	72·8923	·0275	+40·00	2	45·2847	.....	.....	.....
2	72·5349	.....	.....	.....	1	29·6640	29·6703	·0862	76·46
2	54·7793	.....	.....	.....	2	29·5777	.....	.....	.....
2	54·0680	54·0332	·0634	72·97	½	27·4749	27·4911	·0692	60·06
2	54·0653	.....	.....	.....	2	27·2302	.....	.....	.....
2	53·1417	.....	.....	.....	½	11·8837	11·9493	·0979	−73·42
2	48·7925	.....	.....	.....	2	11·4509	.....	.....	.....
1	46·1133	46·1000	·1128	118·55					

Weighted mean..... + 78·03
V_a ..... − 20·91
V_d ..... − ·21
Curvature..... − ·28

Radial velocity..... + 56·6

‡Second check measurement. Accepted result + 55·9.

θ AQUILAE 1050.

1907. Sept. 18.
G. M. T. 14h 45m

Observed by } J. N. TRIBBLE.
Measured by }

Wt.	Mean of Settings.	Corrected Star Settings.	Displacement in Revns.	Velocity.	Wt.	Mean of Settings.	Corrected Star Settings.	Displacement in Revns.	Velocity.
2	73·0318	.....	.....	.....	2	45·2738	.....	.....	.....
1	72·8699	72·8031	·0156	−22·66	1½	45·2139	45·2237	·0250	−26·17
2	72·4635	.....	.....	.....	2	27·2441	.....	.....	.....
2	51·0294	.....	.....	.....	½	27·3813	27·4591	·0374	−32·59
1	53·9742	53·9601	·0035	+4·03					

Weighted mean..... − 26·06
V_a ..... − 22·14
V_d ..... − ·14
Curvature..... − ·28

Radial velocity..... − 48·6

θ AQUILAE 1072.

1907. Sept. 30.
G. M. T. 13h 02m

Observed by J. S. PLASKETT.
Measured by W. E. HARPER.

Wt.	Mean of Settings.	Corrected Star Settings.	Displacement in Revns.	Velocity.	Wt.	Mean of Settings.	Corrected Star Settings.	Displacement in Revns.	Velocity.
2	72·9873				1½	45·2684	45·2689	·0202	21·15
2	72·8666	72·8424	·0237	+34·34	¼	27·4692	27·5017	·0952	4·53
2	72·4250				2	27·2893			
2	54·0275				1¼	11·9493	11·0422	·0418	+31·35
2	53·9952	53·9830	·0264	30·46	2	11·5641			
2	45·2831								

Weighted mean..... +28·83
V_a ..... −25·32
V_d ..... − ·04
Curvature..... − ·28

Radial velocity..... + 3·2

θ AQUILAE 1073.

1907. Sept. 30.
G. M. T. 13h 25m

Observed by J. S. PLASKETT.
Measured by W. E. HARPER.

Wt.	Mean of Settings.	Corrected Star Settings.	Displacement in Revns.	Velocity.	Wt.	Mean of Settings.	Corrected Star Settings.	Displacement in Revns.	Velocity.
2	72·9938				2	45·2805			
1	72·8648	72·8426	·0240	+34·87	1½	45·2685	45·2716	·0240	25·13
2	72·4273				1	11·9490	12·0322	·0318	+23·85
2	54·0241				2	11·5750			
2	53·9952	53·9864	·0298	34·39					

Weighted mean..... +30·03
V_a ..... −25·32
V_d ..... − ·08
Curvature..... − ·28

Radial velocity..... + 4·3

θ AQUILAE 1074.

1907. Sept. 30.
G. M. T. 14h 08m

Observed by J. S. PLASKETT.
Measured by W. E. HARPER.

Wt.	Mean of Settings.	Corrected Star Settings.	Displacement in Revns.	Velocity.	Wt.	Mean of Settings.	Corrected Star Settings.	Displacement in Revns.	Velocity.
2	72·9713				2	45·2615			
2	72·8370	72·8278	·0091	+13·22	1	45·2597	45·2818	·0331	34·65
2	72·4130				½	27·4604	27·5093	·0128	11·16
2	57·8042				2	27·2730			
1	57·8319	57·8256	·0209	25·20	1	11·9371	12·0378	·0374	+28·05
2	54·0157				2	11·5564			
2½	53·9683	53·9680	·0114	13·15					

Weighted mean..... +19·10
V_a ..... −25·32
V_d ..... − ·12
Curvature..... − ·28

Radial velocity..... − 6·6

θ AQUILAE 1080.

1907. Oct I.
G. M. T. 12h 03m

Observed by W. E. HARPER.
Measured by J. N. TRIBBLE.

Wt.	Mean of Settings.	Corrected Star Settings.	Displacement in Revns.	Velocity.	Wt.	Mean of Settings.	Corrected Star Settings.	Displacement in Revns.	Velocity.
2	54·0475	.....	.....	.....	½	45·3006	45·2736	·0349	36·42
1½	54·0344	54·0157	·0459	+52·82	2	11·5949	.....	.....	.....
2	45·3007	.....	.....	.....	1	12·0235	11·9358	·0844	+63·26

Weighted mean. ..... +53·56
V_a ..... −25·51
V_d ..... 0·0
Curvature ..... — ·28

Radial velocity ..... + 27·8

θ AQUILAE 1081.

1907. October 1.
G. M. T. 12h 32m

Observed by W. E. HARPER.
Measured by J. N. TRIBBLE.

Wt.	Mean of Settings.	Corrected Star Settings.	Displacement in Revns.	Velocity.	Wt.	Mean of Settings.	Corrected Star Settings.	Displacement in Revns.	Velocity.
1½	72·9728	.....	.....	.....	2	27·2640	.....	.....	.....
2	54·0051	.....	.....	.....	¾	27·4461	27·5040	·0075	6·53
2	54·0046	54·0146	·0580	+66·91	1½	11·5483	.....	.....	.....
2	45·2637	.....	.....	.....	2	11·9684	12·0781	·0777	58·55
1	45·2717	45·2917	·0430	45·01					

Weighted mean..... +59·18
V_a ..... −25·51
V_d ..... — ·04
Curvature..... — ·28

Radial velocity. ..... + 33·3

θ AQUILAE 1082.

1907. October 1.
G. M. T. 13h 09m

Observed by W. E. HARPER.
Measured by J. N. TRIBBLE.

Wt.	Mean of Settings.	Corrected Star Settings.	Displacement in Revns.	Velocity.	Wt.	Mean of Settings.	Corrected Star Settings.	Displacement in Revns.	Velocity.
2	73·0048	.....	.....	.....	2	27·3045	.....	.....	.....
1½	72·4420	.....	.....	.....	½	27·5159	27·5333	·0368	32·07
1	72·8770	72·8352	·0165	+23·97	2	15·4790	.....	.....	.....
2	54·0435	.....	.....	.....	¼	15·5842	15·6342	·0307	23·89
2	54·0466	54·0186	·0620	71·52	2	11·5926	.....	.....	.....
2	45·2984	.....	.....	.....	¾	12·0295	11·9441	·0945	+71·15
1	45·2929	45·2781	·0294	30·78					

Weighted mean..... +52·95
V_a ..... −25·54
V_d ..... — ·04
Curvature..... — ·50

Radial velocity..... + 26·9

θ AQUILAE 1082.*

1907. Oct. 1.
G. M. T. 13h 09m

Observed by W. E. HARPER.
Measured by J. S. PLASKETT.

Wt.	Mean of Settings.	Corrected Star Settings.	Displacement in Revns.	Velocity.	Wt.	Mean of Settings.	Corrected Star Settings.	Displacement in Revns.	Velocity.
2	72·9676				2	54·0063	54·0177	·0611	70·51
2	72·4047				1½	53 0897			
2	59·7820				3	45·2612			
½	59·6931	59·6941	·0455	+56 10	2	27·2676			
1	57·8570	57·8573	·0526	63·43	1	11·9818	12·0855	·0851	+64·08
1	57·7976				2	15·4432			
2	54 7148				2	11·5524			

Weighted mean ... +60·6
V_a ... −25·54
V_d ... − ·04
Curvature ... − ·50

Radial velocity ... + 34·5

* Check measurement.

θ AQUILAE 1082.‡

1907. Oct. 1.
G. M. T. 13h 09m

Observed by } W. E. HARPER.
Measured by }

Wt.	Mean of Settings.	Corrected Star Settings.	Displacement in Revns.	Velocity.	Wt.	Mean of Settings.	Corrected Star Settings.	Displacement in Revns.	Velocity.
2	72·9803				2	54·0219			
½	72 8630	72·8922	·0274	+39·76	3	54·0131	54·0210	·0512	58·93
2	72·4168				2	52 2388			
2	59·7975				2	45 2724			
½	59·6978	59·7095	·0350	43·05	½	45·2852	45·2864	·0477	49·80
1	57·8638	57·8736	·0468	56·35	1	11·9972	11·9400	·0886	+66·45
2	57·8102				2	11·5646			

Weighted mean ... +56·20
V_a ... −25·54
V_d ... − ·04
Curvature ... − ·50

Radial velocity ... + 30·1

‡ Second check measurement; accepted result +30·5.

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θ AQUILAE 1085.

1907. Oct. 1.
G. M. T. 11h 43m

Observed by } W. E. HARPER.
Measured by }

Wt.	Mean of Settings.	Corrected Star Settings.	Displacement in Revns.	Velocity.	Wt.	Mean of Settings.	Corrected Star Settings.	Displacement in Revns.	Velocity.
2	72·9545	.....	.....	.....	1	53·2139	53·2514	·0376	42·98
1½	72·8310	72·8400	·0213	+30·78	2	53·0630	.....	.....	.....
2	72·3912	.....	.....	.....	2	45·2322	.....	.....	.....
½	57·8245	57·8460	·0413	49·77	1½	45·2464	45·2978	·0491	51·30
2	57·7764	.....	.....	.....	½	27·4664	27·5434	·0469	40·63
1	53·9827	53·0171	·0605	69·81	2	27·2446	.....	.....	.....
1½	53·9809	.....	.....	.....	1½	11·9660	12·0960	·0956	+71·25
1	53·1007	53·1382	·0381	43·55	2	11·5280	.....	.....	.....

Weighted mean ..... +50·77
V_a ..... – 25·54
V_d ..... – ·17
Curvature ..... – ·28

Radial velocity ..... +24·8

θ AQUILAE 1086.

1907. Oct 1.
G. M. T. 15h 24

Observed by } J. N. TRIBBLE.
Measured by }

Wt.	Mean of Settings.	Corrected Star Settings.	Displacement in Revns.	Velocity.	Wt.	Mean of Settings.	Corrected Star Settings.	Displacement in Revns.	Velocity.
2	72·9723	.....	.....	.....	1½	45·3057	45·3151	·0664	69·51
½	72·8482	72·8395	·0208	+30·22	2	27·2818	.....	.....	.....
1½	54·0143	.....	.....	.....	½	27·5220	27·5620	·0655	57·08
1½	54·0087	54·0097	·0531	61·26	2	11·5682	.....	.....	.....
2	45·2742	.....	.....	.....	2	11·9990	12·0888	·0884	+66·61

Weighted mean ..... +62·17
V_a ..... – 25·54
V_d ..... – ·21
Curvature ..... – ·50

Radial velocity ..... + 35·9

θ AQUILAE 1089.

1907. Oct. 2
G. M. T. $12^h\ 41^m$

Observed by } J. N. TRIBBLE.
Measured by }

Wt.	Mean of Settings.	Corrected Star Settings.	Displacement in Revns.	Velocity.	Wt.	Mean of Settings.	Corrected Star Settings.	Displacement in Revns.	Velocity.
2	72·9608				1½	45·2951	45·2951	·0464	48·57
2	72·8377	72·8405	·0218	+31·67	1	27·4772	27·5416	·0451	39·31
2	54·0010				1½	27·2575			
2	53·9840	53·9983	·0417	48·10	1	11·9407	12·0554	·0550	+41·45
2	45·2537				1½	11·5433			

Weighted mean..... +44·41
V_a ..... −25·73
V_d ..... − ·04
Curvature..... ..... − ·50

Radial velocity..... + 18·1

θ AQUILAE 1091.

1907. Oct. 2.
G. M. T. $13^h\ 40^m$

Observed by } J. N. TRIBBLE.
Measured by }

Wt.	Mean of Settings.	Corrected Star Settings.	Displacement in Revns.	Velocity.	Wt.	Mean of Settings.	Corrected Star Settings.	Displacement in Revns.	Velocity.
1½	54·0710				1	45·3326	45·2808	·0421	43·94
2	54·0705	54·0283	·0585	+67·32	2	12·0140	11·9121	·0607	+45·50
2	45·3254				2	11·6091			

Weighted mean..... +53·91
V_a ..... −25·73
V_d ..... − 11
Curvature..... − ·28

Radial velocity..... + 27·8

θ AQUILAE 1092.

1907. Oct. 2
G. M. T. $14^h\ 0^m$

Observed by } J. N. TRIBBLE.
Measured by }

Wt.	Mean of Settings.	Corrected Star Settings.	Displacement in Revns.	Velocity.	Wt.	Mean of Settings.	Corrected Star Settings.	Displacement in Revns.	Velocity.
2	72·9697				1	45·2606	45·2871	·0384	40·20
2	72·8425	72·8365	·0178	+25·86	1½	27·2645			
2	54·0015				½	27·4768	27·5342	·0377	32·86
2	53·9898	54·0038	·0472	54·45	1	11·9760	12·0890	·0886	+66·76
2	45·2573				2	11·5531			

Weighted mean..... +49·04
V_a ..... −25·73
V_d ..... − ·16
Curvature..... − ·28

Radial velocity..... −22·9

θ AQUILAE 1093.

1907. Oct. 2.
G. M. T. 14h 36m

Observed by } J. N. TRIBBLE.
Measured by }

Wt.	Mean of Settings.	Corrected Star Settings.	Displacement in Revns.	Velocity.	Wt.	Mean of Settings.	Corrected Star Settings.	Displacement in Revns.	Velocity.
2	72·9961	.....	.....	.....	1½	45·3075	45 2915	·0528	55·10
2½	72·8785	72·8920	·0272	+39·47	1½	27·2982	.....	.....	.....
2½	54·0407	.....	.....	.....	½	27·4859	27·4543	·0324	28·12
3	54·0354	54·0234	·0536	61·68	½	11 9606	11 8843	·0329	+24·66
2	45·2894	.....	.....	.....	2	11·5835	.....	.....	.....

Weighted mean..... +52·30
V_a ..... —25·73
V_d ..... — ·19
Curvature ..... — ·28

Radial velocity..... +26·1

θ AQUILAE 1094.

1907. Oct. 2.
G. M. T. 14h 59m

Observed by } J. N. TRIBBLE.
Measured by }

Wt.	Mean of Settings.	Corrected Star Settings.	Displacement in Revns.	Velocity.	Wt.	Mean of Settings.	Corrected Star Settings.	Displacement in Revns.	Velocity.
2	53·8927	.....	.....	.....	2	45·1453	.....	.....	.....
1	53·8621	53·9712	·0280	+32 38	½	45·1570	45·3053	·0464	+48·72

Weighted mean..... +37·82
V_a ..... —25·74
V_d ..... — ·21
Curvature..... — ·28

Radial velocity..... +11· 6

θ AQUILAE 1100.

1907. Oct. 18.
G. M. T. 12h 15m

Observed by } W. E. HARPER.
Measured by }

Mean of Settings.	Measured Wave Length.	Normal W.L.	Displacement.	Velocity.	Mean of Settings.	Measured Wave Length.	Normal W.L.	Displacement.	Velocity.
61·3792	.....	.....	.....	.....	61·3520	4482·246	.400	·846	+56·59

Velocity..... +56·59
V_a ..... —28·00
V_d ..... — ·18
Curvature..... — ·28

Radial velocity..... +28·1

θ AQUILAE 1101.

1907. Oct. 18.
G. M. T. $13^h\ 46^m$

Observed by } W. E. HARPER.
Measured by }

Mean of Settings.	Measured Wave Length.	Normal W. L.	Displacement.	Velocity.	Mean of Settings.	Measured Wave Length.	Normal W. L.	Displacement.	Velocity.
71·9841	4559·584	·766	·815	+53·71	61·3936	4482·390	·100	·990	66·23
71·8433					58·8306				
63·3795					36·1916				
61·3974					36·2390	4341·404	·634	·770	+53·13

Weighted mean..... + 61·46
V_a ..... −28·00
V_d ..... — ·18
Curvature..... — ·28

Radial Velocity..... + 33·0

θ AQUILAE 1106.

1907. Oct. 25.
G. M. T. $12^h\ 52^m$

Observed by J. S. PLASKETT.
Measured by W. E. HARPER.

Mean of Settings.	Measured Wave Length.	Normal W. L.	Displacement.	Velocity.	Mean of Settings.	Measured Wave Length.	Normal W. L.	Displacement.	Velocity.
111·1159					61·3286				
110·7355	4891·323	·527	·204	—12·59	61·1051	4481·089	·400	·311	20·81
109·7163					60·3136				
71·7697					36·1414				
71·6947	4549·192	·642	·450	29·65	36·0162	4340·548	·634	·086	—5·94
71·1525					35·3590				

Weighted mean..... — 15·59
V_a ..... — 28·34
V_d ..... — ·16
Curvature..... — ·28

Radial velocity..... — 44·4

θ AQUILAE 1128.

1907. Nov. 4.
G. M. T. $10^h\ 28^m$

Observed by J. S. Plaskett.
Measured by W. E. Harper.

Wt.	Mean of Settings.	Corrected Star Settings.	Displacement in Revns.	Velocity.	Wt.	Mean of Settings.	Corrected Star Settings.	Displacement in Revns.	Velocity.
½	57·9161	57·8810	·0542	+65·26	2½	45·2960	45·2707	·0320	35·41
1	57·8551	.....	.....	.....	2	27·4995	27·4708	·0189	42·44
2	54·7672	.....	.....	.....	2	27·2753	.....	.....	.....
1½	54·0426	54·0150	·0452	51·66	1½	11·9303	11·9146	·0632	47·59
2	53·1401	.....	.....	.....	2	11·5229	.....	.....	.....
2	45·2990	.....	.....	.....					

Weighted mean ..... +44·36
V_a ..... −28·10
V_d ..... 0·0
Curvature..... — ·28

Radial velocity..... +16·0

θ AQUILAE 11 9.

1907. Nov. 4.
G. M. T. $10^h\ 51^m$

Observed by J. S. Plaskett.
Measured by W. E. Harper.

Wt.	Mean of Settings.	Corrected Star Settings.	Displacement in Revns.	Velocity.	Wt.	Mean of Settings.	Corrected Star Settings.	Displacement in Revns.	Velocity.
2	73·0432	.....	.....	.....	2	45·2935	.....	.....	.....
1½	72·9345	72·9·02	·0354	+51·36	2	45·3185	45·2987	·60·	62·6
2	72·4820	.....	.....	.....	1½	27·5148	27·4855	·0636	5·20
2	54·7032	.....	.....	.....	2	27·2760	.....	.....	.....
1½	54·0495	54·0265	·0567	64·81	1½	11·9599	11·9419	·0905	+68·15
2	53·1355	.....	.....		2	11·5250	.....	.....	.....

Weighted mean..... +60·57
V_a ..... −28·19
V_d ..... — ·04
Curvature..... — ·28

Radial velocity ..... +32·1

θ AQUILAE 1146.

1907. Nov. 16.
G. M. T. $12^h\ 00^m$

Observed by J. S. Plaskett.
Measured by C. R. Westland.

Wt.	Mean of Settings.	Corrected Star Settings.	Displacement in Revns.	Velocity.	Wt.	Mean of Settings.	Corrected Star Settings.	Displacement in Revns.	Velocity.
1½	72·9782	.....	.....	.....	2	53·1068	.....	.....	.....
½	72·8285	72·8597	·0051	− 7·40	2	45·2699	.....	.....	.....
1½	72·4148	.....	.....	.....	1½	45·2301	45·2338	·0050	5·22
2	54·7330	.....	.....	.....	1	27·4294	27·4055	·0164	−14·23
1½	53·9521	53·9546	·0152	17·49	2	27·2705	.....	.....	.....

Weighted mean..... −11·55
V_a ..... −26·69
V_d ..... — ·16
Curvature..... — ·28

Radial velocity..... − 38·1

θ AQUILAE 1149.

1907. Nov. 18.
G. M. T. $10^h\ 45^m$

Observed by J. S. PLASKETT.
Measured by W. E. HARPER.

Wt.	Mean of Settings.	Corrected Star Settings.	Displacement in Revns.	Velocity.	Wt.	Mean of Settings.	Corrected Star Settings.	Displacement in Revns.	Velocity.
2	72·9731	.....	....	....	2½	53·9463	53 9661	·0037	− 4·26
1	72 8456	72 8806	·0158	+22·92	2	53·0907	.....	....	.....
1½	72·4152	....	....	.....	2	45·2630	.....	.....	.....
2	54·7233	.. ..	.....	.....	1½	45·2729	45·2635	·0248	+25·89

Weighted mean ..... − 4·26
V_a ..... −26·34
V_d ..... − ·20
Curvature..... − ·28

Radial velocity...., ... −31·1

θ AQUILAE 1150.

1907. Nov. 18.
G. M. T. $12^h\ 37^m$

Observed by J. S. PLASKETT.
Measured by W. E. HARPER.

Wt.	Mean of Settings.	Corrected Star Settings.	Displacement in Revns.	Velocity.	Wt.	Mean of Settings.	Corrected Star Settings.	Displacement in Revns.	Velocity.
2	72·9724	.....	....	....	2	45·2649	.....	.....	.....
2	72·8351	72·8726	·0078	+11·31	1½	45·2280	45·2367	·0020	− 2·09
2	72·4071	.....	.....	.....	½	27·4435	27·4268	·0049	+ 4·25
2	54·7197	....	....	.....	2	27·2633	....	....	.....
3	53·9560	53·9772	·0074	+ 8·52	2	11·8985	11·8635	·0124	+ 9·07
1½	53·0919	. .....	....	....	2	11·5420	.....	.....	... .

Weighted mean..... + 7·25
V_a .... −26·34
V_d ..... − ·22
Curvature..... − ·28

Radial velocity..... −19·6

θ AQUILAE 1154.

1907. Nov. 19.
G. M. T. $10^h\ 41^m$

Observed by J. S. PLASKETT.
Measured by W. E. HARPER.

Wt.	Mean of Settings.	Corrected Star Settings.	Displacement in Revns.	Velocity.	Wt.	Mean of Settings.	Corrected Star Settings.	Displacement in Revns.	Velocity.
2	72·9641	....	.....	.....	1½	53·0724	.....	....	.....
2	72·8238	72·8696	·0048	+ 6·96	2	45·2360	....	....	... .
2	72·3987	..... .	....	.....	2	45·2065	45·2400	·0013	+ 1·36
2	54·7009	....	. .....	.....	½	27·3975	27·4130	·0089	− 7·72
1½	53·9512	53·9930	·0232	+26·70	2	27·2311	....	....	.....

Weighted mean..... + 8·89
V_a .... −26·46
V_d .... − ·11
Curvature. .... − ·28

Radial velocity..... ..... −18·0

θ AQUILAE 1155.

1907. Nov. 19.
G. M. T. 11h 00m

Observed by J. S. PLASKETT.
Measured by W. E. HARPER.

Wt.	Mean of Settings.	Corrected Star Settings.	Displacement in Revns.	Velocity.	Wt.	Mean of Settings.	Corrected Star Settings.	Displacement in Revns.	Velocity.
1	73·0047	.....	.....	.....	2½	53·9832	53·9671	·0027	— 3·11
1½	72·8657	72·8691	·0043	+ 6·24	2	53·1303	.....	.....	.....
2	72·4465	.....	.....	.....	2	45·2904	.....	.....	.....
2	54·7551	.....	.....	.....	1½	45·2121	45·2253	·0134	—13·99

Weighted mean ..... — 3·53
V_a ..... —26·46
V_d ..... — ·14
Curvature ..... — ·28

Radial velocity ..... —30·4

θ AQUILAE 1157.

1907. Nov. 23.
G. M. T. 12h 42m

Observed by J. S. PLASKETT.
Measured by C. R. WESTLAND.

Wt.	Mean of Settings.	Corrected Star Settings.	Displacement in Revns.	Velocity.	Wt.	Mean of Settings.	Corrected Star Settings.	Displacement in Revns.	Velocity.
2	73·0462	.....	.....	.....	1½	53·9209	53·9616	·0082	9·42
1½	72·9090	72·8643	·0005	— 0·73	2	53·0706	.....	.....	.....
2	72·4785	.....	.....	.....	2	45·2005	.....	.....	.....
2	54·7020	.....	.....	.....	1	45·1587	45·2315	·0072	— 7·52

Weighted mean ..... — 5·69
V_a ..... —26·94
V_d ..... — ·26
Curvature ..... — ·28

Radial velocity ..... —33·2

SUMMARY OF MEASURES OF θ AQUILAE.

Plate Number.	Date.	G. M. T.		Julian Day.	Phase.	Velocity.
	1907.	h.	m.			
803	May 31	19	04	2,417,727·79	0·79	−24
819	June 19	19	40	737·81	10·81	−39
841	" 12	20	05	739·84	12·84	−38
854	" 14	19	36	741·82	14·82	−42
865	" 20	18	40	747·78	3·61	−45*
873	" 21	19	20	748·80	8·63	−32*
905	July 2	18	12	759·76	15·59	−40
924	" 8	18	37	765·77	4·43	−22*
931	" 9	17	05	766·71	5·37	−29
942	" 13	16	53	770·70	9·36	−38*
946	" 16	17	07	773·71	12·37	−43
959	" 20	18	19	777·76	16·42	−45
969	" 27	18	15	784·76	6·25	−40
1001	Aug. 10	15	50	798·66	2·98	+19
1012	" 13	16	37	801·69	6·01	−39
1013	" 15	13	45	803·57	7·89	−51*
1023	" 23	16	10	811·67	15·99	−22
1027	" 27	16	04	815·67	2·82	+11*
1028	" 27	15	07	815·63	2·78	+10
1033	Sept. 6	14	41	825·61	12·76	−37*
1038	" 12	15	15	831·63	1·61	−16*
1043	" 14	16	10	833·67	3·65	+56*
1050	" 18	14	45	837·61	7·59	−49
1072	" 30	13	02	849·54	2·35	+ 3
1073	Sept. 30	13	25	2,417,849·56	2·37	+ 4
1074	" 30	14	08	849·58	2·39	− 7
1080	Oct 1	12	03	850·50	3·31	+28
1081	" 1	12	32	850·52	3·33	+33
1082	" 1	13	09	850·54	3·35	+30*
1085	" 1	14	43	850·61	3·42	+25
1086	" 1	15	24	850·64	3·45	+36
1089	" 2	12	41	851·53	4·34	+18
1091	" 2	13	40	851·57	4·38	+28
1092	" 2	14	08	851·58	4·39	+23
1093	" 2	14	36	851·61	4·42	+26
1094	" 2	14	59	851·62	4·43	+12
1106	" 18	12	15	867·51	3·15	+28
1101	" 18	13	46	867·57	3·21	+33
1106	" 25	12	52	874·53	10·17	−44
1128	Nov. 4	10	28	884·44	2·91	+16
1129	" 4	10	51	884.45	2·92	+32
1146	" 16	12	00	896·50	14·97	−38
1149	" 18	10	45	898·45	16·92	−31
1150	" 18	12	37	898·53	17·00	−20
1154	" 19	10	41	899·45	0.75	−18
1155	" 19	11	00	899·46	0.76	−30
1157	" 23	12	42	2,417,903·53	4·83	−33

* Mean of two or three measurements.

APPENDIX C.

MEASUREMENT OF VISUALLY DOUBLE STARS.

R. M. Motherwell.

The 15-inch refractor with a filar micrometer (see report of 1905) is used in this work. The micrometer is fitted with one transverse movable wire, one transverse fixed wire and one longitudinal fixed wire. The distance between the fixed and movable transverse wires is adjusted and recorded by a micrometer screw having a head graduated to hundredths of a revolution and readily estimated to thousandths. The value of a revolution of the micrometer screw is determined as follows:—

The telescope is set on a star of known declination near the meridian. The micrometer is adjusted so that the star follows the longitudinal wire and the movable wire is separated M revolutions from the central fixed wire. The times of the successive transits of the star over the two wires are observed. Let I be the interval between these transits, i the true angular interval between the threads and δ the declination of the star. Then

$$\sin i = \sin I \cos \delta$$

or if the star's declination is less than + 80°

$$i = I \cos \delta$$

Let R = value of one revolution of the micrometer screw and we have

$$R = \frac{15\, i}{M} = \frac{15\, I \cos \delta}{M}$$

Following this method the value of the micrometer screw here used was found to be 18″·375.

The zero point of the circle is always determined at the beginning of each night's work.

The position angle is obtained by separating the wires a few seconds and turning them until the two stars appear to be midway between them. If the stars are very far apart, however, the angle is more accurately obtained by bisecting each star by the fixed wire. The eyes must be kept in a constant position relative to the fixed wire. I find the best position to be that in which the line joining the eyes is perpendicular to the fixed wire. Having taken four readings of the position angle, the wires are rotated through 180° and four readings of the angle taken here.

The average of these readings plus 90° gives the direction of the wires for measuring the distance. The stars are bisected by the two wires and the micrometer reading taken. Then the movable wire is changed to the other side of the fixed wire, the stars bisected as before and the reading taken. The difference between the two readings gives the double distance which does away with the necessity of investigating the error of runs. The measurements on a star any one night include eight measurements for position and at least four for distance. If the seeing is unsteady the number of measurements is increased. A full record of all stars measured is kept on a special form of index card, arranged according to the right ascension of the star. Burnham's General Catalogue of Double Stars furnishes in condensed form all the information required to enable this work to be carried on without unnecessary duplicating of measurements.

The following measurements have been made:—

Date.	Star No.*	R. A. 1880.	Decl. 1880.	Position Angle.	Distance.	Magnitude.
		h. m. s.	° ′	°	″	
1907·814	70	0 7 11	26 19	224·3	17·75	A.B. & C.
1907· 92	319	0 29 16	11 11	11·0	61·07	8·5–10·5
1907· 92	710	1 13 54	13 8	190·2	30·20	8·5 10·
1907·790	758	1 20 29	44 47	100·1	2·15	A. & B.
				136·2	4·85	C. & D.
1907·814	1002	1 48 17	28 13	162·8	5·88	A. B. & C.
1907·812	1427	2 40 41	18 52	315·7	3·07	7·3–8·2
1907· 92	1750	3 25 37	11 8	248·3	17·04	7·5–10
1907· 92	2040	4 0 54	14 50	222·6	3·95	6·–8·5
1907·812	2043	4 1 7	17 1	323·7	4·03	6·1–9·2
1908·116	5014	9 11 23	37 19	231·7	3·00	4·–6·5
1908·217	7117	14 59 10	−6 33	305·8	1·88	8·–9·
1908·217	7210	15 12 57	10 52	170·4	14·46	6·5–7
1908·217	7318	15 29 5	10 56	184·5	3·90	3·–4·
1907·543	7915	17 9 12	28 57	18·5	5·50	7·8–9·5
1907·543	8003	17 19 33	37 15	314·5	4·00	4·–5·1
1907·491	8082	17 30 52	21 4	23·77	10·22	6·0–9·5
1907 510	8303	17 56 33	−8 11	260·2	2·09	5·–5·5
1907·491	9167	19 11 7	27 15	156·15	0·78	6·5–7·
1907·491	9604	19 41 3	5 52	7·5	2·96	8·5–10
1907·530	9693	19 47 19	25 33	136·9	3·98	7·6–7·6
1907·576	10072	20 12 31	26 0	215·0	0·73	7·9 8·2
1907·600	10305	20 26 50	25 24	81·9	1·29	6·2–8·
1907·71	10385	20 33 14	14 35	112·7	3·38	8·–10·5
1907·584	10685	20 56 58	1 4	161·7	1·37	6·3–7·
1907·587	10709	20 58 43	3 3	160·2	3·35	7·7–8·9
1907·543	10773	21 3 33	29 43	307·0	3·5	6·–8·
1907·576	10910	21 14 51	2 37	106·0	1·59	7·6–9·5
1907 697	11068	21 29 40	20 52	320·0	1·7	7·1–9·0
1907·697	11376	21 51 11	51 58	27·0	1·85	7·8–8·0
1907·697	12043	22 48 45	19 42	35·0	6·52	8·5–9·2
1907· 71	12345	23 18 14	5 23	87·3	2·37	8·7–8·7
1907· 71	12753	23 59 49	6 12	161·8	3·12	9· 9·5

PREDICTION AND OBSERVATION OF OCCULTATIONS.

The method which I have followed in predicting occultations is a graphic one by Wm. F. Rigge, and I find it very satisfactory. It eliminates entirely all the laborious computing of the analytical method, and in central occultations the predicted and observed times seldom differ more than 30 or 40 seconds.

In this method the path of the place of observation and that of the cylindrical shadow cast by the moon in the light of the star are projected orthographically on a plane perpendicular to the light of the star. The diagram for a given place of observation contains the path of that place as seen from stars at certain intervals of declination from + 30° to − 30°. The path is an ellipse with the following constants, where ϕ is the latitude of the place, δ the declination of the star and T its hour angle. The semi-major axis is the same for all stars, $a = \cos \phi$; the semi-minor axis is $b = \cos \phi \sin \delta$; the co-ordinate of the centre of each is $d = \sin \phi \cos \delta$. The co-ordinates of the points of any one are $\xi = a \sin T$ and $\eta = d - b \cos T$. The direction and magnitude of the hourly motion of the shadow of the moon are obtained from the Ephemeris and plotted on the x and y axes of the diagram with a paper edge. A parallel ruler is then placed against the paper edge and moved until it intersects the y-axis at the proper point, as given by the Ephemeris.

The local hour angle of conjunction, $H - \lambda$, gives the time at which the path of the shadow intersects the y-axis, so we have the position of the place of observation and that of the shadow at known periods. A transparent disc represents the shadow

* These numbers refer to Burnham's General Catalogue of Double Stars.

and is moved so that its centre follows the path given. When the time indicated on the path by the centre of the disc is the same as the time indicated on the path of the place of observation by the edge of the disc, we have the beginning or ending of an occultation. This time added to the Washington mean time of conjunction minus the Washington hour angle at the same moment gives the time of immersion or emersion and the position angle is read directly from the disc which is graduated clockwise to 10 degrees. A diagram has been prepared for this observatory and mounted on a drawing board for convenience in working. Not more than 10 minutes at the very outside is required to predict the times of immersion and emersion and also the position angles.

The 15-inch refractor fitted with a filar micrometer is generally used in making the observations, but if more convenient the 4½-inch refractor is used. The time is taken from a sidereal dial which has recently been placed in the dome, this dial being compared with the sidereal clock of known rate in the time-room.

Since September 1, 1907, fifty-seven occultations have been predicted, but, owing to cloudy weather, only twelve have been observed.

The following are the stars and dates of observation:—

Date.	Star	Magnitude.	Sidereal Time.	
			Immersion.	Emersion.
1907.			h. m. s.	h. m. s.
September 14	ξ Ophiuchi	4·4	19 56 27·5	20 35 22·0
October 15	η Capricorni	4 8	Sun not down.	19 43 18·7
" 21	85 Ceti	6·2	7 56 0·2	Sunrise.
" 23	δ^1 Tauri	3·9	7 24 10·8	8 3 17·2
" 23	δ^3 Tauri	4·3	8 31 57·9	Sunrise.
" 23	δ Geminorum	3·5	1 24 27 0	2 16 23·0
1908.				
January 8	30 Piscium	4·7	1 24 30·0	Clouds.
" 14	Mayer 198	6·3	4 30 34·9	5 45 1·2
" 14	107 Tauri	6·5	7 11 32 9	7 37 18·5
" 29	B. A. C. 6088	5 7	14 17 50 8	15 19 47·0
February 11	ζ Tauri	3·0	2 50 11·5	4 9 40·0
March 19	α Virginis	6·5	16 36 30·0	17 45 4·0

APPENDIX D.

A DETERMINATION OF THE PROMINENT LINES FROM λ 3900 TO λ 4900. IN THE SPARK-SPECTRUM OF IRON-VANADIUM ALLOY.

Ralph E. DeLury.

The spectrum of the spark between electrodes of an Iron-Vanadium alloy is employed in this Observatory as a comparison in the study of radial velocities. The tables of wave-lengths used are:—

H. Kayser:—'*Standard Lines in the Arc-Spectrum of Iron,*' Astrophysical Journal, XIII, 329-335, 1901. The portion of this table employed is from λ 3900 to the end, λ 4494.

H. A. Rowland:—'*A Preliminary Table of Solar Spectrum Wave-Lengths,*' the University of Chicago Press, 1896. Some of the iron lines from λ 4494 to λ 4900 are used.

H. A. Rowland and C. N. Harrison:—'*The Arc-Spectrum of Vanadium,*' Astrophysical Journal, VII, 273-294, 1898. The prominent lines in the range, λ 3900 to λ 4900 are used.

In the latter table some of the wave-lengths given do not yield results concordant with those obtained by using the Standard Iron lines determined by Kayser. In some cases this is due to the over-lapping of Iron and Vanadium lines; or possibly some of the lines in the spark-spectrum of the alloy may differ from the corresponding lines in the arc-spectrum of pure Vanadium. In order to detect any such appreciable errors, to measure such differences and to examine the nature of the over-lappings, the following measurements of the spark-spectrum of Iron-Vanadium alloy were undertaken.

The concave grating spectroscope described on page 49 of the report for the year ending June 30, 1906, was used in obtaining the spectrum. In order to secure suitable definition certain adjustments were necessary. The angle between the rails was determined by measuring the lengths from their points of intersection, of the wires stretched taut by weights along the tops of the rails and another wire (the hypothenuse) intersecting these near the ends of the rails. It was found that the hypothenuse had to be shortened 6·5 mm. to make the angle between the rails a right angle. This was done by tilting the iron-support of the rail on which the camera rested, and by the adjusting-screws. Then the position for the slit was determined by using a plumb-bob suspended from the ceiling above the point where the two wires running along the rails intersected. The jaws of the slit were improved by grinding them on plate-glass with moistened fine emery dust. The slit was placed as nearly vertical as possible, and by testing visually, the lines of the grating were made parallel to it by means of the adjusting-screw on the side of the grating-mounting. The grating was tilted, by means of the adjusting-screw at the back of the mounting until its centre of curvature coincided with the centre of the eye-piece, by using a collimating (Gauss) eye-piece. It was found that the centre of curvature shifted slightly vertically when the camera was slid along the rail and consequently the adjusting-screw at the back of the grating was provided with a pointer so that it could be set for any point along the rail to insure having the image of the spectrum placed to the best advantage. In this position the lines of the grating and the slit were

perpendicular to the plane determined by the centre of the slit, the centre of the grating and the centre of curvature of the grating. Numerous tests were made to secure these conditions and to get the best focus. A focussing-scale was placed on the plate of the camera support. The wave-lengths were marked off along the rail.

The spark between electrodes of the alloy was obtained by using a potential of 5,000 to 7,000 volts from a transformer. It was placed about 6 inches from the slit and the light from it was focussed on the slit by a small lens, care being taken to have the spark, the centre of the slit and the centre of the grating as nearly as possible in a straight line in order to secure the best illumination. The spark passed at right angles to the slit. Slit-widths of 0·001 and 0·002 inches were used. The photographs, 9 to 12 inches long, were taken in the second order, Ilford Monarch films being employed. The scale here is about 2·77 tenth-metres to 1 mm. Exposures of 20 to 40 minutes brought out sharply the prominent lines. Several photographs were taken at different foci for the various parts of the spectrum, and the sharpest of these (focus 7·0) selected for measurement. It was noticed here that some of the photographs of the image when out of focus gave sharp doubled lines probably due to the shifting of the centre of intensity of the spark due to the alternations, since a corresponding doubling did not occur in carbon arc photographs taken at different readings on the focussing scale. It was found that these doubled lines could be measured by placing the single hair of the microscope between them with more accuracy and with less strain on the eyes than is the case in the ordinary methods, namely, by using a single hair to set on the centre of intensity of the spectrum line or by using the double hairs to set symmetrically about the spectrum line. It may be of advantage in certain cases to use a doubled spectrum for the determination of the lines. In the present case, however, the other two methods of measurement mentioned above, were employed on account of the fact that many close doubles and overlapped lines had to be measured and this would be impossible in the case of the doubled spectrum. In these measurements a Zeiss comparator having a range of 100 mm. was used. This range is rather short for the measurement of such long films, and the new 12-inch measuring machine will be useful for this purpose when it arrives. Readings of the micrometer could be made to 0·001 mm. and estimations to 0·0001 mm. Four or more readings were taken for each line and the average calculated.

The wave-lengths were calculated from the averages of the micrometer readings by interpolation and extrapolation using two prominent lines to determine the scale. These two lines were iron lines in every case and are given in black type in the tables. The calculated wave-lengths were compared with Standard Iron lines, and a curve of errors plotted for each set of measurements. From this curve the corrections given in the tables were found. Applying these corrections to the calculated wave-lengths, the corrected wave-lengths given in the tables were determined. A summary is given in the final table. The means of the corrected wave-lengths are given along with the corresponding lines from the tables of Rowland and Harrison, Rowland and Kayser mentioned above. In determining the means, those wave-lengths marked with an asterisk were omitted. In this table are also given the roughly estimated intensities of the lines and remarks as to their nature and the widths of the lines in millimetres. These widths were determined by comparison with two parallel lines 0·1 mm. apart. These measurements of intensity and width were made from photographs obtained by the use of a slit ·001 inch in width. No lines of intensity less than 1 on the arbitrarily selected scale were measured; this meant that about 500 of the lines appearing on the film were omitted. Figure 15 shows photographs of the range of spectrum measured.

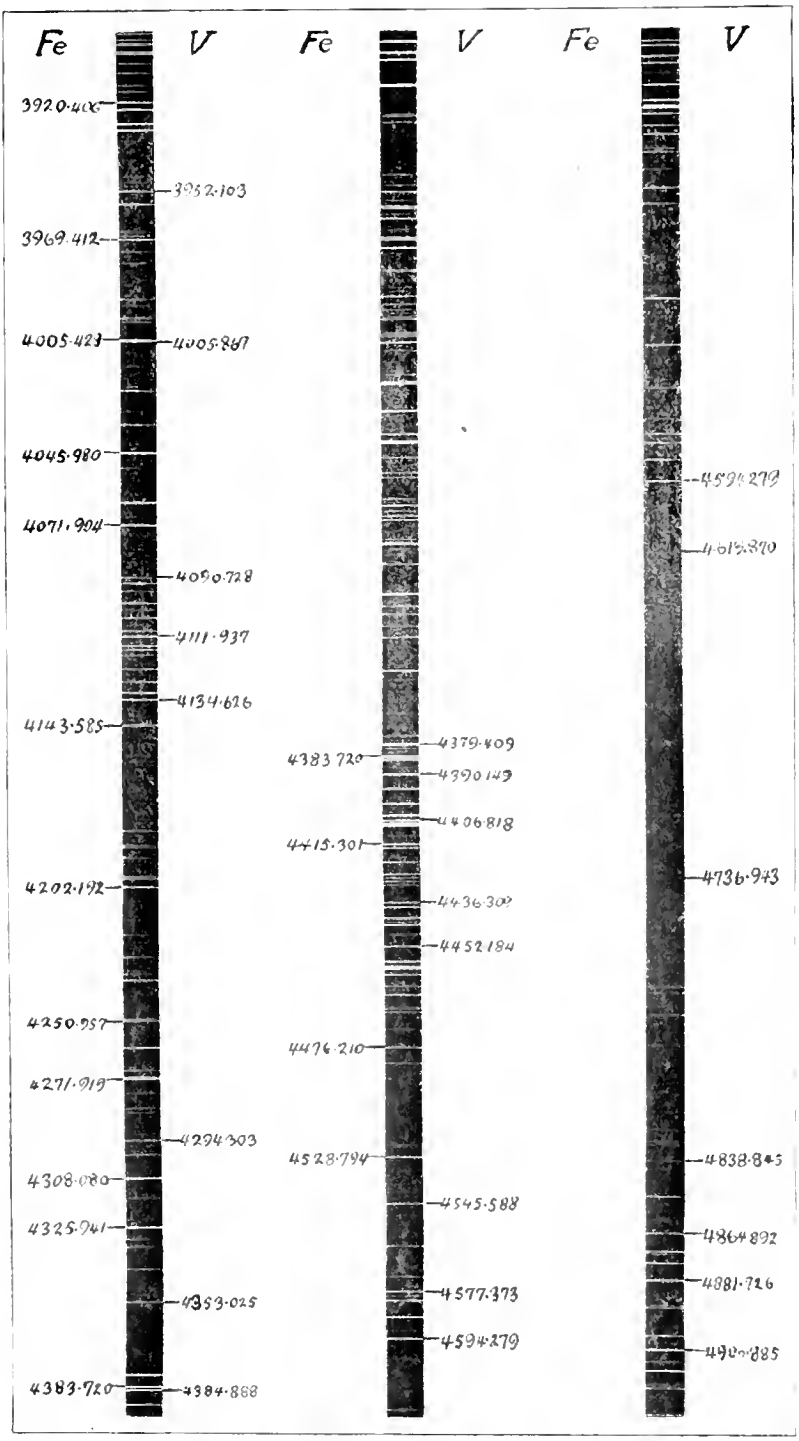


FIG. 15.—Spark Spectrum of Iron-Vanadium Alloy.

25a—p. 258.

Correction.	Corrected Wave-Length.	Correction.	Corrected Wave-Length.	Correction.	Corrected Wave-Length.	Correction.	Corrected Wave-Length.
Film 265 (a), Focus 7·0							
−·002	3895·891						
2	3898·100						
2	3899·283						
2	3899·853						
0	3902·408						
·000	**3903·097**						
0	3903·412						
1	3906·588						
3	3910·028						
6	3914·469						
7	3916·574	Film 412 (a), Focus 7·0					
10	3920·407	·000	**3920·404**				
9	3923·059	−·013	3923·054				
14	3928·072	27	3928·077				
16	3930·433	32	3930·459				
17	3933·815						
		36	3934·151				
		45	3918·920				
		45	3950·101				
22	3952·110	46	3952·095				
		46	3956·642				
22	3956·824	46	3956·848				
		45	3966·754				
		44	3967·575				
21	3968·244	44	3968·230				
21	3968·634						
21	3969·409	44	3969·414				
20	3973·799	43	3973·781				
19	3977·893	42	3977·899				
		40	3984·123				
16	3990·726	37	3990·720				
		36	3992·954				
14	3997·275	34	3997·274				
14	3997·553	34	3997·564				
14	3998·881	34	3998·608*	Film 265 (a), Focus 7·0			
				+ 007	4003·159		
12	4005·399	31	4005·436	7	4005·451		
		29	4009·885				
		26	4014·697				
		22	4022·044				
6	4023·536	21	4023·548	4	4023·581		
−·002	4035·782	15	4035·788	2	4035·818		
+·002	4045·978	10	4045·984	·000	**4045·978**		
		7	4051·130				
		7	4051·499				
		4	4057·244				
		2	4061·069				
		2	4062·626				
7	4063·756	−·001	4063·752	−·004	4063·759		
				4	4065·229		
18	4071·909	+·002	4071·908	2	4071·894		
4	4090·724			0	4090·731		
		6	4091·287				
4	4092·831	5	4092·853	1	4092·836		
3	4095·638	5	4095·645	1	4095·626		
+·001	4099·943	4	4099·939	2	4099·932		
		3	4102·312	3	4102·300		
−·001	4105·310	+·002	4105·319	3	4105·311		
		0	4107·641	4	4107·646		
3	4109·919	−·002	4109·921	5	4109·915		
4	4111·934	3	4111·938	5	4111·939		
5	4115·323	5	4115·310	7	4115·334		
5	4116·646	5	4116·644	8	4116·648		
5	4118·711	6	4118·710	9	4118·709		
5	4123·651	6	4123·645	8	4123·657		
5	4128·211	5	4128·821	7	4128·211		
−·004	4132·180	−·003	4132·163	−·005	4132·180		

Correction.	Corrected Wave-Length.	Correction.	Corrected Wave-Length.	Correction.	Corrected Wave-Length.	Correction.	Corrected Wave-Length.
		−·003	4134·613				
−·003	*4134·104	3	4134·626	−·003	4134·655		
		3	4134·860				
0	4143·599	0	4143·566	+·001	4143·595		
·000	**4144·033**	·000	**4144·033**	+·002	4144·033		
Film 401, Focus 7·0		Film 412 (a), Focus 7·0					
·000	4143·581						
·000	**4144·033**	·000	**4144·033**				
−·005	4147·841						
15	4154·117						
16	4154·662	−·005	4154·662	−·001	4154·662		
19	4156·974	5	4156·954	4	4156·949		
41	4175·797	3	4175·801	13	4175·802		
45	4179·582						
47	4181·926	6	4181·917	5	4181·918		
		13	4183·591	−·002	4183·600		
50	4185·057	21	4185·063				
51	4187·210	25	4187·221	+·001	4187·219		
52	4187·967	26	4187·975	1	4187·976		
53	4190·008						
54	4191·625	28	4191·611	2	*4191·534		
57	4198·461	25	4198·472				
57	4199·255	24	4199·266	0	4199·256		
57	4202·184	22	4202·193	·000	**4202·195**		
				Film 265 (a), Focus 6·5		Film 265 (a), Focus 7·5	
				−·002	4198·463		
				−·001	4199·252	·003	4199·258
				·000	**4202·195**	·000	**4202·195**
				−·003	4205·245		
58	4210·512	15	4210·525				
57	4216·340						
56	4219·528	10	4210·525	14	4219·528		
55	*4222·477	8	4222·381	16	4222·372		
54	4224·306						
53	4226·866						
54	4224·306						
53	4226·866						
52	4227·589	6	4227·597	19	4227·606	−·066	4227·654
49	4232·620	5	4232·621				
49	4233·101						
48	4233·763	5	4233·778	22	4233·785		
48	4234·162						
47	4236·084	4	4236·119	23	4236·121	78	4236·105
45	4238·975						
39	4247·587			27	4247·535		
37	4250·309	5	*4250·020			87	4250·294
37	4250·954	5	4250·947	28	4250·956	87	4250·970
31	4260·673	4	4260·657	30	4260·649	88	4260·668
28	4268·801	3	4268·805	31	4268·822	86	4268·819
27	4271·325	3	4271·334	32	4271·343	86	4271·333
		3	4271·721				
27	4271·908	3	4271·930	33	4271·927	86	4271·911
		3	4271·975				
25	4277·125	3	4277·119	34	4277·109		
23	4282·571	2	4282·567	37	4282·579	83	4282·576
22	4284·226	2	4284·218	38	4284·203		
19	4291·987	1	4291·990	43	4291·968		
19	4294·322	1	4294·301	44	4294·299	75	4294·288
18	4296·264	1	4296·281				
17	4297·841						
17	4298·202						
17	4299·418	−·000	4299·420	46	4299·409	69	4299·419
14	4306·388						
14	4307·349						
−·013	4308·086	·000	**1308·081**	+·048	4308·081	−·061	4308·068
		Film 412 (a), Focus 7·0					
		·000	**4308·081**				

Correction.	Corrected Wave-Length.	Correction.	Corrected Wave-Length.	Correction.	Corrected Wave-Length.	Correction.	Corrected Wave Length.
−·013	4309·966						
10	4315·258	−·002	4315·265	+·050	4315·265	−·055	4315·243
5	4325·961	6	4325·934	51	4325·931	48	4325·948
3	4330·168	7	4330·194	51	4330 194		
−·002	4332·995	7	4332·998	51	4332·995	44	4332·990
·000	**4337·219**	8	4337·499*	51	4337·236		
+·001	4341·182	8	4341·171	50	4341·173	40	4341·174
+·004	4353·023	8	4353·008	47	4353·034	35	4353·028
Film 401, Focus 7·0							
·000	**4337·219**						
−·000	4341·181						
1	4353·033						
3	4376·095						
4	4378·861						
		8	4379·426	33	4379 387	22	4379·412
4	4383·720	8	4383·728	29	4383·702	19	4383·725
5	4384·905	8	4384 895	28	4384 874	18	4384·882
5	4390·177	8	4390 155	22	4390·136	14	4390·152
6	4395 428	8	4395·666*	16	4395·392	9	4395·404
6	4400·735	8	4400·725	10	4400·752	−·004	4400·753
7	4404·937	8	4404 946	6	4404 938	·000	**4404·929**
7	4406 813	8	4406·805	5	4406·834	Film 265 (*a*), Focus 7·5	
						·000	**4383·724**
						−·000	4384·886
						1	4390 168
						3	4395·411
						4	4400·757
						4	4404·922
						5	4406·818
8	4407 798	8	4407·804	4	4407·825	5	4407·815
8	4408 334	8	4408 335	3	4408·380		
8	4408·744	8	4408·716	+·003	4408·694		
8	4412·326						
8	4415·319	10	**4415·291**	·000	**4415·301**	6	4415·306
8	4416 636	10	4416·730*			6	4416·648
8	4420·106	12	4421·751			5	4421·775
8	4426·174	14	4426·199				
8	4427·473	15	4427·490				
8	4428·676	16	4428·694				
8	4429·965						
7	4436·300	22	4436·312			3	4436·323
7	4437·706*						
		21	4438·007			3	4438 028
6	4441·842	28	4441·848			3	4441·886
6	4442·505						
6	4444·371	31	4444·369			3	4444·407
5	4447·896						
4	4452·173	40	4452 176			2	4452·204
1	4459·287						
1	4459 923	50	4459·922			1	4459·956
1	4460·493	51	4460·455			1	4460·518
−·000	4462·534	53	4462·524			−·001	4462·576
				Film 323, Focus 7·0			
+·001	4466·730	58	4466·733	·000	**4466·737**	·000	**4466·737**
3	4469·879			−·021	4468·192		
				38	4468·962		
3	4469 879	63	4469·888	50	4469·882	+·000	4469·919
4	4474 221			·100	4474·228		
4	4474·902	69	4474·914	·105	4474 893		
4	4476·209	71	4476·215	·120	4476·206		
				·140	4480·235		
5	4482·401	79	4482·434	·151	4482·435		
				·159	4484 420		
5	4489·077	−·088	4489·150	180	4489·101		
		Film 407, Focus 7·0		·191	4490·996		
+·004	4494·725	·000	**4494·755**	−·201	4491·756		

Correction.	Corrected Wave-Length.	Correction.	Corrected Wave-Length.	Correction.	Corrected Wave-Length.	Correction.	Corrected Wave-Length.
				−·206	4496·237		
				·208	4497 055		
+·003	4502·147	+·005	4502 160	·216	4502 146		
+ 001	4524·403	17	4524·413	·231	4524 381		
		17	4525·368	·231	4525·322		
·000	**4528·798**	19	4528·809	·226	4528·776		
		19	4531·366	·222	4531·341		
−·001	4545·583	19	4549·887	·186	4549·797		
		18	4553·251	·178	4553·254		
				·171	4556·847		
2	4560·9 6	17	4560·897	·159	4560·919		
				·150	4564·788		
2	4571·981	15	4571·972				
2	4577·370	13	4577·359	·123	4577 390		
2	4578·930	13	4578·907	·120	4578 921		
3	4580 599	13	4580·564	·116	4581 596		
				·122	4584·005		
3	4585·553	11	4586·549	·119	4586·548		
3	4591·422	10	4591·413	·104	4591 400		
−·003	4594 274	9	4594 277	·101	4594·287		
				95	4600·287		
		6	4603·12	93	4603·13		
		6	4606·326	90	4606·324		
		5	4619 8.4	78	4619 865		
		4	4635 345	64	4635·332		
		4	4646·558	53	4646·542		
				31	4666 204		
		3	4670·649	30	4670·595		
				23	4677·729		
				16	4688·049		
		+·001	4706·471	−·000	4706·659		
		·000	**4736 963**	·000	**4707·457**		
		Film 407, Focus 7·0		Film 323, Focus 7 0			
				·000	**4707·457**		
				+·007	4710·618		
		·000	**4736 963**	44	4736·943		
		+·003	4775·260	42	4775·276		
		3	4776·125	42	4776·134		
		4	4778·239	41	4778 256		
		4	4781 441*	40	4781 ·15*		
		4	4783·195	39	4782 917*		
		5	4797·101	33	4796·826*		
		5	4807·695	28	4807·701		
				22	4820·150*		
		6	4821·220	22	4820·954*		
				21	4822·306*		
					4825·824*		
		6	4827·616	20	4827·613		
		7	4831 811	18	4837·806		
		7	4832 586	18	4832·590		
		7	4833·249	17	4833 260		
		7	4838·837	16	4838·852		
		7	4841·808	15	4841·804		
		8	4851·632	12	4851·651		
		8	4856 969	10	4856·965		
				9	4859·925		
		7	4864·895	8	4864·888		
		7	4871·507	6	4871·495		
		6	4872·344	6	4872·352		
		6	4875·646	5	4875·655		
				5	4876·320		
				4	4877·963		
		5	4881·732	3	4881 720		
				3	4882·337		
		+ 001	4890 938	+ 001	4890·948		
		·000	**4891 683**	·000	**4891·683**		
				−·002	4899·065		
		−·002	4901·663	2	4901·733		
				−·003	4904 627		

Correction.	Corrected Wave-Length.	Correction.	Corrected Wave-Length.	Correction.	Corrected Wave-Length.	Correction.	Corrected Wave-Length.
		−·003	4906·898	−·003	4906·872		
		4	4911·148	4	4911·125		
				4	4912·140		
		−·005	4914·418	−·005	4914·319		

* Omitted in calculating the mean.

SUMMARY.

Mean of Corrected Wave-Lengths.	Intensity.	Width in Mm.	Remarks.	Rowland and Harrison Vanadium.	Rowland Solar.		Kayser Iron.
					Vanadium.	Iron.	
3895·801						3895·803	3895·801
3898·100				3898·082	3898·151	3898·032 3898·231	
3899·283						3899·171	
3899·853						3899·850	3899·853
3902·408				3902·371	3902·399		
3903·097						3903·090	3903·097
3903·412						3903·398*u*	
3906·588						3906·628	3906·624
3910·028						3909·976	3909·980
3914·469				3914·437		3914·426Fe,?	
3916·574						3916·544*u* 3916·879	3916·880
3920·406	7	·10	Weak line to red.			3920·410	3920·404
3923·057	8	·10				3923·054	3923·059
3928·075	8	·11	Weak edges.			3928·075	3928·073
3930·446	7	·10				3930·450	
3933·815				3933·775			
3934·151	1	·07				3934·174*u*	
3948·920	2	·06				3948·925	3948·927
3950·101	1	·06				3950·102	
3952·103	5	·08		3952·073			
3956·642	1	·08	Hazy edges.			3956·603	3956·610
3956·836	2	·07				3956·819	3956·823
3966·754	1	·07				3966·778	3966·219
3967·675	1	·05				3967·570	
3968·237	1	·06				3968·114	
3968·634				3968·588		3968·625Ca	
3969·412	11	·12				3969·313	3969·411
3973·790	3	·06				3973·796	
3977·896	2	·06				3977·891	3977·892
3984·123	1	·06				3984·113	3984·112
3990·723	5	·07		3990·693	3990·712		
3992·954	3	·07		3992·916	3992·971V-Cr		
3997·275	1	·07			3997·115		
3997·559	2	·05			3997·547		
3998·881	3	·07		3998·847	3998·790Ti	3998·205	
4003·159							
4005·429	8	·10					
4005·867	5	·09		4005·838		4005·408	
4009·885	1	·05				4009·864	
4014·697	1	·05				4014·677	
4022·044	2	·06		4022·038		4022·018	4022·029
4023·555	5	·08	Weak to violet.	4023·508			
4035·793	5	·08					
4043·293	1	·06					
4045·980	12	·19	Weak edges.			4045·975	4045·978
4051·130	1	·07			4051·204		
4051·499	1	·07		4051·485	4051·491Cr-V		
4057·244	1	·05		4057·206			
4061·069	1	·05				4061·081*u*	
4062·626	1	·05				4062·599	4062·605
4063·756	11	·18	Weak edges, line to red.			4063·759	4063·755
4065·229					4065·239Mn-Ti		
4071·904	12	·18		4071·664		4071·908	4071·901
4090·728	7	·08		4090·703	4090·728		
4092·840	6	·09	Weak line to violet	4092·532!	4092·821	4092·431 4092·665	
4095·938	8	·10		4199·921!	4099·941		
4102·306	3	·06		4102·285	4102·321		
4105·313	6	·09			4105·318		
4107·643	1	·05		4107·599		4107·649Ca-Fe-Zr	4107·646
4109·918	7	·10		4109·906	4109·905	4109·953	
4111·937	7	·19	Weak edges.	4111·916	4111·940		

SUMMARY—*Continued.*

Mean of Corrected Wave-Lengths.	Intensity.	Width in Mm.	Remarks.	Rowland and Harrison Vanadium.	Rowland Solar.		Kayser Iron.
					Vanadium.	Iron.	
4115·322	6	·12	Weak edges.....	4115·311	4115·330	.....	
4116·646	5	·09	....	4116·631	4116·634	.. ..	
4118·710	4	·07	....	4118·320	4118·307	4118·708	4118·709
4123·651	5	·09	.....	.....	4123·589	4123·907	
4128·214	6	·09	.....	4128·152!	4128·251	....	
4132·174	8	·13	....	4132·123	4132·100	4134·233Fe-V	
4134·613	6	·08	....	4134·617	4134·509Fe-V	.. ..	
4134·626	6	·16	Resultant	.....	.....	.....	
4134·860	1	·04	.. . .	.. ..	.....	4134·840	
4143·585	2	·06	....	....	... .	4143·572	
4144·033	7	·11	... .	... .	. . . .	4144·038	4144·033
4147·841	... ..	..... .	.....	....	.....	4147·836	
4154·117	.....	.....	.....	... .	.....	4154·071	
4154·662	1	·06	....	.. . .	....	4154·667	4154·662
4156·959	1	·05	.....	... .	....	4156·970	
4175·800	1	·05	.....	....	.....	4175·806	4175·799
4179·582	.....	.....	... .	....	4179·542	.. ..	
4181·920	6	·06	.....	.....	....	4181·919	4181·918
4183·596	1	·06	.....	4183·071	. .....	....	
4185·060	1	·05	.....	....	....	4185·058	
4187·217	5	·08	.....	.....	.....	4187·204	4187·221
4187·973	5	·08	.. . .	.....	.....	4187·943	
4190·008	.....	.....	.....	4190·011	4189·983	.....	
4191·618	3	·07	Hazy to red	.....	....	(4191·595) (4191·843)	4191·611
4198·465	5	·07	.....	.....	....	4198·494	
4199·257	7	·08	.....	.. ..	....	4199·267Zr-Fe	4199·256
4202·192	8	·10	Faint line to red.	4202·506	....	4202·198	4202·195
4204·130	.. ...	.... ..	.....	.....	....	4204·101	
4205·245	...	.. ....	.. ..	4205·201	....	4205·545	
4210·006	.....	.....	.. ..	4210·002	4209·985	....	
4210·519	1	·06	....	.....	.....	4210·494	4210·521
4216·340	.....	.....	....	....	.....	4216·351	
4219·527	3	·06	....	.. ..	... ...	4219·516	4219·523
4222·377	1	·05	.....	... ...	. .....	4222·382	4222·387
4224·306	.....	.....	....	.....	. .....	4224·337	
4226·866	.....	.....	.....	4226·871	.....	.....	
4227·612	6	·07	Weak line to red.	.....	.....	4227·606	4227·606
4232·621	1	·06	....	4232·604	(4232·618a) (4232·767)	... .	
4233·101	.....	.....	Hazy to red	4233·067	4233·086	.....	
4233·775	3	·06	.....	.....	.....	4233·772	4233·771
4234·162	.....	.....	.....	4234·149	4234·171Co-V	. .....	
4236·107	5	·08	Weak line to violet	4235·909	.....	4236·112	4236·118
4238·975	.....	.....	Weak edges.....	.....	.....	4238·970	4238·980
4247·561	.....	.....	"	... ...	.....	4247·591	4247·604
4250·302	6	·06	... ...	.....	.....	4250·287	4250·299
4250·957	7	·10	.. ..	.....	.....	4250·945	4250·948
4260·662	7	·12	Hazy edges.....	.. ..	....	4260·640	4260·656
4268·812	5	·08	Weak line to red.	4268·787	....	4268·915	
4271·333	5	·08	....	.....	.....	4271·325	4271·333
4271·721	3	·06	....	4271·706	....	....	
4271·919	7	·19	Resultant	.....	... .	.....	
4271·975	8	·12	.....	.....	.....	4271·934	4271·933
4277·118	3	·06	.....	4277·101	4277·147V-	....	
4282·573	4	·06	.....	.....	....	4282·565	4282·567
4284·216	2	·06	....	.....	... ...	4282·565	4282·567
4291·982	1	·05	... .	4291·978	....	.....	
4294·303	5	·08	... .	.....	. . ..	4294·301	4294·290
4296·273	1	·04	....	4296·266	....	.....	
4299·417	5	·08	Hazy edges	4299·240	.....	4299·410Ti-Fe	4299·420
4306·388	.....	.....	.....	.....	.....	.....	
4307·349	.	.....	....	.....	.....	4307·342a	
4308·080	12	·18	.. ..	....	....	4308·081	
4309·966	.....	.....	....	4309·949	.....	.....	
4315·258	2	·06	.. ..	... .	....	4315·262	4315·255

SUMMARY—*Continued.*

Mean of Corrected Wave-Lengths	Intensity.	Width in Mm.	Remarks.	Rowland and Harrison Vanadium.	Rowland Solar.		Kayser Iron.
					Vanadium.	Iron.	
4325·941	12	·18				4325·939	4325·941
4330·185	2	·06		4330·181	4330·189		
4332·995	3	·07		4332·985	4332·988		
4337·225	1	·05				4337·216	4337·218
4341·176	5	·07		4341·162	4341·167		
4353·025	5	·10	Close double. Weak line to violet	4253·040	4353·044	4352·908	4352·910
4367·941							4367·759
4376·095						4376·107	4376·104
4378·861							
4379·409	12	·19		4379·392	4379·396		
4383·720	9	·19	Weak edges			4383·720	4383·724
4384·888	9	·16	Weak edges to red	4384·875	4384·873		
4390·158	10	·16	Weak edge to red	4390·142	4390·149		
4395·407	9	·11	Weak to red.	4395·382	4395·413		
4400·744	8	·10		4400·738	4400·738		
4404·935	9	·15	Weak edges			4404·927	4404·929
4406·818	8	·10		4406·805	4406·810		
4407·811	9	·11		4407·801	4407·810	4407·871	
4408·350	7	·09		4408·368	4408·364		
4408·719	7	·17		4408·665	4408·633	4408·582	
4412·326				4412·299	4412·297		
4415·301	8	·10				4415·293	4415·301
4416·646	2	·07		4416·626	4416·636		
4420·106					4420·100		
4421·756	2	·07	Weak edge to red.	4421·739	4421·733		
4426·184	1	·06	Weak line to violet	4425·594	4426·201Ti		
4427·482	1	·05				4427·482	4427·490
4428·685	1	·06		4428·676	4428·711V—Cr		
4429·965					4429·958		
4436·312	2	·08		4436·309	4436·313		
4438·018	4	·08		4438·004	4438·006		
4441·859	4	·09		4441·847	4441·881V—		
4442·505						4442·510	4442·522
4444·382	4	·08		4444·380	4444·385*a*		
4447·896						4447·892	4447·907
4452·184	5	·10		4452·180	4452·171		
4457·642	1	·07	Weak edge to red.	4457·632	4457·600Ti-V-Zr		
4459·287						4459·301	
4459·934	3	·09		4459·918	4459·922		
4460·489	4	·12	Hazy edge to red.	4460·462	4460·462		
4462·543	3	·09		4462·533	4462·525		
4466·734	2	·07				4466·727	4466·737
4468·192				4468·174	4468·160*a*		
4468·962				1468·931	4468·914*a*		
4469·890	3	·07	Hazy to violet	4469·871	4469·873		
4474·225				4474·207	4474·213*a*		
4474·905	2	·06	Hazy edges.	4474·899	4474·912*a*		
4476·210	2	·07				4476·185	4476·207
4480·235				4480·206	4480·308		
4482·423	1	·07				4482·438	
4484·420						4484·392	4484·420
4489·109	5	·09		4489·096	4488·928!	4489·075!	
4490·996				4490·981	4490·975*a*	4490·942	
4494·745	3	·09				4494·738	4494·755
4496·237				4496·233			
4497·055				4497·574	4497·023Cr		
4502·151	1	·06	Hazy	4502·121	4502·157*a*		
4514·383				4514·357		4514·358Fe, Co	
4524·399	2	·08		4524·378	4524·378*a*		
4525·344	1	·08		4525·337		4525·314	
4528·794	5	·13	Hazy edges.	4528·168		4528·798	
4531·350	2	·07				4531·327	
4545·588	5	·10		4545·566	4545·567Cr—V	4545·568u	
4548·038						4548·024	

SUMMARY—*Concluded.*

Mean of Corrected Wave-Lengths	Intensity.	Width in Mm.	Remarks.	Rowland and Harrison Vanadium.	Rowland Solar.		Kayser Iron.
					Vanadium.	Iron.	
4549·818	1	·09	Hazy to violet....	4549·824	4549·808Ti–Co	4549·642	.....
4553·253	1	·06	.....	.....	.....	.....	.....
4556·847	....	.....	.....	.....	.....	.....	.....
4560·907	4	·10	.....	4560·893	4560·892*u*	.....	.....
4564·788	..	.....	.....	4564·756	4564·750*u*	.....	.....
4571·976	3	·09	.....	4571·959	4571·976*u*	.....	.....
4577·373	6	·11	.....	4577·348	4577·356	.....	.....
4578·919	1	·08	.....	4578·908	4578·909	.....	.....
4580·588	7	·13	.....	4580·562	4580·590	.....	.....
4504·005	.....	.....	.....	.....	.....	4584·018	.....
4586·547	8	·13	.....	4586·554	4586·552	.....	.....
4591·412	1	·08	Hazy to violet....	4591·406	4591·421*u*	.....	.....
4594·279	9	·16	.....	4594·216	4594·297	.....	.....
4600·363	.....	.....	.....	.....	.....	.....	
4603·128	1	·06	.....	.....	.....	4603·126	
4606·325	1	·07	.....	4606·321	.....	.....	
4619·870	3	·10	.....	4619·896	4619·852*u*	.....	
4635·339	1	·05	.....	4635·346	4635·352	.....	
4646·550	1	·06	.....	4646·571	4646·552*u*	.....	
4666·204	.....	.....	.....	.....	.....	.....	
4670·622	2	·07	.....	4670·666	4670·590*u*	.....	
4706·565	1	·07	.....	4706·357	.....	.....	
4707·457	.....	.....	.....	4707·629	.....	4707·457	
4710·618	.....	.....	.....	4710·746	4710·737*u*	4710·471	
4736·943	1	·07	.....	.....	.....	4736·963	
4775·268	3	·10	.....	.....	.....	.....	
4776·130	4	·10	.....	.....	.....	.....	
4781·558	2	·07	.....	4781·514	.....	.....	
4783·195	2	·08	.....	.....	4783·169*u*	.....	
4786·165	3	·10	.....	4786·706	.....	4786·145*u*	
4797·101	3	·09	.....	4797·119	.....	.....	
4807·698	2	·07	.....	4807·736	.....	4807·900	
4827·615	2	·09	Hazy.....	4827·638	4827·637	.....	
4831·809	2	·08	.....	4831·856	4831·831	.....	
4832·588	1	·08	.....	4832·617	4832·615	.....	
4833·255	1	·10	.....	4833·213	.....	.....	
4838·845	3	·10	.....	.....	.....	4838·837 Fe–Ni—Si.?	
4841·806	1	·10	.....	.....	.....	.....	
4851·642	5	·09	.....	4851·686	4851·689 Cr–V	.....	
4859·925	.....	.....	.....	.....	.....	4859·928	
4864·892	5	·10	.....	4864·943	4864·919	.....	
4871·501	7	·11	.....	4871·453	4871·512	.....	
4872·348	1	·07	Hazy.....	.....	.....	4872·332	
4875·651	7	·10	.....	4875·674	4875·671	.....	
4876·320	....	.....	.....	.....	.....	.....	
4877·963	.....	.....	.....	.....	.....	.....	
4881·726	7	·11	.....	4881·745	4881·739	.....	
4882·337	....	.....	.....	4882·359	4882·336	.....	
4890·943	1	·10	.....	4890·265	4890·948	.....	
4891·683	6	·10	.....	4891·414 4891·767	.....	4891·683	
4899·065	....	.....	.....	.....	.....	.....	
4901·698	8	·10	.....	.....	.....	.....	
4904·627	.....	.....	.....	4904·575	4904·597*u*	.....	
4906·885	8	·10	.....	.....	4906·885	.....	

u.—Unidentified in Rowland's Solar Table. In most cases it will be observed these unidentified lines correspond closely to the Vanadium lines of Rowland and Harrisons' Tables.

APPENDIX E.

PHOTOMETRIC OBSERVATIONS.

W. M. Tobey.

Photometric observations are now being made at the Dominion Observatory with a new Polarizing Photometer. This method started in September of last year. Previous to that time the wedge photometer was mainly used. By that method the image of a star was intercepted by a wedge of coloured glass and finally extinguished by movement of the wedge. Thus comparisons were made by recording 'the extinguishing points' of the star's light. This offered many difficulties to the observer, on account of the diffusion of the image at that stage, the uneven absorption of the wedge, and the fact that such observations are very trying to the eyes on account of the straining to keep in sight an object just as it is becoming invisible.

To obviate these difficulties and not to make all comparisons at the critical point of the extinguishing of the star's light, resort was made to our polarizing photometer. Its essential principle is that comparisons are made with a standard artificial star, whose light is first passed through a double image prism. By rotation of an analyser, the light of the artificial star is made to be of the same intensity as that of the real star. Hence if two different stars are compared in succession with the artificial star and if θ and θ_1 are the respective angles of rotation of the prism from the position in which the light is extinguished, we have

$\frac{I}{I_1} = \log \left(\frac{\sin^2 \theta}{\sin^2 \theta_1} \right)$ where I and I_1 are the intensities of our two stars.

Thus the intensity of one star can be found when the other is previously known. Dividing the above ratio by ·4 the logarithm of 2·512, one obtains the difference of magnitude.

The operation of this photometer being purely 'differential,' differences of magnitudes alone being observed, stars only of nearly same zenith distances are to be compared. Thus no correction for distance of a star from the zenith is necessary as in other photometers, where comparisons are generally made with Polaris directly.

The vicinity of S. Cassiopeiæ, being a field that is well determined photometrically, was used for testing. Here there are a number of stars, differing in magnitude, but situated at very nearly the same zenith distance. Thus were used:—

Star.	R. A.			Dec.	
	h.	m.	s.		
b	1	11	25	71°	52′·9
c	1	11	15	72°	20′·8
d	0	44	16	73°	00′·5
e	1	23	14	72°	21′·6
f	1	24	30	72°	23′·6

Which were paired as follows:—

	Reading of Graduated Circle.	Angle from Extinction.	Log $\sin^2\theta$.	Log $\frac{\sin^2\theta}{\sin^2\theta_1}$	Difference of Magnitude.
c	123, 268·5, 305, 88	17·9	8·9752	....	....
b	85, 127, 270, 309·5	20·3	9·0804	·1052	·26
b	302, 89, 124,269	17·0	8·9318	.....	..... .
c	272, 302, 89 2,118	14·7	8·8088	·1230	·31
b	270·2,301·5, 88·7,119	15·4	8·8484	.....	.....
c	115,272, 300·9,90	13·5	8·7364	·1120	·28
c	91,115, 298,273	12·2	8·6500	....	... .
b	272,299·2, 89·1,119	14·2	8·7794	·1294	·32
c	296·5,271, 90,116	12·7	8·6842	... .	....
d	112,92·7, 292,274	9·3	8·4170	·2672	·67
c	114, 91, 271,297	12·2	8·6500	.....	... .
d	293, 274, 111·2, 93	9·3	8·4170	·2330	·58
c	118, 89, 299, 273·5	13·6	8·7426	....	.....
f	273·8, 294·7, 90, 115·2	11·5	8·5994	·1432	·36
f	111, 93, 273·5, 292	9·1	8·3980	..... .	....
c	294 272, 90, 113	11·2	8·5766	·1786	·45

Which may be summarized:—

Star (Compared).	Determined Difference of Magnitude.	Residual.	Harvard Value.
b and *c*	·26	—03	
	·31	—02	
	·28	—01	
	·32	03	
	Mean ·29		·27
c and *d*	·67	05	
	·58	—04	
	Mean ·62		·45
c and *f*	·36	—04	
	·45	05	
	Mean ·40		·33

OBSERVATIONS IN VICINITY OF NORTH POLE.

Star.	Reading of Circle.	θ	L. $\sin^2\theta$	Log $\frac{\sin^2\theta}{\sin^2\theta_1}$	Difference of Magnitude.	V.
a	81, 135, 261, 321	28·°	9·34320	.....	.....	.....
b	300·2, 84, 121, 270	15·5	8·85380	·48942	1·23	—19
b	270, 300, 89, 117	14·5	8·79720	.....	.....	.....
a	143, 328, 78, 258	33·7	9·48834	·69114	1·73	·31
a	147, 259, 327, 76	34·7	9·51066	.....	.....	.....
b	85, 125, 270, 306	19·0	9·04528	·48538	1·21	—21
a	330·5, 150, 76, 257	37·6	9·57120	.....	.....	.....
b	273, 121, 905, 315·5	18·4	8·99840	·57280	1·43	01
b	272, 127, 89·9, 315·2	20·0	9·06810	.....	.....	.....
a	334, 73, 152, 257	39·0	9·59474	·52064	1·32	—10
a	256, 330, 75·5, 149	36·9	9·5770	.....	.....	.....
b	121, 89·3, 303, 269	16·4	8·9016	·6554	1·62	·20
				Mean	1·42	

Which is somewhat less than that (1·54) given in Harvard Annals 48.

OBSERVATIONS IN FIELD OF U ORIONIS.

Star.	Reading of Circle.	θ	Log $\sin^2\theta$	Log $\frac{\sin^2\theta}{\sin^2\theta_1}$	Difference of Magnitude.	V.
a	151, 73, 258, 334	38·5	9·5882	.....	.....	.....
b	327, 260, 77, 141	32·4	9·4572	·1320	·33	·30
f	300, 272, 90, 118	14·0	8·7674	.....	.....	.....
g	293, 270, 93, 112	12·0	8·6358	·1316	·33	·42
h	331, 252, 71, 153	40·	9·6162	.....	.....	.....
k	142, 81, 259, 328	32·5	9·4604	·1558	·39	·33
k	259, 329, 145, 79	34·	9·4952	.....	.....	.....
l	263, 323, 82, 141	30·	9·3980	·0972	·24	33

OBSERVATIONS OF *W Ursae Majoris*.

This is a short period variable.

Star.	Circle Reading.	θ	Time.	Log $\sin^2\theta$	Log $\frac{\sin^2\theta}{\sin^2\theta_1}$	Difference of Magnitude.
Var	314, 266, 85, 136	25·7	1·00 A.M.	9·2742	.....	.....
A	126, 90, 270, 302	17·0	1·03 ,,	8·9318	·3424	·86
A	301, 273, 122, 90	15·0	1·15 ,,	8·8260	.....	.....
Var	85, 129, 267, 312	23·7	1·20 ,,	9·2084	3824	·95
Var	310, 270, 87, 128	20 7	1·37 ,,	9·0968	.....	.....
A	120, 89, 303, 271	15·7	1·40 ,,	8·8646	·2322	·58
A	273, 296, 89, 118	13·5	1·55 ,,	8·7364	.....	.....
Var	132, 86, 268, 320	24·5	1·57 ,,	9·2354	·4990	1·25
Var	314, 266, 84, 136	25·0	2·17 ,,	9·2518	.....	.....
A	118, 89, 270, 303	15·0	2·20 ,,	8·8260	·4258	1·06
A	301, 271, 90, 120	15·0	2·37 ,,	8·8260	.....	.....
Var	132, 84, 266, 315	24·7	2·42 ,,	9·2420	·4160	1·04
Var	315, 267, 83, 135	25·0	3·00 ,,	9·2518	.....	.....
A	122, 90, 271, 303	16·0	3 03 ,,	8·8806	·3712	·93
A	305, 270, 90, 118	16·7	3·17 ,,	8·9168	.....	.....
Var	137, 81, 262, 317	27·5	3 22 ,,	9·3288	·4120	1·03
Var	314, 265, 83, 137	25·7	3·57 ,,	9·2742	5352	1·34
A	118, 90, 272, 299	13 7	4·00 ,,	8 7490	.....	.....
A	297, 271, 115, 90	12·7	4·17 ,,	8·6842	.....	.....
Var	137, 82, 265, 318	27·0	4·20 ,,	9·3140	·6298	1·57
Var	313, 268, 84, 127	22·0	4 40 ,,	9·1472	.....	.....
A	118, 89, 270, 298	14·2	4·43 ,,	8·7794	·3678	·92
A	302, 270, 90, 118	15·0	4·58 ,,	8·8260	.....	.....
Var	124, 87, 268, 305	18·2	5·02 ,,	9·0030	·1770	·45
Var	308, 268, 87, 125	19·7	5·10 ,,	9·0556	.....	.....
A	117, 91, 273, 301	13 5	5·12 ,,	8·7362	·3194	·80

Thus approximate minima were shown at $1^h\ 36^m$ and 5^h, while at 2^h it had regained its fullness of magnitude and held it till $4^h\ 25^m$, when a decline set in. Other observations are, of course, necessary here to complete and refine the determination of the period, &c.

A word might be said in reference to some of the peculiarities and difficulties attached to photometric observations, difficulties to which the observer is almost constantly exposed. Probably the greatest is that due to difference of colour of the two stars to be compared, for it is seldom that two stars are alike in that respect. The great majority of stars are bluish or almost white like Sirius. Against this class we have those of a yellow tint like Capella, those of a red colour like Arcturus, and some even of a deeper red hue. To compare one star of a bright green or blue colour with another which may be anywhere in the scale from that colour to deep red, offers the very greatest embarrassment, because it is impossible to make a red star identical with a blue by any mere increasing or diminishing of its brightness, and because no two observers will agree in making the measurement for comparisons, as some eyes may be peculiarly sensitive to blue light and others to red light. The experience of the writer has shown that this is even intensified, when the difference of magnitude between the two stars is increased, for the greater that difference the greater the intensity of the respective colours. And it therefore seems, that to reduce the colour effect as much as possible, it is well to use stars differing not too much in magnitude, say not greater than one-half a magnitude. In case the difference of magnitude is greater, it is well to use stars of an intermediate magnitude and so arrive at the final comparison, though such intermediate stars are not always to be obtained, especially those whose magnitudes are known with accuracy.

And then it is absolutely essential that the sky should be free from clouds and of a uniform transparency. As Parkhurst, in Researches in Stellar Photometry, says: 'A patchy sky' is the signal to stop work. For this reason many nights, which to an

observer in other lines, would prove to be good for accurate work, must be discarded on account of presence of sheets of haze or otherwise undesirable and fluffy sky. Many is the night, with its observations which have been lost in that way.

Temperature is also an important factor to be reckoned with. At low temperatures the proximity of the eye alone is sufficient to dim with frost the eye-piece, and as this dimming does not necessarily take place evenly over the surface, but rather unevenly, observations as such cannot be relied upon. Thus the eye-piece may be partly dimmed so as to affect the real star, and not affect the artificial one at all or to the same degree.

To attain good results it is also necessary to pay strict attention to some other facts, one of which is that the star to be compared and the artificial one should always be in a constant position, i.e., they should not be sometimes in a vertical, slanting or horizontal line, but always in one same position. The horizontal position seems to be the best and it is the experience of the writer that unless this is done, serious differences in the estimation of the brightness will ensue.

The work on long period variables, stars whose period may be as much as a year or a year and a half, will not be affected by the above difficulties to the same extent, for on any one night, that is favourable, a number of measurements can be taken and the mean value used, so as to eliminate those effects. But not so with some of our irregular and short period variables, some of only a few hours duration, and which necessarily demand observations of almost a continuous nature, especially near the minama where the changes are sudden. With these the most perfect of weather conditions, &c., are to be desired, so that each measurement can be taken as a standard one.

Classified, the work is to determine the photometric magnitude of all such standard stars as are necessary for the determination of variables and the determination, both in amount and period of duration, of the light variation of these different variables by observations. These observations, for long period variables, must necessarily be extended over a considerable lapse of time, while for irregular and short period variables they should be as continuous and frequent as is possible. It then becomes necessary to determine all those interesting variables of the type 'Algol,' a star whose light is periodically eclipsed by some dark revolving body and whose variation is, therefore, determined by photometric means; to determine the type of our long period variable whether of *o* Ceti or *U* Geminorum type; to determine the nature of our short period variables, whether of type δ Cephei or β Lyrae, and lastly, those whose variations are of an irregular nature.

In conclusion, I wish to express my thanks for the very kind assistance and suggestions given to me by Mr. J. S. Plaskett.

APPENDIX 3

REPORT OF THE CHIEF ASTRONOMER, 1908

MERIDIAN WORK AND TIME SERVICE

By R. M. STEWART, M.A.

CONTENTS.

ILLUSTRATIONS.

APPENDIX 3.

REPORT OF R. M. STEWART, M.A., ON MERIDIAN WORK AND TIME SERVICE

OTTAWA, March 31, 1908.

W. F. KING, Esq., B.A., LL.D.,
Chief Astronomer,
Department of the Interior,
Ottawa.

SIR,—I have the honour to report as follows on the work carried out under my charge during the past year.

As in previous years, the time service at the Observatory and the Government Buildings in the city has been kept in operation, and extensions and improvements made. The system of synchronized clocks has been extended to the Post Office, including a six-foot tower clock which is operated electrically, and which has an automatic attachment to control its own illumination. The clocks and electrical apparatus for the Printing Bureau, the Mint and the Archives have been on hand for some time, and everything is in readiness to extend the system to these buildings also, as soon as the necessary wiring shall have been completed by the Department of Public Works. A system of automatic cut-outs has been installed in the various master-clocks, by which, in case of their getting out of step on account of any derangement of the synchronization line, they will cut themselves out of synchronization, and so obviate any danger of stoppage on that score. The usual amount of observing has been done for longitude, clock error, rating of chronometers, &c.

The investigation into the errors of observation with portable transit instruments was continued and a satisfactory conclusion arrived at, so far as concerns the class of errors considered. The information gained in the inquiry will be applied to the observations in the field in the coming summer, with a view to which some necessary alterations have already been made in the micrometers of the field transits. A travelling-wire micrometer for Cooke Transit No. 1 was made in the workshop during the summer of 1907; it was modelled for the most part on those already in use on Transits Nos. 2 and 3, but contained such modifications as experience had suggested; a more detailed description is given below.

The meridian circle arrived about the end of October, and was mounted a short time later. Some transit observations were made under difficulties in the early part of the winter, but, owing probably to an accident in shipment, no use could be made of the vertical circles, which were accordingly returned to the makers for repairs. Later it developed that the piers on which the instrument was mounted were unstable, which will, unfortunately, necessitate their complete reconstruction. Work on the opening mechanism for the roof shutters, and the reconstruction of the vertical wall-shutters, is in progress, but it will probably be some months before the instrument can be got ready for service.

I wish to acknowledge my indebtedness to Mr. D. B. Nugent for assistance in preparing the tables for this report, and to Mr. C. C. Smith for preparing the drawings and for considerable assistance in checking the computations.

SECTION I.

TIME SERVICE.

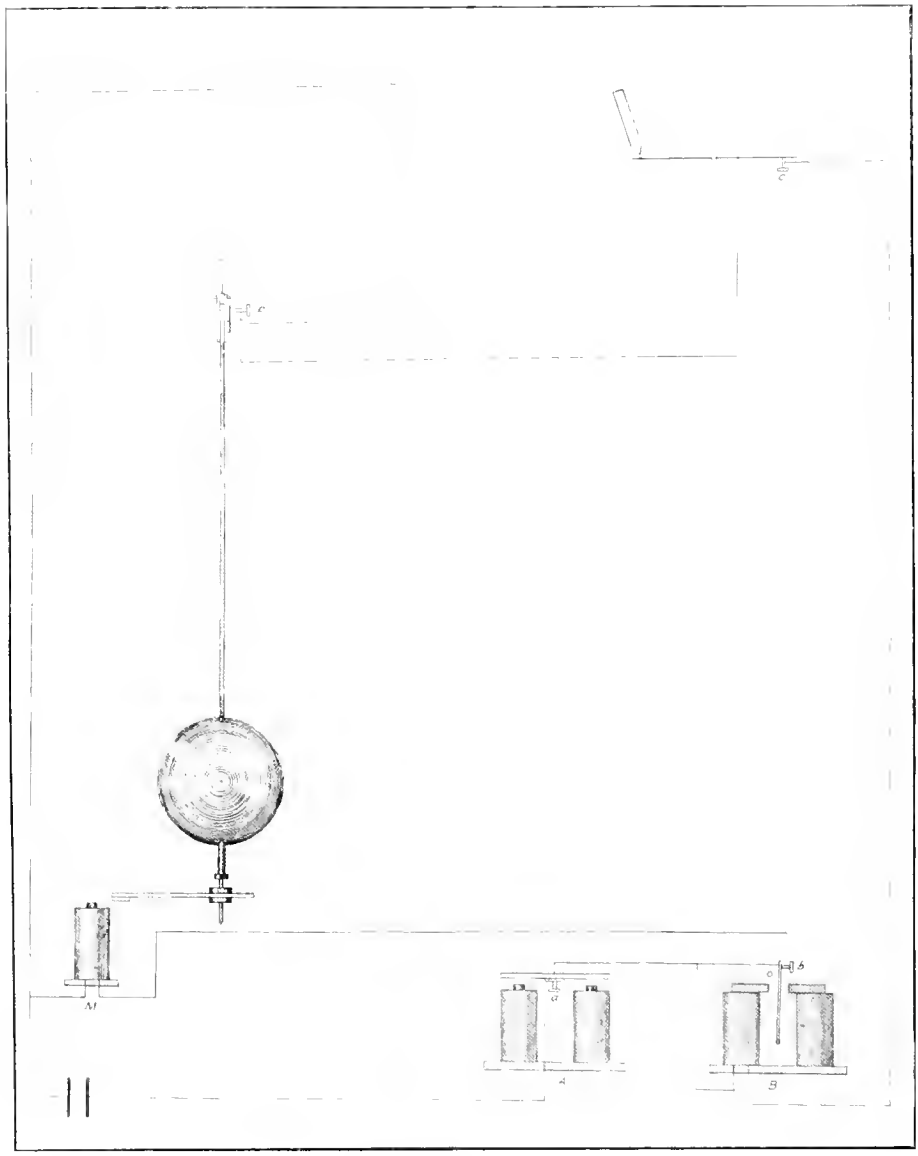
Reference was made in my last report to the proposed extension of the time service to the city Post Office, the Printing Bureau, the Mint and the Archives Building. The ownership of all the dials and electrical apparatus of the time service (with the exception of that in the Observatory itself) is vested in the Department of Public Works. For the sake of convenience, however, all the apparatus is ordered by the Chief Astronomer, after approval by the Department of Public Works; the electrical work, wiring, &c., is performed by the latter. After the work of installation is completed, the clocks are taken charge of by the Observatory, which becomes responsible for the attention necessary to their correct running.

The wiring in the Post Office was completed August 14, 1907, and on August 16 at noon the dials were started; the master-clock had been set up some time previously for the regulation of its rate; it was not put into synchronization until some little time later, when connection by wire with the Observatory was obtained. The movement of the tower clock was started on August 15, as soon as the storage battery had been charged, but the hands were left disconnected until August 24, the intervening period being taken up with testing and adjustment.

This Tower Clock is of the same essential type as the one at the Observatory, with a few improvements and modifications. The dial is six feet in diameter, in five sections of ground glass, retained in place by an iron frame-work in two sections, of which the hour and minute marks are an integral part. The hour marks instead of consisting as ordinarily of the Roman numerals, are single radial lines, thus taking up less space and enabling the time to be read at a greater distance. The illumination is arranged by a white enamelled reflecting-board the same size as the dial, and situated about a foot behind it; the light is thrown upon it from six 16 c. p. incandescent lamps arranged in a circle around its edge with suitable reflectors. The movement is driven by a small motor whose circuit is closed every minute by the master-clock; when the hands have been advanced the space of a minute the motor is automatically disconnected from the movement, and at the same time the circuit driving it is broken; the whole operation occupies perhaps half a second. The movement is connected to the hands by a driving shaft and universal joints.

To make the clock complete it seemed desirable to have an automatic switch for turning on the illumination in the evening and off in the morning. Time-switches are, of course, a commercial article, but on the suggestion of Dr. King, the much better plan was adopted of having the switch controlled by the clock itself. It was made and fitted to the clock in the Observatory work-shop, and has given absolute satisfaction. The 'switch' consists of two horizontal drop-levers operated by adjustable stops on a twenty-four-hour wheel which was added for the purpose. The upper lever is dropped in the evening by one of the stops, thereby making circuit with the lower lever through a carbon contact; in the morning the lower lever is dropped by the second stop and breaks the circuit; during the day the switch is again set by a pin on the twenty-four-hour wheel, which raises both levers simultaneously. By means of graduations on the wheel the stops can readily be set independently with considerable accuracy, so that the times at which the switch operates can be controlled within a few minutes.

About the time of the starting of the dials in the Post Office a request was received from the Ottawa Electric Company for permission to connect a clock to one of the government circuits. This privilege was granted them on condition of their extending the circuit to include the two dials in the Thistle Building on Wellington street, which had formerly been operated from the Langevin Block. The wires connecting the latter buildings consisted of too long a span for proper working, and in addition they passed over private property intermediate; consequently, it was con-



25a—p. 276.

FIG. 1 Synchronization Cut-out.

sidered better to operate the dials from the Post Office. The Ottawa Electric Company acceded to the condition and had the necessary wires erected; the circuit was then connected to the time service switch-board in the Post Office. The dial, a two-foot illuminated one, is situated outside the company's offices on Sparks street, together with an illuminated sign bearing the legend 'Dominion Observatory Time.'

The apparatus for the installation in the Printing Bureau, the Mint and the Archives Building was ordered in the beginning of February, 1907, and had all been received early in May. The dials in the Mint and the Archives Building were to be operated from the Printing Bureau, where the master-clock and switch-room were to be located, the former buildings being connected by wire with the latter. The wiring has, I understand, already been completed in the Mint and Archives Building. There still remains the equipment of the switch-room, the wiring in the Printing Bureau, and the placing of the clocks in position in all three buildings, as well as the erection of the connecting wires. As soon as this has been completed by the Public Works Department the system can be put in operation.

As mentioned in a previous report, the wires running from the Observatory to the buildings in the city, for synchronizing the secondary master-clocks, are rented from the Bell Telephone Company. There has frequently been temporary trouble on these wires, due, no doubt, in a great measure to the fact that, running as they do in cables with many other wires, and passing through the racks in the company's exchange, they are liable to be involved in inadvertent derangement by the constant repairs and alterations inseparable from a telephone system. It has been mentioned that with the system of synchronization in use no harm can result from the *opening* of the controlling circuit, as the synchronized master-clocks will in that case continue to run independently, though with less accuracy; but if it be *closed* without due precautions, if the phase-difference between the synchronizing and the synchronized clocks is excessive, there is a risk of stoppage of the latter. Hence a temporary derangement of the synchronizing line is a more fruitful cause of trouble than a permanent one, and is one of the principal contingencies to be guarded against. In the past, eternal vigilance has been the price of safety, and in spite of all precautions the inevitable has occasionally happened. As it was not practicable to establish an independent line, the only alternative was to instal a safety cut-out in connection with each master-clock, so that if for any reason it got too far out of step with the synchronizing current, it would automatically cut itself out of connection with the latter, and run independently until the proper conditions were restored. The cut-out arrangement consists of the pendulum-contact p (Fig. 1), in series with which and the points of the synchronization relay A is included a neutrally adjusted polar relay B; the local synchronization current passes in series through the points of the relays A and B and the synchronizing magnet M. Normally, during the alternate seconds while the synchronization current flows, the pendulum is performing that part of its swing which lies to the left of the vertical; if for any reason it gets sufficiently out of step that p and a are closed simultaneously, a circuit through B is established which opens the local synchronization circuit at b; since B is neutrally adjusted, it will remain open until closed again by hand. The auxiliary contact c, operated by the escapement, which is open for the first second of every minute, was made necessary by the fact that the synchronization current remains closed for three seconds at the even minute; otherwise the cut-out would act every minute, even when the clock was in step; the three-second interval in the synchronization current is for convenience in checking the coincidence of the master-clocks with the Mean Time Primary, and is also required for the proper operation of the check-dial at the Observatory. The contacts for the five master-clocks were made in the Observatory workshop, and they were installed, the first by Mr. Nugent and myself, the others by Mr. Nugent and Mr. Robertson. Their working has been quite satisfactory.

As in the past, the time has been supplied by telegraph every day to the Great North Western Telegraph Company, and by telephone to any parties requiring it.

A record was kept during the month of January of the number of requests for time by telephone, the accuracy desired varying from the simple hour and minute to the transmission of the actual clock-beats in the way described in my last report. The total number of calls during the month was 153, the maximum for any one day being 11. There were 8 requests for sidereal time, and 14 for the beats of the mean time clock. On one or two occasions during the year these beats have been sent over the long-distance line.

In the course of the longitude operations during the summer of 1907 it became necessary to arrange a circuit for recording the beats of the old Borrel master-clock on the chronograph, which involved the installation of a suitable contact. The type of contact required was the usual one for chronographic registration—that is, it was required to break circuit every alternate second, omitting the 58th. These contacts are usually operated by the escapement, but in this case the beats of the clock were not entirely uniform throughout the minute, the escapement being of the pin-wheel type, which is particularly liable to this defect. It was necessary, therefore, to operate the contact by the pendulum; for this purpose a simple but efficient contrivance was adopted, which may be worth describing. The contact was situated about one-quarter way down the pendulum from its point of support; a sketch showing it as viewed from behind is shown in Fig. 2. The block *b* and the contact

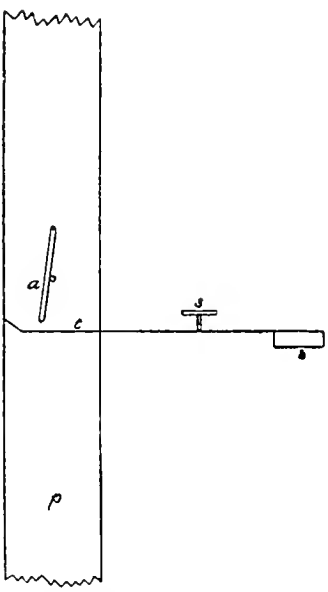


Fig. 2—Pendulum Contact.

screw *s* are attached to the back of the clock-case; *t* is a very light spring attached to *b*, and terminating at its free end with a slight upward bend. Attached to the pendulum rod *p* is a light arm *a*, pivoted to swing freely about a point near its upper extremity, and resting against a stop at one side. As the pendulum swings to the left *a* engages with the point of *t*, depressing it so as to break the circuit at *s;* on the swing to the right *a* is lifted clear of its stop and does not depress *t*. The omission of the break at the 58th second is managed by a wheel connected to the escapement, which short-circuits the contact from the 57th to the 59th second. In order not to affect the going of the clock the whole contact, especially the spring *t*, must be of very light construction.

After a prolonged delay, a considerable part of which was due to the fact that the consignment went astray in shipment, the seconds-dials for use in the Observatory have at last been received. Three of them will be operated by the sidereal master-clock, one in the equatorial room, one in the transit room and one in the meridian circle room; the remaining four will be operated by the mean time signal clock, being distributed through different rooms in the building. Already two of them (one sidereal and one mean time) have been mounted in the equatorial room; only the sidereal one is as yet in operation. They are operated by a reversal of the current every second, and are very satisfactory in their working; they have a resistance of about 160 ohms each, and can be operated in parallel by a battery of four volts.

During February and March a test was made of the eight-box chronometers belonging to the Observatory, which are used for the field work. No chronometer room has as yet been fitted up at the Observatory, so that the temperature could not be controlled very satisfactorily, nor could as large a range be obtained as was desired. The chronometers were placed in the pendulum room, and connected by wire with the time room, where the comparisons were made daily with the sidereal clock by chronograph. The temperatures obtainable were practically restricted to two, according as the steam coils in the room were opened or closed; in field work the temperatures experienced are very much more varied, ranging from below freezing point to sometimes 95° or 100° F, a considerable proportion of this range being occasionally covered within a single day.

During the course of the test the chronometers were tested for magnetic polarity by turning through an angle of 90°; in only one case (Dent 52865) was there a marked change in rate during this period, and even in this case the change was much less than occurred during other portions of the test. During one period of 48 hours comparisons were made every 2 hours, to determine whether there was any change of rate depending on time elapsed since winding; no such change was noticeable in any case. The running of the chronometers on a 48 hour winding was also tested in a similar way, but these rates were not used in working out the trial numbers. The trial numbers are intended as an indication of relative accuracy, the chronometer giving the smaller trial number being in general the more accurate. The particular way in which the different mean variations given by the test are combined to form the trial number is of course merely arbitrary, and if two chronometers have trial numbers nearly equal it does not necessarily follow that the trial numbers are an exact guide. They have been formed in the present instance as follows: In the column 'Mean periodic variation' (Table I) is given the average difference (without regard to sign) between the mean rate for the whole test and that for each of the periods given; to this is added the average of the mean daily variations for the different periods, and the mean variation for two hours as given in the ninth column. This sum is taken as the trial number.

TABLE I.—TESTS OF CHRONOMETERS.

Chronometer.	Feb. 14–Feb. 21		Feb. 23–Mar. 1		Mar. 4–Mar. 11		Mar. 9–Mar. 11		Mar. 11–Mar. 15		Mar. 15–Mar. 19		Mar. 19–Mar. 27		Feb. 14–Mar. 19		
	Mean daily rate.	Mean variation.	Mean daily rate.	Mean variation.	Mean daily rate.	Mean variation.	Mean rate for two hours.	Mean variation.	Mean daily rate.	Mean variation.	Mean daily rate.	Mean variation.	Mean daily rate.	Mean variation.	Mean daily rate.	Mean periodic variation.	Trial Number.
Bond 511*	2·26	·08	2 07	·11	2·33	·08	·19	·02	2 25	·19	2·43	·04	2·33,	2 32	·10,	·21	2 24	·10	·32
Bond 593	·26	·22	78	·16	·47	·14	·03	·02	·34	·16	44	·10	·33,	·59	11,	·12	37	·25	·43
Bond 516	2·60	·18	3 08	·24	2·45	·10	·20	·01	2 31	·16	2 29	·13	1·96,	1·86	15,	·13	2 63	·26	·43
Dent 48419	·37	·60	·25	·12	·31	·11	·02	·04	·20	·48	·05	·07	·50,	1 19	07,	·09	·08	·22	·54
Negus 2088	·55	·12	2·10	·04	1 01	·08	·07	·01	·91	·05	·94	·18	·81,	·69	11,	·06	1·19	·45	·55
Dent 52866	4 07	·23	2 74	·24	3 16	·11	·28	·02	3 68	·19	3·42	·12	3 27,	2 91	17,	·07	3·37	·38	·58
Dent 52865	2 71	·54	1 14	·57	·37	·40	·06	·05	1 06	·06	·18	·40	·35,	·75	37,	·12	·85	1·32	1 76
Hadlock 4082	1 31	·68	4·15	·83	1·37	·44	·12	·02	1 55	·21	2 25	·86	2 39,	2 62	66,	·75	·03	2 11	2·73
Mean Temp.	59		84°		61		60		59		58		55						
Max. "	61		90		63		62		60		60		57°						
Min. "	57		77		58		58		58°		56		53°						

* Mean time Chronometer.

March 9–March 11.—Comparisons made every two hours.

March 11–March 15.—Chronometers turned through a right angle to test for magnetic polarity.

March 15–March 19.—Chronometers replaced in original position.

March 19–March 27.—Chronometers wound only on alternate days. The two rates are the means respectively of the rates for the first and for the second 24 hours.

February 14–March 19.—These columns contain the mean rates and mean variations for the whole period up to March 19.

Trial number.—This is the sum of three quantities: (1) the mean variation in the second last column; (2) the mean of columns 3, 5, 7, 11, 13; (3) the mean variation in column 9.

SECTION II.

REPAIRS AND ALTERATIONS TO FIELD INSTRUMENTS.

During the summer of 1907 a travelling-wire micrometer, or transit micrometer, was made in the workshop and fitted to Cooke Transit No. 1. It was modelled for the most part, with a few alterations, on the Saegmuller micrometers already in use on Transits No. 2 and No. 3. The general type of construction of transit micrometers is now becoming so well known that it is unnecessary to describe it here in detail.* The spider lines, two parallel and one perpendicular to the micrometer screw, are attached to a slide which is moved by the screw; on the head of the latter are fixed several contact strips which make contact with a spring as the screw is turned, thus furnishing the records on the chronograph. A spiral thread of a few turns which is also attached to the micrometer head operates a small graduated wheel for counting the number of revolutions; attached to this is a flange with a notch of a length corresponding to four revolutions of the screw, which operates a cut-out lever so that only the record of those four revolutions reaches the chronograph. The adjustment for collimation is made by a dove-tailed slide supporting the whole micrometer box; another slide at right angles to this is also provided, while the whole micrometer is arranged to turn between stops through an angle of 90° in order that it may also be used for measuring differences of zenith distance. The eye-piece is mounted on an independent slide whose motion is controlled by a separate screw. The micrometer is driven through a gear wheel by a pair of driving-heads worked by both hands, one revolution of the driving-heads corresponding to two revolutions of the micrometer.

In the usual type the cut-out is so arranged that the record is made by the four turns in the centre of the field; in this instance, however, for reasons described below (see Section IV), it was desired to record every alternate four revolutions throughout the field. It was also decided to have the eye-piece slide driven at the same speed as the micrometer wire, so that while observing the wire would appear stationary in the middle of the field. It seemed likely that in this way there would be less danger of systematic error due to apparent motion of the star and wire across the field. An auxiliary adjustment was also provided by which the eye-piece could be moved independently by hand as before.

As a matter of fact, the micrometer is yet unfinished in many details. At the time of making, it was desired for several reasons to get it into commission as soon as possible, and for this reason all non-essentials, such as polishing, lacquering, and even the careful finishing up of some of the merely auxiliary parts, such as the eye-piece slide, &c., were dispensed with, and the instrument pressed into service as soon as it was in a condition to do efficient work. It had been hoped to have it ready for work by the beginning of September, but for some reasons into which it is not necessary to enter here, it was delayed for a full month, being used for the first time on the first of October. On account of pressure of work in the machine shop it has been left in the same condition up to the present; it is hoped, however, to have it completed in the near future.

The operation of the instrument will be readily understood from Fig. 3, which is reproduced from a photograph. The micrometer screw, rigidly attached to the micrometer head *a*, is operated by the large gear wheel mounted on the shaft of the driving heads *bb;* near the other end of the same shaft is a small gear-wheel meshing into the wheel *c*, the gear-ratios being so arranged that *c* makes one revolution for every eight of the micrometer screw. Extending half-way around *c*, near its outer edge, is a flange which engages with the lever *d;* the other end of this lever, on which is an insulating knob, operates the spring *e*, lifting it off the contact screw *f* (mounted

* For a more detailed description see Report of the Chief Astronomer for 1905. Appendix 2, by Otto J. Klotz.

on an ebonite block) when *d* engages with the flange on *c*. The circuit is thus closed through *e f* during every alternate four revolutions of the micrometer screw. One end of the observing circuit is led to *f*, and, providing *e f* is closed, it is continued thence through the wire *g* to the platinum-tipped contact brush *h;* this brush, as the screw is rotated, makes contact with five platinum strips let into the ebonite head *i;* these strips are connected to the body of the micrometer box and so to the telescope, which forms the return circuit. The eye-piece slide *l* is moved by the screw *m*, which is operated from the small wheel attached to *c;* the pitch of the screw is sixteen turns per inch, and the gear-ratios are so adjusted that the rate of motion of the eye-piece is the same as that of the carriage driven by the micrometer screw, which carries the spider lines. An independent motion of the eye-piece slide is also provided by means of a rack and pinion which moves the nut *n* with relation to the slide *l*. A screw adjustment for focussing the eye-piece was also provided; the tube into which the eye-piece slides is made in two sections, one of which screws into the other; after adjustment of the focus has been once made the maintenance of their relative positions is insured by a lock-nut; the necessity is thus avoided of refocussing every time the diagonal eye-piece is turned from one side of the instrument to the other. In the usual type of micrometer there is a comb with five teeth in the field of view, which marks the four revolutions of the screw which correspond to the centre of the field. This was replaced by a comb in four sections, each of which was similar to the above; the four sections were set symmetrically with respect to the centre of the field, and the cut-out arrangement so adjusted that the record on the chronograph was made while the spider-thread was passing over the several sections of the comb.

In other respects the micrometer is practically identical with those on Transits No. 2 and No. 3. The original cut-out (corresponding to four revolutions of the screw) was not omitted, as at that time it was a question whether the contemplated methods of observation which made the new one necessary would prove practicable, and it was not certain which would finally be used. The micrometer screw has a pitch of 120 turns to the inch; the thread was first cut as carefully as possible in the lathe, and the periodical and other errors eliminated by prolonged grinding in suitable nuts, first with fine emery and at the last with rouge.

The Y's of Cooke I, for the support of the axis, formerly consisted each of two cylindrical segments, so that each bearing surface extended through an arc of about 45° around the circumference of the pivot, and over a space of nearly an inch longitudinally. This form, a very undesirable one, was altered so as to conform to the recognized pattern. A section through the Y by a plane perpendicular to the axis now consists of two segments of straight lines perpendicular to each other, and each inclined 45° to the horizon; a section by a plane passing through the axis and perpendicular to one of the above lines is a curved line very slightly convex towards the axis. This constitutes the nearest practicable approach to the ideal 'two-point' bearing.

This transit has never been used as a zenith telescope, being always reserved as the home instrument in longitude operations. As soon, however, as the Meridian Circle is available for regular observations, Cooke I will be freed for field work, which makes necessary some further alterations for its adaptation as a zenith telescope. These are to be made in the near future, and consist of the addition of a mounting for a latitude level, and the installation of new slow-motion zenith-distance tangent screws, the ones now in place being too coarse for fine adjustments. At the same time it is proposed to raise the standards so that the instrument may be transited eye-end down, which is at present impossible.

After a thorough test of the new micrometer it was recommended to Dr. King, for reasons given in Section IV of this report, and approved by him, that the cut-outs on the micrometers of the two other transits should be altered so as to conform to the principle embodied in the new one. In these micrometers no provision is made for

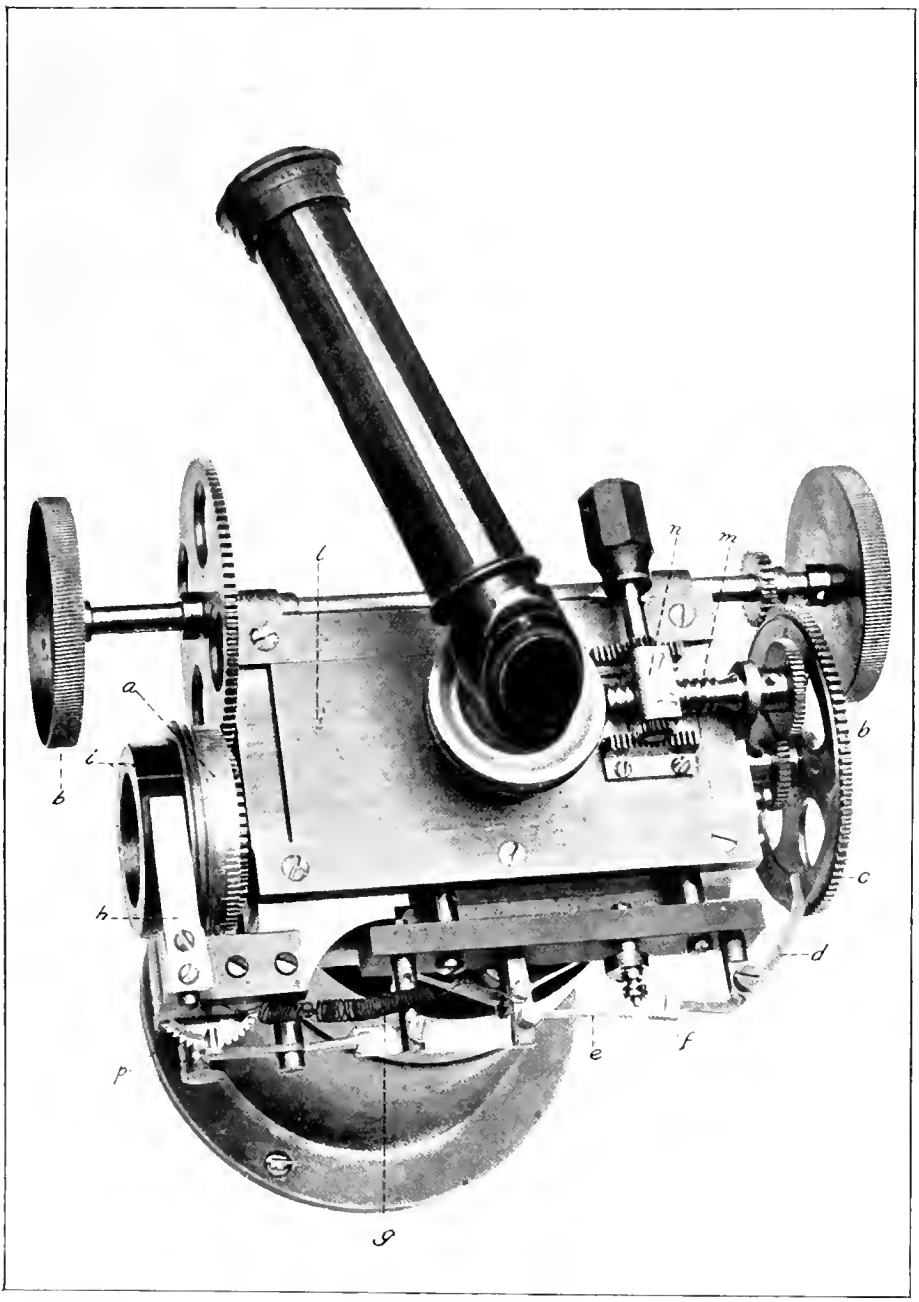


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Fig. 3.—Transit Micrometer.

the motion of the eye-piece with the spider-line carriage, only the independent movement being provided; consequently, the wheel *c* is lacking. As the introduction of this wheel would have necessitated further alterations which were rather inconvenient, it was decided to dispense with the driving of the eye-piece slide, and to attempt to provide for the increased number of records on the chronograph by a simple alteration of the existing arrangement. The flange attached to the small counter-wheel (*p*, Fig. 3) was removed, and a new one containing four notches made to replace it. It was feared at first that owing to the smallness of the flange and the necessity for having the notches exactly the correct width and at the correct interval, this might be difficult to accomplish; however, after several attempts it was successfully done. The number of notches was limited to four, because it had been found that a larger number of records would never be required. New combs were also made, similar to the one in Transit No. 1. These combs being extremely minute (the distances between contiguous teeth being in one case $\frac{1}{120}$-inch, in the other $\frac{1}{130}$-inch) were difficult to make without special appliances, and a very neat method was suggested by Mr. Mackey, our ingenious mechanician. The thin strip of brass from which the comb was to be made was inserted in a slot in a cylindrical rod and the whole hammered well together; it was then inserted in the lathe, turned down till the whole was an apparently homogeneous piece, and a thread of the proper pitch cut; to cut out the spaces between the sections of the comb the lathe-carriage was moved along the ways by the driving screw to the proper position, disconnected from the latter and a cut of the proper depth taken; it was then connected again to the driving screw, moved along the proper distance (eight revolutions) and another cut taken, this process being repeated the required number of times. On releasing the brass strip from the slot in which it had been held, the finished comb dropped out.

The chronographs used in the field operations are of the small Fauth (now Bausch and Lomb) type. The governors are driven by a spiral gear, consisting of a thread of low pitch cut on the shaft of the governors, which engages with a gear wheel in the train. This has always proved more or less unsatisfactory, and last summer one in particular of the chronographs absolutely refused to work. The spiral gear was taken out, an extra wheel inserted in the train, and a bevel gear introduced to drive the governor-shaft. This has worked so well that it has been decided to make the same alteration in the other chronographs; work on this is now in progress.

SECTION III.

THE MERIDIAN CIRCLE.

The Meridian Circle, for which an order had been placed some years ago with Messrs. Troughton and Simms, was received on October 28 last, and the work of setting up and adjusting was immediately proceeded with. The telescope is of six inches aperture and about seven feet focal length; the field contains six fixed vertical threads and two horizontal ones, in addition to the movable micrometer threads; the right ascension micrometer is supplied with the Repsold automatic registering device. The field illumination is provided for by an annular reflector in the axis; bright wire illumination is effected by four small electric lamps inside the tube near the eye-end. There are two circles, each graduated to every five minutes, one being fixed in position on the axis, the other movable. They are read by four microscopes each, two pointer-microscopes (one for each circle) being also provided for reading to the nearest five-minute division. There is an end-thrust bearing at each end of the axis, one being fixed, while the other is tightened by two nuts pressing against coil springs; this ensures the constancy of the position of the telescope with respect to the standards, so that the division marks may always be in focus in the reading-microscopes. There are two collimating telescopes, each of four inches aperture and about four and a half feet focal length. For reversing the telescope a reversing carriage is provided, which runs on rails laid between the piers. The level is read by nadir observations

on a circular mercury trough with the usual type of collimating eye-piece; there is also another mercury trough mounted on wheels, for observation of stars by reflection. In addition, the usual complement is provided of extra eye-pieces, apparatus for testing pivot errors, &c.

The piers for the support of the instrument and collimators had been built previously; they all rise from the level of the foundation walls of the building. The two instrument piers are supported by a single base which terminates about 18 inches below the level of the floor. On attempting to mount the instrument it was found that owing to the height of the reversing carriage the piers were considerably too low. After this had been remedied the instrument was mounted and got in approximate adjustment about the beginning of December. After the adjustment it was discovered that the piers were not altogether free from the concrete floor, a certain amount of soft concrete having apparently become lodged in the spaces and hardened there; after this had been cut away it was found that the level error had changed from about 3 seconds of arc to about 12 seconds. Further adjustment, however, was postponed until later, and the level error remained about this value for some time.

On putting the reading microscopes into position and attempting to adjust them it was immediately apparent that there was some defect in the circles, as the microscopes when focussed for one zenith distance did not remain in focus as the telescope was revolved. This might have been due to any one of three causes: (1) a lack of trueness in the fixed end-thrust bearing, causing a slight motion east and west of the telescope as a whole when revolved; (2) a lack of perpendicularity between the plane of the circles and the axis of the telescope; (3) a deviation of the circles themselves from the true plane form.

To test the first hypothesis, which, however, seemed unlikely in itself, one of the microscopes was mounted so as to view longitudinally the centre of one end of the axis, and the telescope was revolved. As the stationary point in the axis remained truly in focus during the whole revolution, the possibility of the first cause was eliminated. The next step was to determine the deviation of the graduation bands of the circles, around their whole circumference, from a true plane at right angles to the axis of rotation. For this purpose one of the western microscopes was removed from its mounting, and replaced by two cylindrical brass bearings; in these a steel rod was arranged to slide so that one end could readily and surely be brought into contact with the silver strip on which the graduations were ruled. The microscope which had been removed was mounted with its line of sight perpendicular to the steel rod, upon which was engraved a mark to be viewed by it. To test the circles, each required point was brought opposite the rod, which was then brought into contact with the circle, and the micrometer of the microscope set on the engraved mark. This was first done for every 20° around the fixed circle; the telescope was then reversed and the same process repeated with the movable circle. A microscope was then dismounted from the eastern pier and similar measurements taken from that point on both circles, the division marks set on in this instance being intermediate to those tested previously. Finally the value of one turn of the micrometer was determined (about ·134 mm.), and the displacements from the mean plane reduced to millimetres. These displacements are shown in tabular form in Table II, and graphically in Fig. 4, in which the ordinates, representing the displacements, are magnified 25 times. The smoothness of these curves, as well as the interagreement of the series of readings in Clamp West and Clamp East for both circles, indicate the delicacy of this method of measurement.

It was now evident that the trouble lay in a distortion of both circles, and, from the existence of two maxima and two minima and their relative positions, that the distortion consisted in a simple bend along a line passing nearly, but not quite, through the centre of each circle. As the relative position of the two circles in the packing box had not been noted at the time of unpacking, it was not known whether these lines had coincided at that time; it appeared likely, however, that the damage had been caused by rough handling in shipment.

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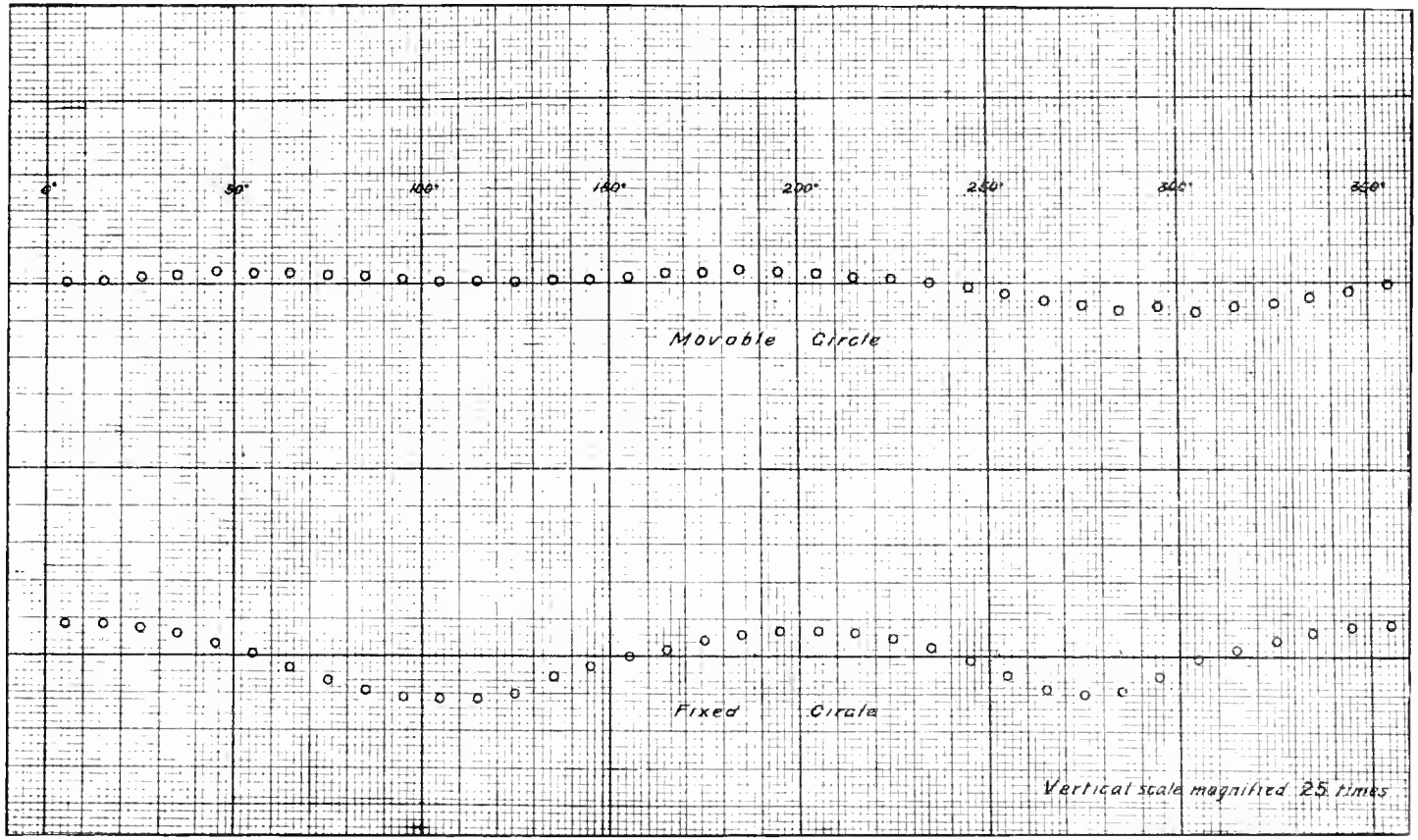

FIG. 4.—Errors of graduated circles.

The above facts were communicated to Messrs. Troughton and Simms, who decided that it would be necessary only to return them the circles, together with a pair of microscopes for testing. They were accordingly shipped on January 16, and are still in the makers' hands.

The weather during December and the early part of January was very poor astronomically, but as often as possible observations were taken for the purpose of testing the instrument; as the circles were useless the observations were, of course, mainly confined to transits. The right ascension micrometer was found not to work very satisfactorily, but was improved by cleaning and by the insertion of a stronger spring; some minor adjustments were also found necessary. Such observations as were made were carried on under considerable difficulty, as the electric wiring for the meridian circle room has not yet been done. A pair of wires was strung temporarily from the time room to afford connection with the chronograph; another pair led to a single electric light; this, together with an oil lantern, furnished the only means of illumination for telescope field, collimators, nadir eye-piece, setting circles, &c. The specifications for the wiring have been in the hands of the Public Works Department for about a year, but nothing has been done as yet. It was necessary also to open and close the roof-shutters by hand, as the opening mechanism had not been provided. Work on the latter was begun early in January, and as the necessary scaffolding interfered with the sky-view, the use of the instrument had then to be discontinued.

The roof-shutters in the meridian circle room consist of nine sections; the two openings in the transit room are closed by shutters of six sections each. When the opening mechanism was being planned it was considered best to join these sections in groups of three, giving three independent shutters in the meridian circle room, and two for each opening in the transit room. The shutters will be controlled by counterpoised levers which can be operated by a winch on the wall. The mechanism for the middle shutter in the meridian circle room has been installed, and works satisfactorily. The original iron wall-shutters, six in all, have proved to be entirely useless, both because they do not exclude the snow and rain, and because they have become in some cases so warped that they will not open and close. One of them has been experimentally replaced by a wooden shutter which gives promise of satisfactory working. There are also many other details in the building which require alterations and repairs; it is hoped that work will be pushed on them during the coming summer.

When the scaffolding had been removed from the meridian circle room after the erection of the shutter mechanism, the instrument was overhauled and got ready for work. It was speedily discovered, however, that a decided shifting of the piers had taken place; the level error, which had previously been about 12 seconds of arc, had now increased to over three minutes; on examination the shifting was apparent to the eye in the uneven spacing between the piers and the floor on opposite sides, which had before been fairly uniform. The collimation axes of the collimators were also out of line by several minutes of arc, both in altitude and azimuth, showing a relative displacement of their piers. The main instrument piers had been tilted towards the west, that of the north collimator towards the north, while the shifting of the south collimator was not so evident, though no doubt considerable. It had been discovered a day or two previously that the two instrument piers and the two collimator piers in the transit room had been fractured in the basement; this was evidently due to upheaval of the bases, resulting in a lateral pressure against the concrete floor above; the latter, being reinforced by steel girders, had withstood the strain, and the piers had given way. The cause of the upheaval was traced to the action of frost; the meridian circle piers had apparently been saved from absolute fracture by the fact that they were surrounded to a certain height by loose earth; the floor of the basement of the transit room was, on the other hand, of concrete. It will be necessary to reconstruct all seven piers, sinking their bases several feet further into the earth, to guard against a repetition of the upheaval. The approximate level error of the meridian circle is shown in Table III for a number of dates throughout the winter.

It is proposed during the coming summer to erect piers for azimuth marks north and south of the meridian circle. The primary marks will be fixed underground for stability, while on the piers will be movable marks, which can be set vertically over the underground ones by a process similar to that used at the Royal Observatory, Cape of Good Hope. This, it is hoped, will furnish marks whose absolute stability can be relied on for considerable intervals, if not permanently. The collimating lenses for these marks, situated within the building, will also be movable, for adjustment over similar marks.

An observing couch has been designed, and the order has been placed for its construction. It will run on the same rails as the reversing carriage, and will comprise mechanism for quick setting in any desired position, combined with a slow motion for the final adjustment.

A detailed description of the meridian circle, with all its accessories, is reserved until the equipment is completed, as a considerable part of the apparatus is as yet not installed, and in some cases indeed not yet definitely planned.

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TABLE II.—ERRORS OF GRADUATED CIRCLES.

Division Mark.	Displacement.			
	Movable Circle.		Fixed Circle.	
	Clamp W.	Clamp E.	Clamp W.	Clamp E.
5	·01 mm.		·17 mm.	
15		·02 mm.		·17 mm.
25	·05 mm.		·15 mm.	
35		·06 mm.		·12 mm.
45	·08 mm.		·07 mm.	
55		·07 mm.		·01 mm.
65	·07 mm.		—·06 mm.	
75		·06 mm.		—·12 mm.
85	·05 mm.		—·18 mm.	
95		·03 mm.		—·22 mm.
105	·01 mm.		—·23 mm.	
115		·01 mm.		—·23 mm.
125	·01 mm.		—·16 mm.	
135		·02 mm.		—·10 mm.
145	·02 mm.		—·05 mm.	
155		·04 mm.		·00 mm.
165	·06 mm.		·04 mm.	
175		·07 mm.		·09 mm.
185	·08 mm.		·12 mm.	
195		·07 mm.		·14 mm.
205	·06 mm.		·14 mm.	
215		·04 mm.		·13 mm.
225	·03 mm.		·10 mm.	
235		·00 mm.		·05 mm.
245	—·02 mm.		—·02 mm.	
255		—·05 mm.		—·09 mm.
265	—·08 mm.		—·17 mm.	
275		—·11 mm.		—·20 mm.
285	—·14 mm.		—·18 mm.	
295		—·12 mm.		—·10 mm.
305	—·15 mm.		—·02 mm.	
315		—·12 mm.		·04 mm.
325	—·10 mm.		·09 mm.	
335		—·07 mm.		·14 mm.
345	—·04 mm.		·16 mm.	
355		—·01 mm.		·17 mm.

TABLE III.—LEVEL ERROR OF MERIDIAN CIRCLE.

Date.	Level Error.	Date.	Level Error.
December 12	— 3·6″	January 5	—11·3″
" 13	— 3·4″	" 9	— 9·0″
" 19	— 2·6″	February 22	—3′ 19″
" 21	—12·4″	March 8	—5′ 17″
" 26	—10·4″	" 14	—5′ 39″
" 28	—11·6″	" 22	—5′ 41″
January 3	—11·3″	" 30	—5′ 50″

SECTION IV.

ERRORS OF TRANSIT OBSERVATIONS.

An account was given in my last report of a series of observations undertaken as a comparison of the relative accuracy of transits with the key and with the transit micrometer. The comparison was based on an investigation of the discrepancies occurring between successive time determinations made on the same night by the same observer with the same instrument; it showed that after allowing for the systematic personal equation of the key observations, there was, as regards accuracy, very little to choose between the two methods of observation, and that consequently the ordinary explanation of these discrepancies (by the assumption of rapid fluctuations of personal equation) is probably in error, since presumably these fluctuations, if existent at all in micrometer observations, would be very much reduced, as is the personal equation itself. These conclusions were supported by the examination of such other micrometer observations at the Observatory as were available. It was added that this could not be taken as invalidating the claim of superiority for the transit micrometer, since it has never been disputed that personal equation, perhaps the greatest bugbear of transit observations, is at least very materially reduced by the use of the micrometer. It was pointed out, however, that the discrepancies common to both kinds of observations were much larger in comparison with the nominal probable errors obtained in the usual way, than should be the case. From an examination of nearly a hundred nights' work, the average discrepancy between two sets taken on the same night was found to be ·039 sec., a value which was shown to be equivalent to a probable error of about ·025 sec., while the average probable error as obtained from the residuals of the separate stars was ·011 sec. This showed that, in addition to the irregular errors which show themselves as residuals, there must be some other source of error, systematic with respect to any one set, but varying from one set to another.

It was suggested that this might be due to defective determinations of azimuth arising from ordinary accidental errors of observation of polars; since only two polars were observed in each set, it would likely not infrequently happen that the errors in both these might be fairly large and of the same sign; this granted, the observed effect would follow. From the few suitable observations which were available at that time, it was shown that by observing several polars in a set, and selecting them in separate pairs for combination with the south stars, the results could be varied by quantities ranging up to ·07 sec.; this was taken as a provisional confirmation of the hypothesis. It may be stated here that this result has been fully confirmed by later and more extensive observations.

If, then, the cause at which we have arrived be the correct one, and assuming also that the portable instruments are fairly stable during the course of a single evening, we should expect that on those nights when the discrepancies are large they would be reduced if we could increase the precision of the azimuth determinations. This test has been applied in the following way: From all the observations examined previously, the ten nights were selected which showed the largest discrepancies. All the observations on each night were reduced together for a single value of azimuth and collimation; this value of the azimuth should evidently be better (if the instrument were stable) than either of the values previously applied in the reduction of the sets separately. Finally, a value of the clock correction was found from the south stars of each set separately, by applying this value of azimuth and collimation to all. The effect of this method of reduction is shown in Table IV. The second and third columns show the clock corrections as originally determined, and the discrepancies between the different determinations on the same night; the fourth and fifth columns show the same quantities after employing the reduction mentioned. The discrepancies are materially reduced in every case, the reduction varying from 40 per cent to 86 per cent; the average of all is reduced to one-third of its former value. No more

unequivocal proof could, I imagine, be found, that these discrepancies are for the most part due to defective determinations of azimuth, and that any method of observing that can be devised to strengthen the azimuth will materially increase the average accuracy of time observations. As will be seen below, theory also supports the conclusion that the ordinary distribution of stars in a time set will not give the most satisfactory results.

The simplest way to strengthen the azimuth determination would, of course, be to increase the proportion of polars observed, but unfortunately the number of polars in the standard catalogues is rather scant; it was thought possible, however, that by increasing the number of observations on each star a similar effect might be gained. It was for the purpose of experiments along this line that the special cut-out was attached to the micrometer made for Cooke Transit No. 1. Four revolutions of the micrometer correspond to an equatorial interval of about 13 seconds; the time required for an observation of a star of 75° declination would thus be nearly a minute. There is no doubt that any great extension of this time would result in undue fatigue of the eye, and tend to lessen the accuracy of at least the latter part of the observation; if, however, several observations of this duration are made, separated by about the same interval, this fatigue does not result, as was evident from some preliminary experiments. In addition, observations so taken would be independent in another way, since ample time would be allowed between observations for re-focussing, adjustment of illumination, &c. Also, the instrument could be reversed during the observation of each star, involving an elimination of collimation error, as well as a simplification of the computation.

It was decided to make the observations in the following way: For polars, the observation began at 14 rev. from the centre of the field, continuing to 10 rev.; then after an interval of 4 rev. it was repeated from 6 rev. to 2 rev.; the instrument was then reversed and the observation completed over the same parts of the screw as before. For south stars, on account of their swifter motion, it was possible to observe only from 14 rev. to 10 rev., in order to allow sufficient time for reversal.

The new micrometer was used for the first time on October 1, 1907. During the month of October, in connection with the longitude operations then in progress, two time-sets were taken on every clear night, each set consisting usually of three or four polars and from six to eight south stars. Throughout the winter it has been used whenever necessary for the determination of clock-error. On October 8, October 15 and October 30, observations of as many polar stars as possible (at either upper or lower culmination) were made in addition, in order to determine whether the probable error was materially reduced by the new process. Denoting the times of the four observations of any star (in the order made) by T_1, T_2, T_3 and T_4, it is evident that any one of these is the equivalent of (or indeed *is*) an ordinary observation without reversal, affected by errors both of azimuth and collimation; also, the quantities $\frac{T_1 + T_4}{2}$ and $\frac{T_2 + T_3}{2}$ as well as their mean, $\frac{T_1 + T_2 + T_3 + T_4}{4}$, (observations during which the instrument is reversed), are unaffected by collimation error. Hence, from the same series of observations (thus eliminating uncertainties arising from differences of seeing or other variations of conditions) we can obtain the required comparison of simple and reversed observations, as well as of the advantage gained by increasing the number of observations in each position of the instrument. The computations were made in the following way: In the first place, the mean of the four observations on each star was taken as the time of transit of that star; after applying corrections for level, pivot inequalities, &c., the observations were combined by least squares in the usual way for azimuth and clock error. The residuals were formed and examined for progressive change, denoting change of azimuth during the night; the most probable value of the rate of change (assumed constant) was computed by least squares, and applied as a correction to the original azimuth. This quantity (now a function of the time) was adopted as the definitive azimuth for the

night, and the residuals were reformed (see column v_1, Tables V, VI and VII). Next, the observations were grouped in the sense $\frac{T_1 + T_4}{2}, \frac{T_2 + T_3}{2}$, and these quantities were considered as distinct observations. The residuals were formed as before, using the same value of azimuth (column v_2). Finally, the observations were grouped in the sense $\frac{T_1 + T_2}{2}, \frac{T_3 + T_4}{2}$. In this case there are two values of collimation, the one to be used for any particular star depending on the direction of motion of the star and on the position of the instrument at the beginning of the observation—that is, on the particular half of the screw used for the observation of that star. A preliminary collimation correction of 25^s·850 sec. δ was applied to all the observations; here the exact value of δ for the particular day in question was required, since the coefficient of sec. δ was large; when the collimation is small an approximate value is sufficient. In the case of only one or two stars was a correction for curvature of path required; in those cases it was incorporated in the preliminary collimation correction. It was necessary also to apply the separate values of pivot inequality for Clamp West and Clamp East. It may be mentioned here that, the pivots of Cooke Transit No. 1 being somewhat irregular, a special series of observations was conducted to determine the irregularities at different zenith distances; a curve was plotted and the proper correction applied throughout to each star, depending on its zenith distance. After the preliminary collimation correction and the azimuth and clock corrections had been applied, the resulting equations were solved for the two values of collimation and the residuals were formed. As in the case of azimuth, the rate of change of collimation was computed from the residuals and applied; the residuals were then reformed (column v_3).

The results of this computation are shown in Tables V, VI and VII. The quantities denoted by the symbols are as follows:—

$$l_1 = a - \frac{T_1 + T_2 + T_3 + T_4}{4} - Bb - \cdot 01 \text{ sec. } \delta - \Delta T - \text{aberration.}$$

$$l_2 = a - \frac{T_1 + T_4}{2} - Bb - \cdot 01 \text{ sec. } \delta - \Delta T - \text{aberration.}$$

and $$a - \frac{T_2 + T_3}{2} - Bb - \cdot 01 \text{ sec. } \delta - \Delta T - \text{aberration.}$$

$$l_3 = a - \frac{T_1 + T_2}{2} \mp 25 \cdot 850 \text{ sec. } \delta - Bb' - \cdot 01 \text{ sec. } \delta - \Delta T - \text{aberration.}$$

and $$a - \frac{T_3 + T_4}{2} \mp 25 \cdot 850 \text{ sec. } \delta - Bb' - \cdot 01 \text{ sec. } \delta - \Delta T - \text{aberration.}$$

$v_1 = l_1 - Aa$

$v_2 = l_2 - Aa$

$v_3 = l_3 - Aa - Cc$

A = sin $\phi - \delta$ sec. δ

B = cos $\phi - \delta$ sec. δ

$C = \mp$ sec. δ

ΔT = clock correction.

a = azimuth error.

b = level error.

c = collimation error.

$\mu^2 = \frac{[v^2]}{n - \nu}$ = square of 'mean square' error of a single observation. The correction ·01 sec. δ is for the width of the contact strips on the micrometer head; the chronograph is actuated as soon as the edge of the brush touches the edge of the contact strip, that is, slightly before the position of symmetry is reached; the result

is a collimation effect, which, however, does not change sign when the instrument is reversed.

If μ_1, μ_2, μ_3 represent the mean square errors corresponding to the sets of residuals v_1, v_2, v_3, and if p_1, p_2, p_3 denote respectively the weights of a simple observation, an observation by reversal, and an observation combined from four simple observations as above, we have evidently $\frac{p_2}{p_1} = \frac{\mu_3^2}{\mu_1^2}$, $\frac{p_3}{p_2} = \frac{\mu_2^2}{\mu_1^2}$; these ratios are measures respectively of the advantage to be gained by simple reversal and of the additional advantage to be gained by doubling the number of observations in each position of the instrument. The values of μ_1^2, μ_2^2, &c., with their means, are collected in Table VIII. The weight of an observation is increased by two-thirds by reversal, while the additional advantage gained by increasing observations in the same position is only 16 per cent. We may conclude that the principle of reversal is well worth adopting, but that in general one observation in each position of the instrument is sufficient.

For October 15 the values of $\frac{p_2}{p_1}$ and $\frac{p_3}{p_2}$ are considerably larger than for the other dates; as the weather on that night was hazy and the seeing poor this may be taken as an indication that under such conditions it might be worth while to take the full four observations if convenient.

The above values apply strictly, of course, only to stars of about the declination considered (about 70° to 80°); we might expect, however, that reversal would be of about equal benefit for all stars. We may test this hypothesis, though in a less rigorous way, by examining the mean square error shown for south stars during the observations in October, and comparing it with that shown in observations taken in the ordinary way. From the nineteen sets taken during that time the average value of μ^2 is ·00187; the separate values vary very considerably, as is to be expected from the small number of stars in a set (usually six to eight); the average value of the same quantity during the observations in December, 1906, and January, 1907, (practically the only other observations made by the writer with the transit micrometer) is ·00324. The ratio of these two quantities, corresponding to $\frac{p_2}{p_1}$, is 1·73, practically the same value as obtained above for polar stars. We may take it, then, as established that there is a gain of roughly two-thirds for all stars in making observations by reversal, and there will be a corresponding gain in the accuracy of the azimuth determination.*

It may be of interest now to inquire into the proper theoretical grouping of the component stars of a set, to see what influence changes in the grouping will have on the magnitude of errors. From each simple observation we obtain an observation equation of the form

$$C\ c + A\ a + \Delta T = l$$

where l is the clock error uncorrected for azimuth and collimation. Combining the observation equations we get the three normal equations

$$\left.\begin{array}{llllllll} [p\,C^2] & \cdot c & + [p\,A\,C] & \cdot a & + [p\,C] & \cdot \Delta T = [p\,C\,l] \\ [p\,A\,C] & \cdot c & + [p\,A^2] & \cdot a & + [p\,A] & \cdot \Delta T = [p\,A\,l] \\ [p\,C] & \cdot c & + [p\,A] & \cdot a & + [p] & \cdot \Delta T = [p\,l] \end{array}\right\} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (1)$$

where p is the weight of any observation equation (p being considered unity for an equatorial star). So far as the value of ΔT is concerned, these reduce to

*The method of observation by reversal has been practised for some years by the Prussian Geodetic Institute.

$$W. \triangle T = L \qquad (2)$$

$$\text{where } W = [p] - \frac{[p\,C]^2}{[p\,C^2]} - \frac{\left([p\,A] - \frac{[p\,A\,C]\,[p\,C]}{[p\,C^2]}\right)^2}{[p\,A^2] - \frac{[p\,A\,C]^2}{[p\,C^2]}} \qquad (3)$$

$$L = [p\,l] - \frac{[p\,C]\,[p\,C\,l]}{[p\,C^2]} - \frac{\left([p\,A] - \frac{[p\,A\,C]\,[p\,C]}{[p\,C^2]}\right)\left([p\,A\,l] - \frac{[p\,A\,C]\,[p\,C\,l]}{[p\,C^2]}\right)}{[P\,A^2] - \frac{[p\,A\,C]^2}{[p\,C^2]}} \qquad (4)$$

If r_o be the probable error of an observation on an equatorial star, and r_L that of L, it may be shown that $r_L = \sqrt{W} \cdot r_o$.*

$$\text{Hence } r_{\triangle T} = \frac{1}{\sqrt{W}} \cdot r_o \qquad (5)$$

that is, W is the weight of the computed clock correction. The problem then reduces to that of finding the distribution of stars which will make W a maximum.

If, without altering the values of $[p]$, $[p\,A]$ and $[p\,A^2]$, we can make $[p\,C] = o$ and $[p\,A\,C] = o$, the value of W will be increased. For in (3), $[p]$ will be unaltered, while

$$\frac{[p\,C]^2}{[p\,C^2]} + \frac{\left([p\,A] - \frac{[p\,A\,C]\,[p\,C]}{[p\,C^2]}\right)^2}{[p\,A^2] - \frac{[p\,A\,C]^2}{[p\,C^2]}} \text{ will reduce to } \frac{[p\,A]^2}{[p\,A^2]},$$

which is a smaller quantity, as may be shown by direct subtraction, remembering that $[p\,A^2] - \frac{[p\,A\,C]^2}{[p\,C^2]}$ is positive, which may be easily proved.

In order to prove that it is always possible to satisfy this 'collimation condition' without altering the values of $[p]$, $[p\,A]$ and $[p\,A^2]$, it becomes necessary to make some assumption as to the relation between p and the declination. Assuming that the accidental error of an observation arises from two independent sources, one being the error of setting on a motionless star, the other that due to the star's motion, and proportional to its velocity, we shall have, if r is the probable error in time

$$r^2 = (m_1^2 + m_2^2 \cos^2 \delta) \sec^2 \delta = (1 + a^2 \tan^2 \delta)\, r_o^2 \qquad (6)$$

If p be taken as unity for an equatorial star, this gives

$$p = \frac{1}{1 + a^2 \tan^2 \delta} \qquad (7)$$

Since $A = \sin \phi - \cos \phi \tan \delta$, we have

$$[p\,A] = \sin \phi\, [p] - \cos \phi\, [p \tan \delta] \qquad (8)$$

$$[p\,A^2] = \sin^2 \phi\, [p] - 2 \sin \phi \cos \phi\, [p \tan \delta] + \cos^2 \phi\, [p \tan^2 \delta]$$

or, from (7) and (8)

$$[p\,A^2] = 2 \sin \phi\, [p\,A] + \frac{\cos^2 \phi}{a^2\, P} (n\,P - [p]) \qquad (9)$$

where n is the number of stars, and P the value of p for a zenith star. Hence if $[p]$ and $[p\,A]$ are constant, $[p\,A^2]$ is also constant.

Now for any combination of four stars, we may fulfil the collimation condition by pairing them, the stars in either pair being of the same declination, but in opposite clamps. In order that $[p]$ and $[p\,A]$, and, therefore, $[p\,A^2]$, may remain unchanged, we must also have, if δ_x and δ_y be the new declinations,

$$p_x + p_y = \tfrac{1}{2}\,[p]$$

$$p_x\, A_x + p_y\, A_y = \tfrac{1}{2}\,[p\,A]$$

* See Johnson—Theory of Errors and Method of Least Squares.

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or, transforming with the help of (7) and (8)

$$\left.\begin{aligned} p_x \quad + \quad p_y \quad &= \tfrac{1}{2}\,[p] \\ \sqrt{p_x - p_x^2} + \sqrt{p_y - p_y^2} &= \frac{a}{2}\,[p \tan \delta] \end{aligned}\right\} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (10)$$

The necessary condition that such a re-arrangement is possible, is that the values of p_x and p_y obtained from (10) shall be real and positive. It is fulfilled provided

$$4\,[p] > [p]^2 + a^2\,[p \tan \delta]^2,$$

the truth of which follows from the fact that

$$[p] = [p^2\,(1 + a^2 \tan^2 \delta)] = [p^2] + a^2\,[p^2 \tan^2 \delta]$$

and the general principle that

$$n\,(a_1^2 + a_2^2 + \ldots\ldots + a_n^2) > (a_1 + a_2 + \ldots\ldots + a_n)^2.$$

By repeating the above operation with the remaining stars, four at a time (using, if necessary, one of the pairs a second time to complete the last group of four), we arrive at the result that for any set containing an even number of stars, whatever the original distribution, we may so change that distribution as to make $[p\,C] = o$ and $[p\,A\,C] = o$, without altering $[p]$, $[p\,A]$ or $[p\,A^2]$. As has been shown above, this condition will increase the value of W. If it be fulfilled, (3) reduces to

$$W = [p] - \frac{[p\,A]^2}{[p\,A^2]} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (11)$$

If now we vary $[p\,A]$ and $[p\,A^2]$, subject to the condition that $[p]$ remain unchanged, it is evident that W is a maximum when $\dfrac{[p\,A]^2}{[p\,A^2]}$ is a minimum. Differentiating the latter quantity with respect to $[p\,A]$, and introducing (9), we obtain as the condition for a maximum

$$[p\,A]\left([p\,A] - \frac{\cos^2 \phi}{a^2\,P \sin \phi}\sqrt{[p] - n\,P}\right) = o$$

that is,

$$[p\,A] = o \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (12)$$

$$\text{or } [p\,A] = \frac{\cos^2 \phi}{a^2\,P \sin \phi}([p] - n\,P) \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (13)$$

according as $[p] \lesseqgtr n\,P$. This amounts to saying that $[p\,A]$ must be zero if consistent with the condition that $[p]$ remain unchanged; otherwise it must have the value given by (13). It may be remarked, in passing, that this is not its smallest possible value; the latter would involve $p_1 = p_2 = p_3 = \&c. > P$; that is, all the stars would be of the same declination, and all south of the zenith, a condition which, of course, would not be permissible.

If $[p] < n\,P$, (11) reduces to $W = [p]$, and now finally proceeding to vary $[p]$, yet still observing the condition (12), we may increase W by increasing $[p]$ up to the value $n\,P$. If $[p] > n\,P$, by applying (13), (9), and the relation $1 + a^2 \tan^2 \phi = \dfrac{1}{P}$, (11) becomes $W = (n - [p])\,\dfrac{P}{1-P}$. Evidently in this case W increases as $[p]$ decreases till the latter reaches the value $n\,P$, in which case it is again equal to $n\,P$, while (13) now coincides with (12).

Hence, finally, the conditions for maximum efficiency are

$$\left.\begin{aligned} [p\,C] &= o \\ [p\,A\,C] &= o \\ [p\,A] &= o \\ [p] &= n\,P \end{aligned}\right\} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (14)$$

They correspond to the case in which all stars are observed exactly in the zenith, an equal number in the two positions of the instrument.

Now this is a condition which it is obviously impossible to fulfil exactly in actual practice, and it becomes a question of experience whether, on account of the physical inconvenience of observing zenith stars, it can be even approximately fulfilled except

with a transit of the 'broken' type. Consequently, dismissing the collimation condition as indicating that the two 'clamps' should be roughly coincident, or, better still, that all observations should be made by reversal, it becomes of interest to inquire how much deviations from the other condition will affect the accuracy of the result. This is a problem which does not by any means yield readily to general treatment, but by imagining the set broken up into two groups, one north and the other south of the zenith, the stars of each group being all of the same declination, the problem is somewhat simplified. This will not involve any great departure from the actual conditions, since though the groups are usually spread over a considerable interval in declination, the distance between the groups is in general considerably greater.

If we have n south stars at declination δ and n' north stars at declination δ', and if we suppose the collimation condition to have been fulfilled, (11) will reduce to

$$W = \frac{n\,n'\,p\,p'\,(A - A')^2}{n\,p\,A^2 + n'\,p'\,A'^2} \qquad (15)$$

Supposing the whole number of stars in the set, $n + n' = N$, to be fixed, and supposing δ and δ' also fixed, we may find the best distribution, i.e., the best values of n and n', by differentiating (15) with respect to n and n' and introducing the condition $dn + dn' = o$. This gives the condition

$$n^2\,p\,A^2 = n'^2\,p'\,A'^2 \qquad (16)$$

Introducing this condition in (15) and eliminating n and n' we get

$$W = \frac{p\,p'\,(A - A')^2}{(\sqrt{p}\,A^2 + \sqrt{p'}\,A'^2)^2} \cdot N \qquad (17)$$

the surd quantities being taken with the positive sign. This value of W is the maximum that can be obtained from N stars grouped at declinations δ and δ'. If now we differentiate (17) with respect to δ, and substitute the values of p, p', A and A' in terms of δ and δ', we get

$$\frac{1}{N}\,\frac{dW}{d\delta} = \frac{2\,p^2\,p'^2\,(A - A')}{(\sqrt{p}\,A^2 + \sqrt{p'}\,A'^2)^3}\left\{\frac{(1 + a^2 \tan\delta \tan\delta')\sqrt{A'^2} + }{\sqrt{(1 + a^2 \tan^2\delta)(1 + a^2 \tan^2\delta')}} \cdot A'\right\}\frac{dA}{d\delta}$$

Now p, p' and A are positive, while $\frac{dA}{d\delta}$ is negative; also it may be easily shown that the quantity in the large brackets is of the same sign as A' (that is, negative when δ' is less than 90°, positive when greater). Hence $\frac{dW}{d\delta}$ is positive. In like manner, differentiating (17) with respect to δ', it may be shown that $\frac{dW}{d\delta'}$ is negative. Hence W is increased either by increasing δ or decreasing δ', that is, by diminishing the zenith distance of either north or south stars, or both, *provided the ratio* $\frac{n'}{n}$ *be at the same time so varied as to satisfy* (16). This conclusion includes the case of north stars at lower culmination.

The best set, then, can be obtained by the use of stars, both north and south, as near to the zenith as they can comfortably be observed. We have yet to consider, however, whether there are any practical considerations, such as the number of stars obtainable at different declinations, which will interfere with the adoption of this principle. To get a clearer idea of the amount of variation in precision corresponding to variations in declination, we may compute W and also n and n', for special values of δ and δ'. To do this we must, however, make an assumption as to the value of a^2 in (7), which can be obtained only by observation. It has been computed from the results of several years' observations by the Prussian Geodetic Institute,* com-

* See 'Test of a Transit Micrometer,' U. S. Coast and Geodetic Survey Report, 1904.

prising the work of several observers; the values for different years and for different observers vary from ·11 to ·44, the mean value being ·21. Some data from which its value may be computed are also given by a test of the transit-micrometer of the Meridian Circle at Munich;† the approximate value in this case is ·26. From some tests made by the United States Coast and Geodetic Survey, they came to the conclusion that 'the total error for a star . . . . . is nearly the same for stars of all declinations, if expressed in angular measure. This is what should be expected if the errors concerned are of the same nature as if the object pointed upon were stationary instead of being a moving star.'* This would correspond to the value unity for a^2.

It may be remarked that the value of a probably varies considerably with the instrumental conditions, such as speed of driving heads, magnifying power, definition of image, &c.

Regarding the first point the matter is put very well in the United States Coast and Geodetic Survey report* as follows: 'If the speed of the driving heads is made very great, the observer will have difficulty in making the moving line keep up with the moving star-image, and this difficulty will be greater for the fast-moving equatorial stars than for others. The errors of bisection expressed in angular measure should be considerably greater for equatorial stars than for slow-moving stars under these conditions. If the speed of the driving heads is made very small, there will be no difficulty in keeping up with any star. A given error in the position of the driving heads at any instant will produce, however, a much larger displacement of the movable line in the field of view than when the driving heads are geared to move much more rapidly. The consequent difficulty in placing the movable line in a desired position will tend to produce errors of bisection of about the same magnitude expressed in angular measure for all declinations, and the size of the errors will tend to increase as the speed of the driving heads is made slower.' These changes in conditions would correspond to a change in the value of a.

Again, in obtaining the formula for p, no account was taken of the magnification employed. An increase in the magnification (up to certain limits) might be expected to diminish m_1 in (6), that is, to increase the accuracy of setting on a stationary point; on the other hand, the tendency would be for m_2, the error depending on the star's motion, to be relatively unaffected; for while from one cause it would tend to be reduced in the same ratio as m_1, the increase in magnification would increase the star's apparent velocity, and so by hypothesis increase m_2; these two tendencies would more or less balance each other, and we should have m_2 nearly constant, while m_1 would vary inversely as the magnification. As $a^2 = \frac{m_1^2}{m_1^2 + m_2^2}$, a would decrease with increase of magnification.

From these considerations it would seem best to adopt for the present purpose the value of a given by observations with the same type of instrument which we are considering, namely, the Cooke transit. From the values of μ_2^2 given in Table VIII, together with the value $\mu^2 = ·00187$ for stars about declination 22°, we obtain for a^2 the values ·56, ·44 and ·40, the mean being ·47, or roughly one-half. This value has been used in the computations below. We, of course, have no definite proof that the variations of p follow the law we have assumed (that is, that a is constant for all declinations), but at least this assumption can not lead us far astray if the declinations we consider do not depart too far from those from which our value of a was deduced.

In Table IX are shown the maximum weights, as computed from (17), of sets of twelve stars observed at the latitude of Ottawa (45° 24′), for different values of δ and δ'; also the values of n' as computed from (16). The unit of weight has in this case been taken as an observation on a single zenith star. The values for 90°

† Astronomische Nachrichten, No. 3942-3, Band 165.

* See 'Test of a Transit Micrometer,' U.S. Coast and Geodetic Survey Report, 1904.

have been added simply to show the tendency as δ' is increased beyond 80°. The desideratum is to so choose δ and δ' that the value of W may be as high as possible without unduly increasing n', since stars are relatively much scarcer north than south of the zenith. By increasing δ, n' is markedly decreased, while W is increased; hence for both reasons, but more especially the former, the south stars should be observed as near the zenith as practicable. It is probably unwise to observe any stars of less zenith distance than seven or eight degrees, because the free use of the micrometer heads is interfered with by the standards of the teleseope. In actual practice, in order to get a sufficient number of stars in a reasonable time, this will involve a mean value of zenith distance not less than 20°. In the case of north stars (see Table IX) a decrease in δ', while it increases W, also increases n' in a much greater ratio; on the other hand, the number of stars available in the Berliner Jahrbuch is about the same between declinations 70° and 80° as between 60° and 70°. Hence, instead of choosing 65° (a zenith distance of 20°) as the mean declination of polars, it will be better to choose 75°, as this will not involve a great decrease in W, while it will permit us to observe nearly the proper ratio of polars in the set. For δ= 25° and δ' = 75° we get n' = 4·2; that is, the best results for these declinations are got by observing in the ratio of about one north star to two south stars, instead of one to five or six as has been usually done. We might still further lower n' without very materially decreasing W by increasing δ' beyond 75°, but, in addition to the fact that the difficulties of observing with the micrometer are greatly increased for stars much beyond 80° declination, the number of stars available decreases more rapidly than n'; consequently, the best declination for polars is probably from 70° to 82° or 83°.

Tables X and XI show the weights, computed by formula (15), of sets of twelve stars for the same declinations as above, the numbers of polars being respectively two and four. An inspection of the corresponding weights in both tables shows that the advantage gained by increasing the number of polars is very considerable.

Tables XII, XIII and XIV are the same as the three preceding ones, except that they are computed for latitude 35°. Tables XV, XVI and XVII are computed for latitude 55°. The similarity in the weights (for equal zenith distances) in all three sets of tables shows that the same general conclusions hold also for those latitudes and for intermediate ones.

In Table XVIII are collected the weights for a few typical sets, showing the advantages to be gained by decreasing the zenith distance of the south stars, by increasing the relative number of polars, and by reversing during each observation. In the case of the sets observed by reversal the weights obtained by formula (15) have been increased by two-thirds, in accordance with the results arrived at above. In all cases the weights given by the formula have been multiplied by $(1 + a^2 \tan^2 \phi)$, in order to make the unit a zenith star.

It is, of course, to be remembered that in all that precedes, the only errors taken account of have been those inherent in the actual observation; it has been tacitly assumed, for instance, that the adopted correction for level, as applied to any one set taken as a whole, does not differ appreciably from its true value, that the collimation of the instrument does not change with variations in position, that anomalous changes in refraction do not affect the result, that the residual pivot errors are negligible, &c. Though none of these assumptions is strictly true, the actual evidence shows that these errors are overbalanced by the errors arising from defective azimuth determinations, i.e., by relatively insufficient observations of northern stars; consequently, the introduction of the consideration of relatively insignificant errors would tend to alter merely the relative and absolute *values* of the theoretical weights, but not their *sequence*. We must not expect, then, to gain the whole advantage shown by the differences in the weights in Table XVIII, but of some advantage, and probably a very considerable one, we may be assured.

There is a method of taking time observations which has not been considered. We might obtain a strong azimuth determination by observing north stars, some at upper and some at lower culmination; this value of the azimuth applied to the south stars would give the clock error. In some observations taken to test this method there was, however, an indication of a systematic difference between azimuths so determined and those derived from a combination of north and south stars. Even if this were the case, it would make little difference, provided the same method were always adhered to; however, in a set containing polars at upper and at lower culmination it is necessary to observe in three distinct parts of the sky, and to any one who has struggled with clouds on a broken night it will be readily apparent that this might not always be feasible.

There is still another matter to be considered. We have considered as mutually exclusive the two alternatives of observing polars between declinations 60° and 70°, or between 70° and 80°. We might, however, distribute the polars between 60° and 80°; this would involve (for the best results) an additional increase in the number of polars observed, but this would be more than compensated for (so far as scarcity of polars is concerned) by the additional number available. In making the computations it has always been the custom here to give all observations equal weights, and so far as the value of $\triangle T$ is concerned this is perfectly legitimate, *provided the polars are not spread over a wide range of declination;* if this condition is fulfilled the value obtained for $\triangle T$ will be practically the same whatever system of weights be employed, but if not, we can not get a correct result without weighting the observations for different declinations. Whether the advantage to be gained by opening a wider range of declination for polars is more than sufficient to compensate for the increased labour of computation involved by weighting the observations, is a matter to be decided by experience. The question is whether under actual working conditions it will be possible always to obtain a sufficient percentage of stars between 70° and 80°; if not we may have recourse to the other expedient.

So far as concerns actual results of observation, on which to base an estimate of the improvement attainable, they are as yet naturally rather meagre. No time has been available for a test along these lines, further than that furnished by the regular observations, nor was it considered advisable to make special observations for that purpose, as a thorough test will be available from the longitude work during the coming summer. Enough knowledge has been gained, however, to show that the method of observation is perfectly feasible, and so far as the possibility of a comparison goes, the improvement in accuracy seems decided. On nine nights during October last, two time sets were taken in connection with the longitude work then in progress. The average discordance between two sets on the same night was ·019 sec.; the largest being ·042 sec.; the average discordance obtained previously (as mentioned above) was just double this. Theoretically these quantities should be proportional to the probable errors; it is hardly likely, however, that the average from a larger number of nights would be so small as ·019 sec., since this would mean a four-fold increase in the weight of a set.

Contrary to what might be expected, there is very little additional labour involved in the observation of a set by the new method. The scaling is considerably increased, but the computation is very much simplified; even if a system of weighting should have to be adopted the computation would still be on the whole rather simpler. It may be added that the observers here are all in accordance with the writer as to the necessity for an improvement in the methods of observation, and as to the efficiency of the remedy proposed.

Conclusions.

A time set should consist of a certain number of south stars, combined with a suitable number of polars at upper culmination (except in high latitudes, when it would be necessary to use stars culminating below the pole, which should be at

declinations as high as feasible). The south stars should be selected as near the zenith as they can comfortably be observed; the north stars, provided a suitable number can be obtained, should lie between declinations 70° and 82° or 83°; otherwise the southern limit may be extended to perhaps 60°.

The distribution of north and south stars, provided the north stars be above 70°, should be roughly one north star to two south stars; if north stars be observed at lower declinations their number should be increased. This is on the assumption that the mean zenith distance of the south stars is about 20°. If the instrument used is such that this zenith distance can be materially lessened the above ratio of north stars may be somewhat decreased; an approximation to its value can be obtained from Table IX.

The instrument should be reversed during the observation of all stars.

When the declinations of the polars are above 70°, it is permissible in the computation to give all observations equal weight; if, however, the north stars are spread over a greater interval in declination, it will be necessary to weight the observations according to the declinations.

TABLE IV.—REDUCTION BY SEPARATE AND BY MEAN AZIMUTHS.

Date.	ΔT	Discordance.	ΔT	Discordance.
	s		s	
Aug. 17, 1905	3·589 3·486	103	3·527 3·480	047
Aug. 25, 1905	3·501 3·403 3·437	098	3·478 3·429 3·425	·053
Sept. 8, 1905	3·433 3·352	·081	3·405 3·376	029
Apr. 2, 1906	−14·217 −14·109	·108	−14·183 −14·156	·027
June 19, 1906	−28·571 −28·654	·083	−28·591 −28·628	·037
July 6, 1906	− 0·240 − 0·353	·113	− 0·298 − 0·314	016
July 9, 1906	− 0·471 − 0·567	·096	− 0·512 − 0·526	014
July 19, 1906	− 1·228 − 1·329	·101	− 1·254 − 1·268	·014
Dec. 17, 1906	− 2·704 − 2·601	103	− 2·635 − 2·659	·024
Dec. 19, 1906	− 3·182 − 3·053	·129	− 3·154 − 3·077	·077
Mean		·102		·034

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TABLE V.—TRANSIT OBSERVATIONS, OCTOBER 8, 1907.

Star.	α	δ	l_1	l_2	l_3	$A\alpha$	Cc	v_1	v_2	v_3
	h. m.	° ′								
502*	20 12	77 26	1·40	1·37	2·46	1·31	·93	·09	·06	·22
				1·43	·35	1·31	—·93		·12	—·03
510*	21 07	77 45	1·43	1·39	2·30	1·34	·96	09	·05	·00
				1·47	·55	1·34	—·96		·13	·17
516	21 41	70 53	·63	·55	—·03	·69	—·74	—·06	—·14	·02
				·71	1·29	69	·74		·02	—·14
521	22 08	71 53	·71	·74	·07	·75	—·80	—·04	—·01	·12
				·68	1·36	·75	·80		—·07	—·19
525*	22 34	73 10	·87	·89	1·69	·84	·73	·03	·05	·12
				·85	·06	·84	—·73		·01	—·05
529	23 05	74 53	1·23	1·18	·08	·98	—·96	·25	·20	·06
				1·28	2·38	98	·96		·30	44
334	23 36	77 07	1·46	1·50	·43	1·21	—1·13	·25	·29	·35
				1·42	2·50	1·21	1·13		·21	·16
440*	12 00	77 25	—1·87	—1·88	—·99	—1·98	1·00	·11	10	—·01
				—1·86	—2·75	—1·98	—1·00		12	·23
338*	0 11	76 26	·96	·97	1·99	1·13	92	—·17	—·16	—·06
				·95	—·07	1·13	—·92		—·18	—·28
171	12 29	70 18	—1·32	—1·28	—2·04	—1·36	—·76	·04	·08	·08
				—1·36	·61	—1·36	·76		·00	·01
340	0 40	74 29	·72	·68	—·26	·92	—·96	—·20	—·24	—·22
				·76	1·70	92	·96		—·16	—·18
345	1 04	79 11	1·41	1·41	·03	1·49	—1·38	—·08	—·08	—·08
				1·41	2·80	1·49	1·38		—·08	—·07
452	13 24	72 52	—1·52	—1·53	—2·38	—1·50	—·88	—·02	—·03	·00
				—1·51	—·67	—1·50	·88		—·01	—·05
347	1 31	72 34	·70	·68	—·27	·76	—·87	—·06	—·08	—·16
				·72	1·67	76	·87		—·04	·04
31*	1 56	71 58	·69	·66	1·52	·72	·73	—·03	—·06	·07
				·72	—·14	·72	—·73		·00	—·13
459*	14 09	77 59	—1·96	—1·89	—·92	—1·99	1·08	·03	·10	—·01
				—2·03	—3·00	—1·99	—1·08		—·04	·07
38	2 29	72 25	·87	·92	—·02	·74	—·87	·13	18	·11
				·82	1·75	·74	·87		·08	·14
198	14 51	74 32	—1·76	—1·83	—2·64	—1·61	—·99	—·15	—·22	—·04
				—1·69	—·88	—1·61	·99		—·08	—·26
360	3 09	77 24	1·16	1·19	—·11	1·19	—1·22	—·03	·00	—·08
				1·13	2·43	1·19	1·22		—·06	·02
203	15 21	72 10	—1·48	—1·48	—2·40	—1·42	—·87	—·06	—·06	—·11
				—1·48	—·56	—1·42	·87		—·06	—·01
472*	16 13	76 07	—1·70	—1·72	—·77	—1·72	·97	·02	·00	—·02
				—1·68	—2·63	—1·72	—·97		·04	·06
474	16 20	75 58	—1·75	—1·80	—2·83	—1·70	—1·12	—·05	—·10	—·01
				—1·70	—·67	—1·70	1·12		·00	—·09
$[v^2]$	.....	.....	.....	.....	.....	.....	.....	·2889	·6626	·9855
μ^2	.....	.....	.....	.....	.....	.....	.....	·0144	·0158	·0246

a = —·508^s + ·00623 $(T - 0\ 7^h)$.
c = —·219^s — ·00392 $(T - 0\cdot7^h)$ for stars marked (*).
c = —·257^s — ·00392 $(T - 0\cdot7^h)$ for other stars.

TABLE VI.—TRANSIT OBSERVATIONS, OCT. 15, 1907.

Star.	α		δ		l_1	l_2	l_3	$4a$	Cc	v_1	v_2	v_3
	h.	m.	°	′								
510	21	07	77	45	1·46	1·42	·59	1·39	— ·94	·07	·03	·14
						1·50	2·33	1·39	·94		·11	·00
308	21	28	70	10	·73	·67	·08	·67	— ·60	·06	·00	·01
						·79	1·39	·67	·60		·12	·12
516	21	41	70	53	·70	·64	·01	·71	— ·62	— ·01	— ·07	— ·08
						·76	1·38	·71	·62		·05	·05
521*	22	08	71	53	·74	·77	1·40	·75	·60	— ·01	·02	·05
						·71	·09	·75	·60		— ·01	— ·06
525*	22	34	73	10	·86	·78	1·51	·84	·65	·02	— ·06	·02
						·94	·21	·84	·65		·10	·02
529*	23	05	74	53	1·12	1·11	1·84	·97	·72	·15	·14	·15
						1·13	·40	·97	— ·72		·16	·15
334*	23	36	77	07	1·27	1·30	2·15	1·19	·85	·08	·11	·11
						1·24	·40	1·19	·85		·05	·06
440	12	00	77	25	—2·00	—2·00	—2·84	—1·91	— ·95	— ·09	— ·09	·02
						—2·00	—1·16	—1·91	·95		— ·09	— ·29
171*	12	29	70	18	—1·37	—1·37	— ·94	—1·30	·56	— ·07	— ·07	— ·20
						—1·37	—1·81	—1·30	— ·56		— ·07	·05
340*	0	40	74	29	·93	·96	1·71	·89	·71	·04	·07	·11
						·90	·15	·89	— ·71		·01	— ·03
345*	1	04	79	11	1·61	1·69	2·66	1·41	1·02	·20	·28	·23
						1·53	·55	1·41	—1·02		·12	·16
452	13	24	72	52	—1·41	—1·47	—2·10	—1·41	— ·71	·00	— ·06	·02
						—1·35	— ·72	—1·41	·71		·06	·02
347	1	31	72	31	·67	·68	— ·12	·72	— ·70	·05	— ·04	— ·14
						·66	1·47	·72	·70		— ·06	·05
31*	1	56	71	58	·55	·54	1·26	·67	·62	— ·12	— ·13	— ·03
						·56	— ·16	·67	— ·62		— ·11	— ·21
459*	14	09	77	59	—1·97	—1·86	1·10	—1·84	·93	— ·13	— ·02	— ·19
						—2·08	—2·84	—1·84	— ·93		— ·24	— ·07
38	2	29	72	25	·71	·71	— ·07	·68	·70	·03	·03	— ·05
						·71	1·49	·68	·70		·03	·11
198	14	51	74	32	—1·78	—1·79	2·49	—1·46	— ·79	— ·32	— ·33	·24
						—1·77	—1·06	—1·46	·79		— ·31	— ·39
360*	3	09	77	24	1·05	1·05	2·11	1·07	·89	— ·02	— ·02	·15
						1·05	— ·01	1·07	— ·89		— ·62	·19
203*	15	21	72	10	—1·27	—1·30	— ·75	—1·27	·64	·00	— ·03	— ·12
						—1·24	—1·80	—1·27	— ·64		·03	·11
364	3	41	71	03	·59	·60	— ·15	·58	— ·65	·01	·02	— ·08
						·58	1·34	·58	·65		·00	·11
217	15	47	78	05	—1·71	—1·69	—2·60	—1·74	—1·03	·03	·05	·17
						—1·73	— ·82	—1·74	1·03		·01	— ·11
472*	16	13	76	07	—1·50	—1·42	— ·76	—1·50	·82	·00	·08	— ·08
						—1·58	—2·24	—1·50	— ·82		— ·08	·08
474	16	20	75	58	—1·57	—1·57	—2·37	—1·48	— ·88	— ·09	— ·09	— ·01
						—1·57	— ·77	—1·48	·88		— ·09	— ·17
369	4	36	75	46	·86	·93	— ·16	·86	— ·87	·00	·07	— ·15
						·79	1·88	·86	·87		— ·07	·15
235	16	55	82	12	—2·35	—2·14	—3·82	—2·44	—1·58	·09	·30	·29
						—2·56	— ·88	—2·44	1·58		— ·12	— ·02
373	5	07	79	07	1·27	1·37	·02	1·21	—1·14	·06	·16	— ·05
						1·17	2·52	1·21	1·14		— ·04	·17
$[v^2]$											·2509	7162	·9214
μ^2											·0105	·0143	·0192

$a = .471^s - .01726\,(T - 1.5^h)$.
$c = .193^s - .00175\,(T - 1.5^h)$ for stars marked (*).
$c = .209^s - .00175\,(T - 1.5^h)$ for other stars.

TABLE VII.—TRANSIT OBSERVATIONS, OCT. 30, 1907.

Star.	α		δ		l_1	l_2	l_3	$\Delta\alpha$	C_c	v_1	v_2	v_3
	h.	m.	°	′								
308*	21	27	70	10	2·66	2·62	1·83	2·71	—·84	—·05	—·09	—·04
						2·70	3·49	2·71	·84		—·01	—·06
516	21	41	70	53	2·90	2·94	3·79	2·89	·82	·01	·05	·08
						2·86	2·01	2·89	—·82		—·03	—·06
521*	22	08	71	53	3·29	3·27	2·33	3·15	—·91	·14	·12	·09
						3·31	4·25	3·15	·91		·16	·19
525*	22	34	73	10	3·52	3·50	2·58	3·54	—·98	—·02	—·04	·02
						3·54	4·46	3·54	·98		·00	—·06
529	23	05	74	54	4·22	4·17	5·17	4·15	1·04	·07	·02	—·02
						4·27	3·28	4·15	—1·04		·12	·17
334*	23	36	77	07	5·44	5·48	4·20	5·18	—1·28	·26	·30	·39
						5·40	6·68	5·18	1·28		·22	·22
338*	0	11	76	26	4·87	4·84	3·64	4·80	—1·23	·07	·04	·07
						4·90	6·11	4·80	1·23		·10	·08
171	12	29	70	18	—5·91	—5·95	—5·11	—5·82	·81	—·09	—·14	—·10
						—5·86	—6·72	—5·82	—·81		—·04	—·09
340	0	40	74	29	3·81	3·86	4·85	3·98	1·02	—·17	—·12	—·15
						3·76	2·78	3·98	—1·02		—·22	—·18
345*	1	04	79	11	6·52	6·47	5·06	6·47	—1·54	·05	·00	·13
						6·57	7·98	6·47	1·54		·10	—·03
452	13	24	72	52	—6·53	—6·53	—5·58	—6·51	·94	—·02	—·02	—·01
						—6·53	—7·48	—6·51	—·94		—·02	—·03
347	1	31	72	34	3·23	3·21	4·13	3·32	·92	—·09	—·11	—·11
						3·25	2·33	3·32	—·92		—·07	—·07
31*	1	56	71	58	3·13	3·15	2·35	3·16	—·94	—·03	—·01	·13
						3·11	3·90	3·16	·94		—·05	—·20
459*	14	09	77	59	—8·89	—8·78	—10·20	—8·72	—1·39	—·08	—·06	—·09
						—8·82	—7·40	—8·72	1·39		—·10	—·07
38	2	29	72	25	3·36	3·39	4·23	3·26	·91	·10	·13	·06
						3·33	2·49	3·26	—·91		·07	·14
198	14	51	74	32	—7·14	—7·20	—6·02	—7·05	1·05	—·09	—·15	—·02
						—7·08	—8·27	—7·05	—1·05		—·03	—·17
360	3	09	77	24	5·21	5·17	6·37	5·28	1·27	—·07	—·11	—·18
						5·25	4·06	5·28	—1·27		—·03	·05
203	15	21	72	10	—6·31	—6·30	—5·37	—6·25	·91	—·06	—·05	—·03
						—6·32	—7·25	—6·25	—·91		—·07	—·09
364*	3	11	71	03	2·95	2·91	2·15	2·89	—·90	·06	·02	·16
						2·99	3·75	2·89	·90		·10	—·04
217*	15	47	78	05	—8·84	—8·80	—10·39	—8·74	—1·41	—·10	—·06	—·24
						—8·88	—7·28	—8·74	1·41		—·14	·05
472	16	13	76	07	—7·64	—7·66	—6·36	—7·67	1·17	·03	·01	·14
						—7·62	—8·93	—7·67	—1·17		·05	—·09
474*	16	20	75	58	—7·65	—7·60	—8·95	—7·61	—1·21	—·04	·01	—·13
						—7·70	—6·34	—7·61	1·21		—·09	·06
369*	4	36	75	46	4·32	4·36	3·21	4·45	—1·20	—·13	—·09	—·04
						4·28	5·43	4·45	1·20		—·17	—·22
235*	16	55	82	12	—12·62	—12·69	—14·87	—12·81	—2·17	·19	·12	·11
						—12·55	—10·38	—12·81	2·17		·26	·26
373*	5	07	79	07	6·37	6·34	4·86	6·38	—1·57	—·01	—·04	·05
						6·40	7·88	6·38	1·57		·02	—·07
92*	5	27	74	59	4·31	4·34	3·19	4·13	—1·14	·18	·21½	·20
						4·28	5·43	4·13	1·14		·15	·16
(v^2)										·2835	·6436	·8557
μ^2										·0118	·0129	·0178

$a = -2\ 182^s + \cdot00591\ (T - 1\cdot8^h)$
$c = \cdot290^s - \cdot00169\ (T - 1\cdot8^h)$ for stars marked (*).
$c = \cdot276^s - \cdot00169\ (T - 1\cdot8^h)$ for other stars.

TABLE VIII.—RELATIVE WEIGHTS OF SIMPLE AND REVERSED OBSERVATIONS.

Date.	μ_1^2	μ_2^2	μ_3^2	$\frac{p_2}{p_1}$	$\frac{p_3}{p_2}$
October 8	·0144	·0158	0246	1·71	1·10
October 15	·0105	·0143	·0192	1·83	1 36
October 30	·0118	·0129	·0178	1·51	1·09
Means	·0123	·0143	·0205	1·67	1·16

TABLE IX.—MAXIMUM WEIGHTS OF SETS OF 12 STARS FOR LATITUDE 45° 24′

—	$\delta=0°$		$\delta=10°$		$\delta=20°$		$\delta=30°$	
	W	n	W'	n'	W''	n'	W''	n'
$\delta'=60°$	10·1	8·3	10·5	7·8	10·9	7·0	11·3	5·7
$\delta'=70°$	8·8	6·7	9·4	6·1	10·0	5·3	10·7	4·1
$\delta'=80°$	7·5	5·7	8·2	5·1	9·1	4·3	10·1	3·2
$\delta'=90°$	6·2	5·0	7·1	4·4	8·2	3·7	9 4	2·7

TABLE X.—WEIGHTS OF SETS OF 10 SOUTH AND 2 NORTH STARS FOR LATITUDE 45° 24′

—	$\delta=0°$	$\delta=10°$	$\delta=20°$	$\delta=30°$
$\delta'=60°$	3·4	3·9	4·9	6·8
$\delta'=70°$	4·1	5·1	6·5	8·8
$\delta'=80°$	4·4	5·6	7·2	9·5
$\delta'=90°$	4·2	5·5	7·1	9·2

TABLE XI.—WEIGHTS OF SETS OF 8 SOUTH AND 4 NORTH STARS FOR LATITUDE 45° 24′

—	$\delta=0°$	$\delta=10°$	$\delta=20°$	$\delta=30°$
$\delta'=60°$	6·4	7·3	8·5	10·4
$\delta'=70°$	7·1	8 2	9·5	10·7
$\delta'=80°$	6·9	8·0	9·1	9·9
$\delta'=90°$	6·0	7·1	8·1	8·9

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TABLE XII.—MAXIMUM WEIGHTS OF SETS OF 12 STARS FOR LATITUDE 35°

	$\delta = -10°$		$\delta = 0°$		$\delta = 10°$		$\delta = 20°$	
	W	n'	W	n'	W	n'	W	n'
$\delta' = 50°$	10·4	8·5	10·7	7·8	11·1	7 0	11 4	5·6
$\delta' = 60°$	9·2	6·8	9·8	6·2	10·4	5·3	11 0	4 0
$\delta' = 70°$	8·1	5·8	8·8	5·1	9·6	4·3	10·5	3·1
$\delta' = 80°$	6·9	5 0	7·8	4·4	8·8	3·6	9 9	2·6

TABLE XIII.—WEIGHTS OF SETS OF 10 SOUTH AND 2 NORTH STARS FOR LATITUDE 35°

	$\delta = -10°$	$\delta = 0°$	$\delta = 10°$	$\delta = 20°$
$\delta' = 50°$	3·4	4·0	5 0	7·0
$\delta' = 60°$	4·3	5 2	6·7	9·2
$\delta' = 70°$	4·7	6·0	7·6	9·9
$\delta' = 80°$	4·7	6 0	7·7	9 7

TABLE XIV.—WEIGHTS OF SETS OF 8 SOUTH AND 4 NORTH STARS FOR LATITUDE 35°

	$\delta = -10°$	$\delta = 0°$	$\delta = 10°$	$\delta = 20°$
$\delta' = 50$	6·5	7·4	8·7	10·6
$\delta' = 60°$	7·4	8·6	9·8	11·0
$\delta' = 70°$	7·3	8·5	9·6	10·2
$\delta' = 80°$	6·6	7 7	8·7	9·3

TABLE XV.—MAXIMUM WEIGHTS OF SETS OF 12 STARS FOR LATITUDE 55°.

—	$\delta = 10°$		$\delta = 20°$		$\delta = 30°$		$\delta = 40°$	
	W	n'	W	n'	W	n'	W	n'
$\delta' = 70°$	9·7	8·1	10·1	7·6	10·6	6·8	11·1	5·5
$\delta' = 80°$	8·2	6·6	8·9	6·0	9·6	5·2	10 4	4·0
$\delta' = 90°$	6·8	5·6	7·6	5 1	8·6	4·3	9 7	3·2

TABLE XVI.—WEIGHTS OF SETS OF 10 SOUTH AND 2 NORTH STARS FOR LATITUDE 55°.

—	$\delta = 10°$	$\delta = 20°$	$\delta = 30°$	$\delta = 40°$
$\delta' = 70°$	3 4	4·0	4·9	6·9
$\delta' = 80°$	4·0	4·9	6·3	8·7
$\delta' = 90°$	4·1	5·2	6·8	9·1

TABLE XVII.—WEIGHTS OF SETS OF 8 SOUTH AND 4 NORTH STARS FOR LATITUDE 55°.

—	$\delta = 10°$	$\delta = 20°$	$\delta = 30°$	$\delta = 40°$
$\delta' = 70°$	6·4	7·3	8·5	10·4
$\delta' = 80°$	6·7	7·9	9·2	10·4
$\delta' = 90°$	6·3	7·4	8·5	9·5

TABLE XVIII.—COMPARATIVE WEIGHTS OF TIME SETS.

No. of polars.	δ'	No. of south stars.	δ	Method of observation.	Weight.
*2	76° 45′	10	14°	Without reversal	6·0
†2	78° 19′	10	14°	" "	6·1
‡2	83° 30′	10	14°	" "	6·2
2	75°	10	25°	" "	8·0
2	"	12	"	" "	8·6
2	"	4	"	By reversal.....	8·3
2	"	6	"	" "	10·5
3	"	6	"	" "	12·5
3	"	8	"	" "	14·8
4	"	8	"	" "	16·6

* Values of δ and δ' actual means from a large number of sets observed in the past.

† Condition $[A]=0$ fulfilled.

‡ If $\delta=14°$, $n=10$, $n'=2$, W is a maximum when $\delta'=83°\ 30'$

I have the honour to be, sir,
Your obedient servant,

R. M. STEWART.

APPENDIX 4.

REPORT OF THE CHIEF ASTRONOMER, 1908.

TABULAR STATEMENT OF LONGITUDE AND LATITUDE OBSERVATIONS, 1907

BY

J. MACARA.

CONTENTS.

MAP.

APPENDIX 4.

TABULAR STATEMENT OF LONGITUDE AND LATITUDE OBSERVATIONS.

DEPARTMENT OF THE INTERIOR,
DOMINION ASTRONOMICAL OBSERVATORY,
OTTAWA, CANADA, March 31, 1908.

W. F. KING, Esq., B.A., LL.D.,
Chief Astronomer,
Ottawa.

SIR,—I have the honour to transmit herewith a tabular statement of the differences of longitude and the latitude results of stations observed in 1907. Annexed thereto is, also, a description of the stations occupied. A synopsis of the statement giving the longitude and latitude of the various stations will be found on page 322.

The accompanying map shows the position of the various astronomical stations established up to the date of this report.

I have the honour to be, sir,
Your obedient servant,

J. MACARA.

DIFFERENCE OF LONGITUDE BETWEEN DAWSON AND BOUNDARY.

Date.	Difference of Chronograph.		Clock Correction.		Difference of Longitude.				Time of Transmission.
	Western Signals.	Eastern Signals.	Western Station.	Eastern Station.	Western Signals.	Eastern Signals.	Mean.	r.	
1907.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.		
June 13	7 10·023	7 10·044	+3 12·208	+2 18·279	6 16·094	6 16·115	6 16·105		
" 16	20·552	20·560	3 20·015	-2 15·680	16·217	16·225	16·221		
" 20	42·680	42·676	3 31·862	+2 05·323	16·141	16·137	16·139		
" 25	8 02·172	8 02·191	3 44·196	+1 58·130	16·106	16·125	16·115		
" 26	04·416	04·439	3 47·071	+1 58·721	16·066	16·089	16·078		
" 28	06·737	06·783	3 51·121	+2 00·191	16·107	16·153	16·130		

Observers: { West—W. C. Jaques. / East—F. A. McDiarmid.

	h.	m.	s.
Mean		6	16·131
Longitude of Boundary	9	24	00·027
" Dawson	9	17	43·896

DIFFERENCE OF LONGITUDE BETWEEN SELKIRK AND DAWSON.

Date.	Difference of Chronograph.		Clock Correction.		Difference of Longitude.				Time of Transmission.
	Western Signals.	Eastern Signals.	Western Station.	Eastern Station.	Western Signals.	Eastern Signals.	Mean.	c	
1907.	m. s.	m. s.	s.	s.	m. s.	m. s.	m. s.		
July 5	8 58·467	8 58·537	+ 9·261	−35 953	8 13·253	8 13·323	8 13·288		
" 7	9 10 513	9 10·583	+14·854	− 42 418	13·241	13 311	13 276		
" 11	9 27 740	9 27 785	+22·327	−52 055	13 358	13 393	13·375		
" 13	9 34·654	9 34·680	+24·119	−57 256	13·279	13 305	13 292		
" 14	9 39·922	9 39 938	+27 479	−59 214	13 229	13·245	13·237		

Observers: { West—W. C. Jaques.
East—F. A. McDiarmid.

	h.	m.	s.
Mean		8	13·294
Longitude of Dawson	9	17	43 896
" Selkirk	9	09	30 602

DIFFERENCE OF LONGITUDE BETWEEN TANTALUS AND DAWSON.

Date.	Difference of Chronograph.		Clock Correction.		Difference of Longitude.			r.	Time of Transmission
	Western Signals.	Eastern Signals.	Western Station.	Eastern Station.	Western Signals.	Eastern Signals.	Mean.		
1907.	m. s.	m. s.	s.	m. s.	m. s.	m. s.	m. s.		
July 18	16 21·114	16 21·150	+38·838	−3 07·011	12 35·265	12 35·301	12 35·283		
" 20	23·457	23·481	+41·083	−3 07·050	35·324	35·348	35·336		
" 22	23·496	23·514	+43·809	−3 04·402	35·285	35·303	35·294		
" 23	21·785	21·821	+43·613	−3 02·889	35·283	35·319	35·301		
" 24	21·432	21·469	+44·291	−3 01·807	35·331	35·371	35·352		

Observers: { West—W. C. Jaques.
East.—F. A. McDiarmid.

	h.	m.	s.
Mean		12	35·313
Longitude of Dawson	9	17	43·896
" Tantalus	9	05	08·583

DIFFERENCE OF LONGITUDE BETWEEN WHITEHORSE AND DAWSON.

Date.	Difference of Chronograph.		Clock Correction.		Difference of Longitude.				Time of Transmission.
	Western Signals.	Eastern Signals.	Western Station.	Eastern Station.	Western Signals.	Eastern Signals.	Mean.	r	
1907.	m. s.	m. s.	m. s.	s.	m. s.	m. s.	m. s.		
July 29	19 21 000	19 21 056	+59 823	—48·854	17 32 323	17 32 379	17 32 351		
" 30	22·312	22·357	1 02 269	—47·699	32·344	32 389	32 366		
" 31	20·387	26·443	1 01·470	—46·625	32·292	32·348	32·320		
August 2	26 058	26·111	1 06·301	47 549	32 208	32 261	32·235		

Observers: { West—W. C. Jaques. / East—F. A. McDiarmid.

	h.	m.	s.
Mean		17	32·318
Longitude of Dawson	9	17	43·896
" Whitehorse	9	00	11·578

DIFFERENCE OF LONGITUDE BETWEEN PEMBROKE AND OTTAWA (DOMINION OBSERVATORY.)

Date.	Difference of Chronograph.		Clock Correction.		Difference of Longitude.				Time of Transmission.
	Western Signals.	Eastern Signals.	Western Station.	Eastern Station.	Western Signals.	Eastern Signals.	Mean.	r.	
1907.	m. s.	m. s.	s.	s.	m. s.	m. s.	m. s.	s.	s.
August 3.	5 00·156	5 00·051	20·118	14·358	5 34·632	5 34·527	5 34·580	·007	·077
" 6.	00·484	00·403	20·790	13·373	·647	·566	·606	·033	·040
" 7.	00·830	00·761	20·879	12·899	·599	·530	·564	·009	·035
" 8.	00·689	00·617	21·343	12·546	·578	·506	·542	·031	·036

Observers { West—C. A. French. / East—R. M. Stewart.

	h.	m.	s.
Mean		5	34·573
Personal equation			·503
$\Delta\lambda$		5	35·076
λ Ottawa (Dom. Obs.)	5	02	51·797
λ Pembroke	5	08	26·873

DIFFERENCE OF LONGITUDE BETWEEN SUMMIT OF WHITE PASS AND DAWSON.

Date.	Difference of Chronograph.		Clock Correction.		Difference of Longitude.				Time of Transmission.
	Western Signals.	Eastern Signals.	Western Station.	Eastern Station.	Western Signals.	Eastern Signals.	Mean.	v.	
1907.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.		
August 7	20 11·890	20 11·938	+ 1 08·510	− 1 52·938	17 10·442	17 10·490	17 10·466		
" 13	25·506	25·552	+ 1 11·599	− 2 03·609	10·298	10·344	10·321		
" 16	38·978	39·064	1 14·001	2 14·640	10·337	10·423	10·380		

Observers { West—W. C. Jaques.
East—F. A. McDiarmid.

	h.	m.	s.
Mean		17	10·389
Longitude of Dawson	9	17	43·896
Longitude of White Pass	9	00	33·507

DIFFERENCE OF LONGITUDE BETWEEN MATTAWA AND OTTAWA (DOMINION OBSERVATORY.)

Date.	Difference of Chronograph.		Clock Correction.		Difference of Longitude.				Time of Transmission.
	Western Signals.	Eastern Signals.	Western Station.	Eastern Station.	Western Signals.	Eastern Signals.	Mean.	r.	
1907.	m. s.	m. s.	s.	s.	m. s.	m. s.	m. s.	s.	s.
August 22	11 42·760	11 42·674	5·566	8·911	11 57·177	11 57·031	11 57·134	·031	·043
" 23	42·729	42·631	5·740	8·709	57·178	57·080	57·129	·026	·049
" 28	36·056	35·960	−13·102	7·917	57·075	56·979	57·027	·076	·045
" 29	35·299	35·209	13·989	7·878	57·166	57·076	57·121	·018	·045

Observers { West—C. A. French. / East—R. M. Stewart.

	h.	m.	s.
Mean		11	57·103
Personal equation			·503
$\Delta\lambda$		11	57·606
λ Ottawa (Dom. Obs.)	5	02	51·797
λ Mattawa	5	14	49·403

DIFFERENCE OF LONGITUDE BETWEEN LABELLE AND OTTAWA (DOMINION OBSERVATORY.)

Date.	Difference of Chronograph.		Clock Correction.		Difference of Longitude.				Time of Transmission.
	Western Signals.	Eastern Signals.	Western Station.	Eastern Station.	Western Signals.	Eastern Signals.	Mean.	v	
1907.	m. s.	m. s.	s.	m. s.	m. s.	m. s.	m. s.		
September 17	2 49·561	2 49·702	+7·792	+1 15·607	3 57·376	3 57·517	3 57·446		
" 18	2 51·190	2 51·326	+7·577	1 13·621	3 57·234	3 57·370	3 57·302		

Observers { West—R. M. Stewart.
East—F. A. McDiarmid.

	h.	m.	s.
Mean		3	57·374
Longitude of Ottawa (Dom. Obs.)	5	02	51·797
" Labelle	4	58	54·423

DIFFERENCE OF LONGITUDE BETWEEN CHAPLEAU AND OTTAWA (DOMINION OBSERVATORY).

Date.	Difference of Chronograph.		Clock Correction.		Difference of Longitude.			r.	Time of Transmission.
	Western Signals.	Eastern Signals.	Western Station.	Eastern Station.	Western Signals.	Eastern Signals.	Mean.		
1907.	m. s.	m. s.	m. s.	s.	m. s.	m. s.	m. s.	s.	s.
Sept. 20.	32 01·978	32 01·765	1 23·624	7·052	30 45·406	30 45·193	30 45·300	·093	106
" 21.	02·377	02·171	1 23·733	6·831	475	269	·372	021	103
" 22.	03·627	03·424	1 24·747	6·650	530	·327	428	035	102
" 25.	08·301	08·099	1 28·975	6·200	526	·324	425	032	101
" 30.	17·004	16·784	1 37·063	5·611	552	332	442	049	110

Observers { West—C. A. French. / East—R. M. Stewart

	h.	m.	s.
Mean		30	45·393
Personal equation			·503
$\Delta\lambda$		30	45·896
λ Ottawa (Dom. Obs.)	5	02	51·797
λ Chapleau	5	33	37·693

DIFFERENCE OF LONGITUDE BETWEEN ROBERVAL AND OTTAWA (DOMINION OBSERVATORY).

Date.	Difference of Chronograph.		Clock Correction.		Difference of Longitude.				Time of Transmission.
	Western Signals.	Eastern Signals.	Western Station.	Eastern Station.	Western Signals.	Eastern Signals.	Mean.	r	
1907.	m. s.	m. s.	s.	s.	m. s.	m. s.	m. s.		
Sept. 25	13 57·568	13 57·725	+ 6·733	− 6·727	13 57·562	13 57·719	13 57·640		
Oct. 1	14 23·108	14 23·303	+ 6·023	19·631	57·454	57·649	57·552		

Observers { West—R. M. Stewart.
East—F. A. McDiarmid.

	h.	m.	s.
Mean		13	57·596
Longitude of Ottawa (Dom. Obs.)	5	02	51·797
" " Roberval	4	48	54·201

DIFFERENCE OF LONGITUDE BETWEEN LAKE EDWARD AND OTTAWA (DOMINION OBSERVATORY).

Date.	Difference of Chronograph.		Clock Correction.		Difference of Longitude.				Time of Transmission.
	Western Signals.	Eastern Signals.	Western Station.	Eastern Station.	Western Signals.	Eastern Signals.	Mean.	v.	
1907.	m. s.	m. s.	s.	s.	m. s.	m. s.	m. s.		
Oct. 2	11 08·850	14 09·047	+ 5·930	− 17·378	13 45·542	13 45·739	13 45·641	.....	.....
" 4	18·253	18·457	+ 5·726	26·917	45·610	45·814	45·712	.....	.....
" 5	24·289	24·388	+ 5·703	32·968	45·618	45·717	45·668	.....	.....

Observers: { West—R. M. Stewart. / East—F. A. McDiarmid.

	h.	m.	s.
Mean		13	45·674
Longitude of Ottawa (Dom. Obs.)	5	02	51·797
" " Lake Edward	4	49	06·123

DIFFERENCE OF LONGITUDE BETWEEN SCOTIA JUNCTION AND OTTAWA (DOMINION OBSERVATORY).

Date.	Difference of Chronograph.		Clock Correction.		Difference of Longitude.				Time of Transmission.
	Western Signals.	Eastern Signals.	Western Station.	Eastern Station.	Western Signals.	Eastern Signals.	Mean.	r.	
1907.	m. s.	m. s.	s.	s.	m. s.	m. s.	m. s.	s.	s.
Oct. 8	14 43·357	14 43·249	29·941	5·623	14 19·039	14 18·931	14 18·985	−·047	·054
" 15	15 01·122	15 01·029	47·498	5·408	19·032	18·939	18·986	·046	·047
" 18	15 07·398	15 07·280	53·755	5·497	19·140	19·022	19·081	·049	·059
" 20	15 10·470	15 10·393	56·967	5·613	19·116	19·039	19·077	·045	·039

Observers { West—C. A. French.
East—R. M. Stewart.

	h.	m.	s.
Mean		14	19·032
λ Ottawa (Dom. Obs.)	5	02	51·797
λ Scotia Junction	5	17	10·829

DIFFERENCE OF LONGITUDE BETWEEN RIVIERE A PIERRE AND DOMINION OBSERVATORY, OTTAWA.

Date.	Difference of Chronograph.		Clock Correction.		Difference of Longitude.				Time of Transmission.
	Western Signals.	Eastern Signals.	Western Station.	Eastern Station.	Western Signals.	Eastern Signals.	Mean.	v.	
1907.	m. s.	m. s.	s.	m. s.	m. s.	m. s.	m. s.		
Oct. 13	12 51·586	12 51·729	+5·426	1 21·865	14 08·025	14 08·168	14 08·097	.....	.....
" 15	12 39·435	12 39·662	+5·408	1 33·927	14 07·954	14 08·181	14 08·068	.....	.....

Observers { West—R. M. Stewart.
East—W. C. Jaques.

	h.	m.	s.
Mean		14	08·083
Longitude of Ottawa (Dom. Obs.)	5	02	51·797
" Riviere à Pierre	4	48	43·714

DIFFERENCE OF LONGITUDE BETWEEN BARRY BAY AND DOMINION OBSERVATORY, OTTAWA.

Date.	Difference of Chronograph.		Clock Correction.		Difference of Longitude.				Time of Transmission.
	Western Signals.	Eastern Signals.	Western Station.	Eastern Station.	Western Signals.	Eastern Signals.	Mean.	v.	
1907.	m. s.	m. s.	s.	s.	m. s.	m. s.	m. s.	s.	s.
Oct. 26	8 01·311	8 01·267	16·590	6·083	7 50·804	7 50·760	7 50·782	·047	·022
" 30	08·397	08·361	24·259	6·616	50·754	7 50·718	7 50·736	·001	018
" 31	10·455	10·435	26·599	6·841	50·697	7 50·677	7 50·687	−·048	·010

Observers { West—C. A. French.
East—R. M. Stewart.

	h.	m.	s.
Mean		7	50·735
λ Ottawa (Dom. Obs.)	5	02	51·797
λ Barry Bay	5	10	42 532

LONGITUDE AND LATITUDE OF STATIONS OBSERVED IN 1907.

Place.	Difference of Longitude.	To.	Longitude.	Longitude.	Latitude.
	m. s.		h. m. s.	° ′ ″	° ′ ″
Dawson	6 16·131	Boundary	9 17 43·896	139 25 58·44	64 03 23 15
Selkirk	8 13·294	Dawson	9 09 30·602	137 22 39 03	62 46 20 98
Tantalus	12 35·313	"	9 05 08·583	136 17 08 75	62 05 28·56
Whitehorse	17 32·318	"	9 00 11·578	135 02 53·67	60 43 17·17
Pembroke	5 34·573	Dominion Observatory	5 08 26·873	77 06 43·10	45 49 42·15
White Pass	17 10·389	Dawson	9 00 33·507	135 08 22·61	59 37 28·66
Mattawa	11 57·103	Dominion Observatory	5 14 49·403	78 42 21·05	46 18 10·55
Labelle	3 57·374	" "	4 58 54·423	74 43 36·35	46 17 02·27
Chapleau	30 45·393	" "	5 33 37·693	83 24 25·40	47 50 31·21
Roberval	13 57·596	" "	4 48 54·201	72 13 33·02	48 31 03·68
Lake Edward	13 45·674	" "	1 49 06·123	72 16 31·85	47 39 34·25
Scotia Junction	14 19·032	" "	5 17 10·829	79 17 42·14	45 30 46·75
Rivière à Pierre	14 08·083	" "	4 48 43·714	72 10 55·71	16 59 16·90
Barry Bay	7 50 735	" "	5 16 42·532	77 40 37·98	45 29 17·11
Michipicoten Harbour					47 57 40·16

LOCAL POSITIONS OF ASTRONOMICAL STATIONS.

Dawson.—The pier is 168·3 feet east and 7·1 feet north of the southeast corner of the Administration Building.

Selkirk.—The pier is 32 feet east and 22·5 feet south of the northeast corner of the Government Telegraph Office.

Tantalus.—The pier is 150·8 feet north and 32 feet west of the northwest corner of the Northwest Mounted Police Barracks.

Whitehorse.—The pier is just behind the Government Telegraph Office, and is 336·1 feet north and 379·7 feet west of the middle point of crossing of Main street and the White Pass and Yukon Railway.

Pembroke.—The pier is 98·2 feet north and 167·5 feet east of the intersection of the easterly limit of John street with the southerly limit of Wellington street.

White Pass.—The pier is 111·1 feet north and 45·9 feet west of the bronze monument on the Canada-Alaska boundary line at summit of White Pass.

Mattawa.—The pier is 419·6 feet west and 56·2 feet south of the southwest corner of the Canadian Pacific Railway station house.

Labelle.—The pier is 1,685 feet east and 82 feet south of the middle point of crossing of the Canadian Pacific Railway and Berthiaume road. This crossing is about 470 feet east of the Canadian Pacific Railway station house.

Chapleau.—The pier is 174·7 feet west and 432·3 feet south of the railway crossing sign board of the Canadian Pacific Railway. This crossing is about 300 feet west of the Canadian Pacific Railway station house.

Roberval.—The pier is 138·2 feet north and 47·1 feet west of the middle point of crossing of the Quebec and Lake St. John Railway and the Roberval road.

Lake Edward.—The pier is 332·4 feet east and 40·6 feet north of the northeast corner of the Quebec and Lake St. John Railway station house.

Scotia Junction.—The pier is about one-half mile east of the Grand Trunk Railway station house and is 249·4 feet north and 7·5 feet east of the sign post at the Grand Trunk Railway crossing.

Rivière à Pierre.—The pier is 120·2 feet west and 39·3 feet north of the northwest corner of the Quebec and Lake St. John Railway station house.

Barry Bay.—The pier is about 200 feet south of the Grand Trunk Railway station house and is 106·9 feet south and 1·1 feet east of the northeast corner of the Balmoral Hotel.

Michipicoten Harbour.—The pier is 45 feet north and 104 feet west of the northwest corner of the Algoma Inn.

Dominion Observatory.—The reference point of the longitudes observed in 1907 is a temporary transit house, the meridian of which is $0^s·12$ east of the centre of the dome of the observatory.

APPENDIX 5.

REPORT OF THE CHIEF ASTRONOMER, 1908.

STATEMENT OF WORK PERFORMED IN THE PHOTOGRAPHIC DIVISION

BY

J. D. WALLIS.

APPENDIX 5.

STATEMENT OF WORK DONE IN THE PHOTOGRAPHIC DIVISION.

	Size of plates and prints.											Total.
	3¼ x 4¼	4 x 5	4¼ x 6½	5 x 7	8 x 10	10 x 14	11 x 14	16 x 20	24 x 36	8 x 36	30 x 40	
Plate negatives			821		117		63	84				1,085
Film negatives		170										170
Black and white and blue prints											41	41
Platinum prints				60								60
Argo paper prints		284	476	1,821	395							2,976
Bromide prints						1,542	113	401	36	103	13	2,208
Transparencies	135											135
Seismograms										365		365
Sun plates developed					244							244
Total	135	454	1,297	1,881	756	1,542	176	485	36	468	54	7,284

J. D. WALLIS,
Photographer.

APPENDIX 6.

REPORT OF THE CHIEF ASTRONOMER, 1908.

DETERMINATION OF THE ORBITS OF SPECTROSCOPIC BINARIES

BY

W. F. KING, LL.D.

ILLUSTRATIONS.

APPENDIX 6.

(Reprinted from the *Astrophysical Journal*, Vol. XXVII, No. 2.)

DETERMINATION OF THE ORBITS OF SPECTROSCOPIC BINARIES.

By W. F. King, LL.D.

On the assumption that the orbit of the star is an ellipse described about a centre of force in one focus, the graph formed by taking the velocities in the line of sight as ordinates and the corresponding times as abscissas will be a periodic curve, from which can be determined the elements of the orbit, viz., the periodic time, the eccentricity, the longitude of the periastron from the ascending node, the projection of the major axis upon the line of sight, and the velocity of the system as a whole, that is, of the center of gravity of the system or of the focus of the elliptic orbit.

Various methods of determining these elements have been given, either geometrical, like that of Lehmann-Filhés, depending upon the comparison of areas of certain parts of the curve; or analytical, like that of Russell, using a Fourier series.

The curve of observed line-of-sight velocities differs from the true curve, by reason of errors of observation. The method of least squares may be employed to correct the first values of the elements, and to give the most probable values.

Spectra of certain types, however, are difficult to measure with accuracy, with the result that the graph of observed velocities may present differences from the theoretical curve which bear a considerable ratio to the velocity, so that the method is not to be depended upon unless successive approximations are made, entailing much labour. In such cases correction of the graph may be resorted to.

A free-hand curve is drawn, as nearly as possible of the form which the velocity curve should have, and as nearly as possible representing the observations. This curve may be adjusted so as to fulfil certain theoretical conditions, as to equality of areas, &c. (Lehmann-Filhés method). From this curve the elements are determined and from them an 'ephemeris' is computed and a new graph representing these elements is drawn. Comparison of this with the former curve indicates correction to the elements, whereby a better accordance with observations may be secured. A new ephemeris with corrected values of the elements is then made, followed by a comparison with the observations. By successive trials in this way, the values of the elements most nearly according with the observations are finally determined. This is the method which has been followed here in obtaining the elements of the orbits of early type stars, and I notice by some orbits recently published by the Lick Observatory, that the same procedure has been adopted there.

The object of the present paper is to present a method whereby as much as possible of the work of testing the accuracy of the successive graphs and of preparing the ephemerides may be done graphically.

Let the ellipse $A\,B\,A_1\,B_1$ in Fig. 1 represent the orbit of the star, S the centre of force at the focus, AA_1 the major axis, N the ascending node, N_1 the descending node. Let P be the position of the star in its orbit at any time. We will suppose the motion of P to be clockwise. Draw SY perpendicular to the tangent at P. The

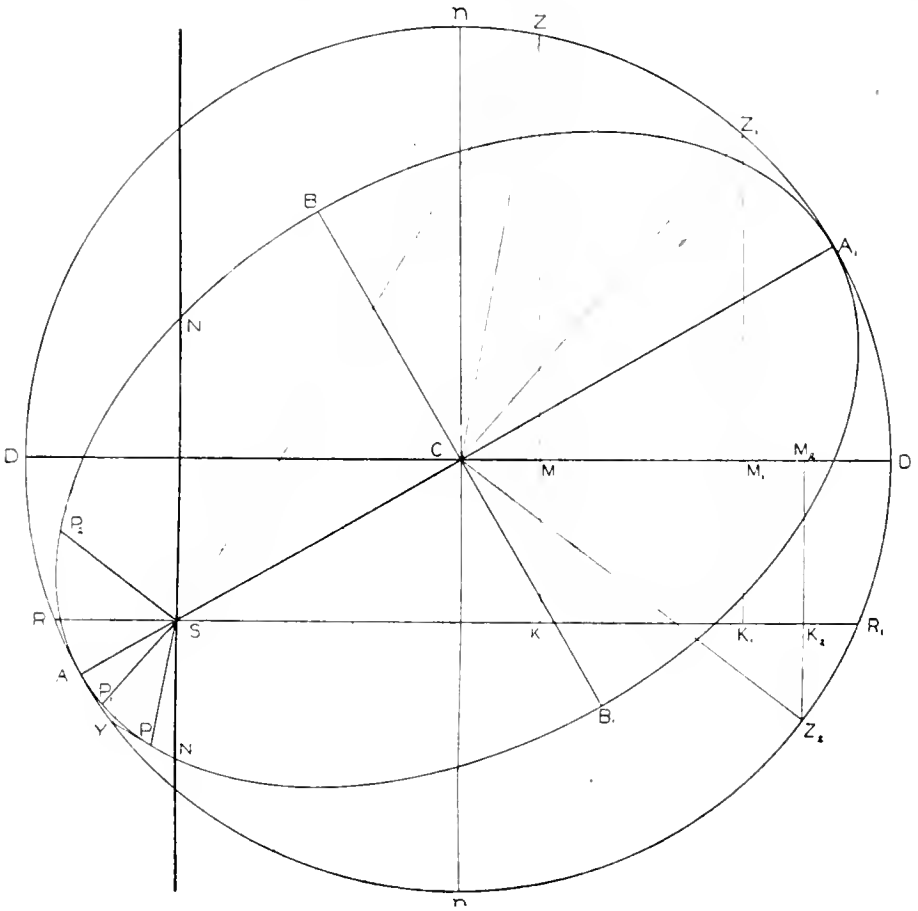

FIG. 1.

point Y will, by a property of the ellipse, fall on the circle $AZZ_1\,A_1$, described on the major axis as diameter. If h is twice the area described in the unit time, v the velocity of the body in its orbit (with reference to S considered fixed). And if we produce YS to meet the circle again in Z,

$$SY \cdot SZ = SA_1 \cdot SA = a^2\,(1 - e)^2.$$

Hence

$$v = \frac{h}{a^2(1 - e^2)} \cdot SZ\,.$$

SZ therefore is proportional to the velocity at P. It is perpendicular to its direction. Therefore the circle $AZZ_1\,A_1$ is the hodograph of the orbit, changed in scale in the ratio $1 : \dfrac{a^2(1 - e^2)}{h}$ and turned through a right angle.

Draw RSR_1 through S, and DCD_1 through the centre C, perpendicular to the line of nodes. Draw ZMK perpendicular to these two lines and cutting them in M

and K. Then ZK is proportional to that component of the velocity relative to S, which is perpendicular to the line of nodes and in the plane of the orbit. If the plane of the orbit is inclined to the line of sight at an angle $90° - i$, $ZK \sin i$ is proportional to the velocity in the line of sight.

Multiplying all the ordinates, as ZK, of the circle by $\sin i$, we evidently find for the hodograph of velocities in the line of sight an ellipse, of which the semi-major axis is proportional to CD or a, and the semi-minor axis to $a \sin i$.

It is to be observed that, by a property of the ellipse and the circle on its major axis CZ is parallel to SP. When, therefore, P proceeding from the ascending node has turned an angle u about the focus, the corresponding point of the elliptic hodograph has the eccentric angle u (counted from the minor axis). The velocity in the line of sight (still considering S at rest) is therefore

$$(ZM + MK) \sin i = a \sin i \cos u + MK \sin i.$$

This consists of a constant part $MK \sin i$ which is equal to $SM \sin i \cos \omega$ (ω denoting the longitude of the apse counted from the ascending node) or $ae \sin i \cos \omega$; and a variable part $a \sin i \cos u$.

Let us now conceive the scale of the figure to have been changed by multiplying all lines in it by $\frac{h}{a^2(1-e^2)}$; then the circle AZZ_1A_1 becomes the hodograph in the

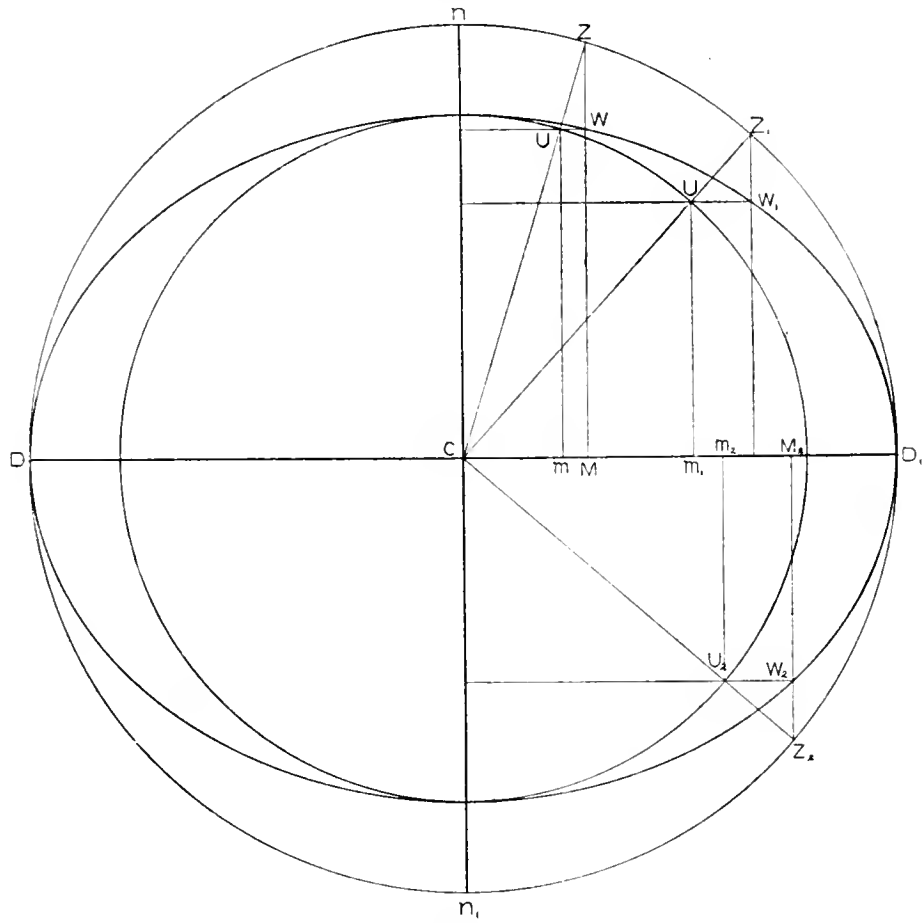

FIG. 2.

orbit, and the ellipse produced by multiplying the ordinates perpendicular to RSR_1 by sin i becomes the hodograph of observed velocities. Comparing this ellipse with the graph of observed velocities in the line of sight, we see (assuming that the observations are without error) that the two curves have the same ordinates but different abscissas; those of the graph being proportional to the time, those of the ellipse being proportional to the sine of the eccentric angle counted from the minor axis, that is, to the sine of the longitude (u) counted from the periastron.

Fig. 2 shows by the circle $AZZ_1 A_1$ the orbital hodograph, and by the ellipse $AWW_1 A_1$ the hodograph of the line of sight, having the ordinates MW, $M_1 W_1$, &c., equal to MZ sin i, $M_1 Z_1$ sin i, &c. Reduce all the abscissas of the ellipse in the same ratio, multiplying by sin i. Then the ellipse becomes the circle $UU_1 U_2$ described on the minor axis as diameter.

By consideration of the similar triangles ZMC, UMC, &c., it is seen that the new positions U, U_1 . . . . of the points W, W_1, W_2 fall on the straight lines joining C with Z, Z_1, Z_2, &c. Therefore the longitudes are unchanged, and the circle U, U_1, U_2, may be used as the equivalent of the hodograph of observed velocities. The problem is reduced to comparison of a circle with a curve in which the abscissas are proportional to the time.

The radius of this circle may be denoted by K. In terms of the elements of the ellipse

$$K = a \frac{h}{a^2(1-e^2)} \sin i = \frac{h \sin i}{a(1-e^2)} .$$

h is found from the periodic time U, for

$$h = \frac{2\pi a^2 \sqrt{1-e^2}}{U} .$$

$$\therefore K = \frac{2\pi a}{U\sqrt{1-e^2}} \sin i.$$

K is equal to one-half the difference between the maximum and minimum velocities in the line of sight. When this and e have been found with the desired precision, the value of $a \sin i$ follows from the above formula. Figs. 3 and 4 will serve to illustrate the application in practice of the foregoing principles.

First of all, the observed velocities having been plotted as ordinates with the times as abscissas, a free-hand curve is drawn approximately of the peculiar form of the theoretical curve, and passing through or near to the points representing the individual observations. The curves in the figures may be taken as representing more or less closely such a graph of observations. In the figures the curves have been drawn with exactness for two eccentricities, 0·75 and 0·10. A circle is drawn having for diameter the difference between the maximum and minimum ordinates, and having its centre on the line midway between the maximum and minimum points. This line, parallel to the axis of abscissas, may be called the central line of the curve.

The periodic time having been determined in the usual way, the abscissa-length corresponding to it is divided into any convenient number of equal parts, say 40; it should be an even number. The ordinates for these abscissas are placed in the circle, and the points so found in the circumference of the latter are marked. If the curve is of correct form, the points marked on the circumference will be found to lie at unequal distances from one another (except when the eccentricity of the orbit is zero), but these unequal distances will be found to vary uniformly. The points will be close together in the vicinity of one point of the circle, and will gradually separate as we proceed in either direction therefrom, until at the diametrically opposite point they reach their maximum distance apart. It is evident that the former point will correspond to aspastron, and that of widest separation to periastron.

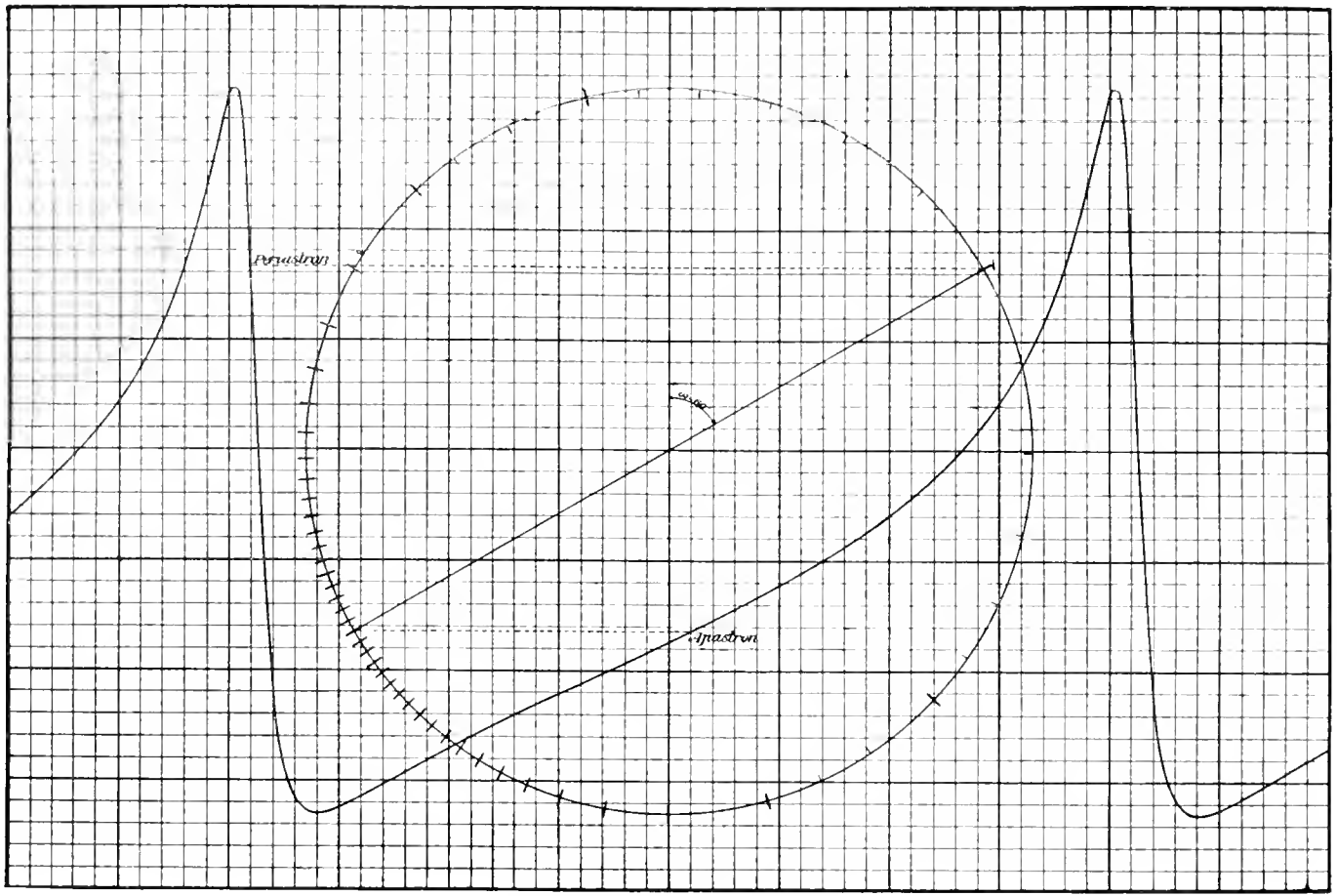

FIG. 3.—Graph for $e = 0{\cdot}75$, $\omega = 60°$.

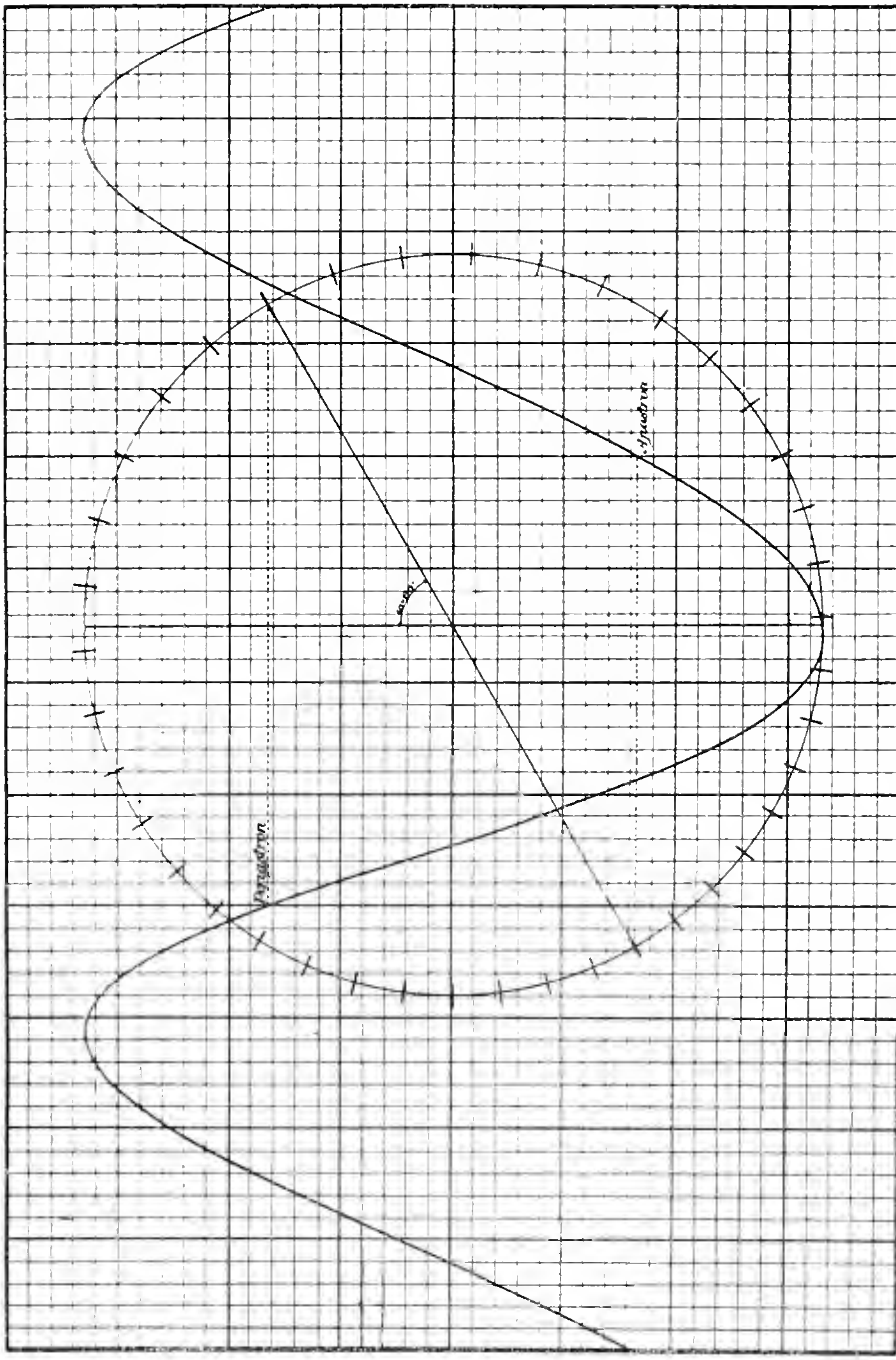

Fig. 4. Graph for $e = 0.10$, $\omega = 60°$.

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If it chances that one of the points of division of the line of abscissas corresponds to an apse, the divisions of the circumference will be equal at equal distances from the apsidal diameter. If not, they will not be equal on the two sides of this diameter, and the periastron will not coincide exactly with a division, but will lie within the greatest division of the circumference. Apastron similarly lies within the least division. We may, if we please, use the approximate positions of the apses thus found to set off our fortieths of the period along the line of abscissas from a new origin, whereby two of the points of the circle will more closely coincide with the apsidal points. In this manner, given a graph sufficiently near to the theoretical form, the position of the apsidal diameter may be determined and the angle which it makes with the axis of y measured with a protractor. This angle is the longitude (ω) of the apse.

It will be observed that this process furnishes a more thorough test of the accuracy of the graph than the method of equality of areas. If it is imperfect, the points on the circumference of the circle will not be distributed according to the regular order of increase or decrease of the included arcs. If an ordinate of the graph is too long or too short, the corresponding point on the circumference will be too near or too far from the vertical diameter.

If the points of maximum and minimum velocity have not been well determined, the diameter of the circle will be too long or too short. In the former case all the points on the circumference will be crowded away from the vertical diameter; in the latter, toward it. Since the arcs of the circle represent differences of longitude corresponding to the given intervals of time, and $\frac{du}{dt}$ varies inversely as the square of the distance from the focus, we have by measuring the lengths d and d_1 of the arcs at points whose longitudes from the periastron are θ and θ_1,

$$\frac{d}{d_1} = \frac{(1 + e\cos\theta)^2}{(1 + e\cos\theta_1)^2},$$

whence the eccentricity may be found, when the position of periastron is known. If we measure the arcs at periastron and apastron, we have

$$\frac{d}{d_1} = \left(\frac{1 + e}{1 - e}\right)^2.$$

In applying this method, it is usually sufficient to measure the chords instead of the arcs, as only an approximation is needed at this stage. If the eccentricity is so large as to so greatly increase the arcs near periastron that they may not be considered equal to their chords, additional points may be interpolated near periastron.

It is not advisable, however, to spend too much time on these preliminary processes, as it is hardly possible that the first graph should be drawn with sufficient accuracy to give a good final result. The approximate value of the longitude of the apse and the eccentricity is, however, needed for the construction of a better graph, or 'ephemeris.'

The process in use here of approximate determination of the elements and constructing an ephemeris is as follows: Using the analytical formulæ, the true anomalies corresponding to aliquot parts of the period of the binary are computed for any assumed eccentricity, and set off on the circumference of a circle, to be used as a protractor. A division of the period into 40 equal parts is in general convenient, though for high eccentricities a further subdivision must be made for the neighbourhood of periastron. The need for this is shown in Figs. 5, 6, and 7, which show protractors drawn for eccentricities 0·70, 0·75, and 0·80, respectively. The anomaly corresponding to one-fortieth of the period (or 9° of mean anomaly) is seen in Fig. 7 to be almost 90°. Intermediate lines near periastron have therefore been interpolated (shown dotted in the figures), dividing the one-fortieth next to periastron into 6 equal parts, each corresponding to 1°·5 of mean anomaly (this is found convenient

with the tables we use, which give the solution of Kepler's equation for every half-degree). The second interval from periastron has been divided into 3 equal parts (3° of mean anomaly).

In Figs. 8, 9, and 10, drawn for small eccentricities, 0·05, 0·10, and 0·15, respectively, the parts of the circumference are nearly equal throughout. A number of these protractors, on transparent celluloid, have been made here. After the ordinates of the curve have been transferred to the circle, and the circumference marked off, a choice among the protractors will show which one agrees most closely with the marked points, and thereby the values of the longitude of the apse and the eccentricity of the orbit are obtained. Tests here have shown that the eccentricity can thus be determined within 0·01 when the velocity-curve is accurately drawn. If not accurately drawn, no such close approximation is necessary.

To construct an ephemeris, given eccentricity e, apse longitude ω, range of velocity $2K$, and period U, proceed as follows:

Draw a circle of radius K. Draw its 'vertical' and 'horizontal' diameters, producing the latter to the length necessary for the period U, according to the time-scale adopted. Set the protractor, made for eccentricity e, with its centre over that of the circle, and its apsidal diameter making an angle ω with the vertical diameter. Plot the radial lines representing the anomalies corresponding to the divisions of the period upon the paper, noting their intersections with the circumference.

Having divided the line representing the period into a number of parts corresponding to the protractor, erect perpendiculars at these points of lengths equal to the corresponding ordinates of the circle. A free-hand curve drawn through the extremities of the ordinates gives the required curve or 'ephemeris.' If, as will usually happen, the observations are plotted and the graph drawn on cross-section paper, the procedure will be considerably shorter. Draw the circle of radius K on the same or a similar sheet, place centrally on it the transparent protractor with the periastron point at the proper longitude ω from the vertical diameter, and note the ordinates of the points of intersection of the circumference of the circle with the radial lines of the protractor. These ordinates can be at once placed on their corresponding abscissas without either drawing or measuring.

If a set of protractors, such as in use here for values of e differing by 0·05, is not available, an alternative procedure is to use an ordinary protractor to set off arcs of 10°, say, and then the abscissas of the time velocity curve may be made equal to the mean anomalies corresponding to true anomalies of every 10° around the orbit. This can easily be done with a set of tables, such as have been computed here, giving the parts of the period corresponding to true anomalies of every 10° for all values of e from 0 to 1, at intervals of 0·05.

When the ephemeris has been drawn, it may be redrawn to a different apsidal longitude in the manner following. In Fig. 11, draw CA and CB equal to the radius K of the generating circle, and including an angle (β) equal to that by which it is desired to change the apse-longitude. It is evident that if the point C be placed on the central line of the curve, and A on any point of the curve, the point D where the ordinate of A meets a line through B parallel to the axis of abscissas will be a point on the curve corresponding to an orbit, of the same eccentricity e, and apse-longitude $\omega + \beta$. For if the ordinate of A is $K \sin(\theta + \omega)$, θ being the true anomaly, that of D will be $K \sin(\theta + \omega + \beta)$, and the abscissa (the time) remains the same.

To decrease the apse-longitude, set B on the curve and find the point D_1 on the ordinate of B, such that AD_1 is parallel to the axis of abscissas.

In practice a curve may be converted very rapidly. Let the construction be made on cardboard. After drawing the lines CA and CB, describe a circle on AB as diameter. Cut this circle out of the cardboard, marking on its circumference the point A. Cut the cardboard so that there is a tolerably sharp point at C. If the curve has been drawn on cross-section paper, the intersection of the ordinate of A can be followed down by eye to its intersection with the circumference at D, and

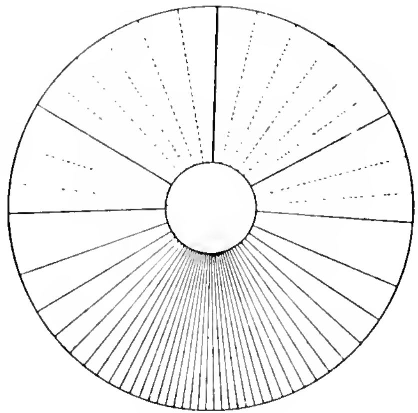

FIG. 5. $e=0.70$.

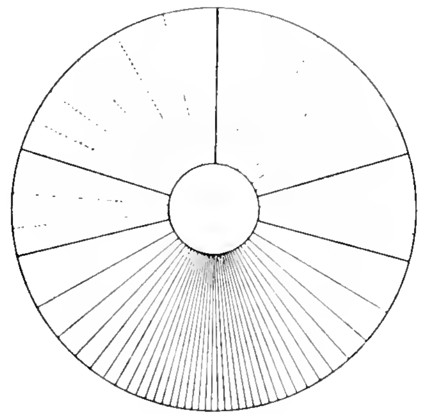

FIG. 6. $e=0.75$.

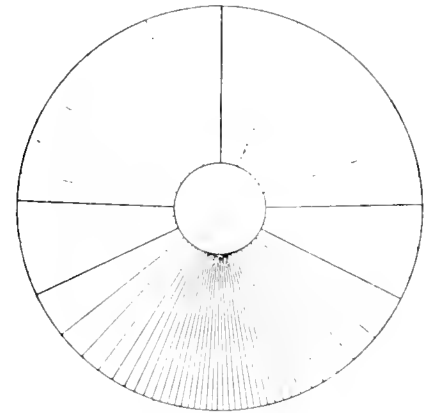

FIG. 7. $e=0.80$.

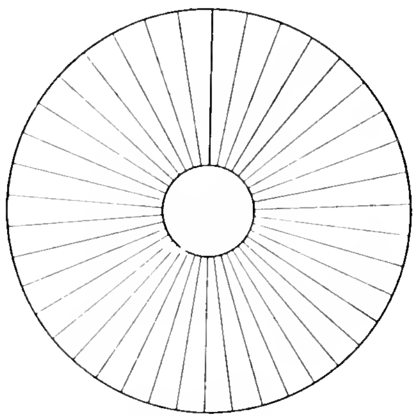

FIG. 8. $e=0.05$.

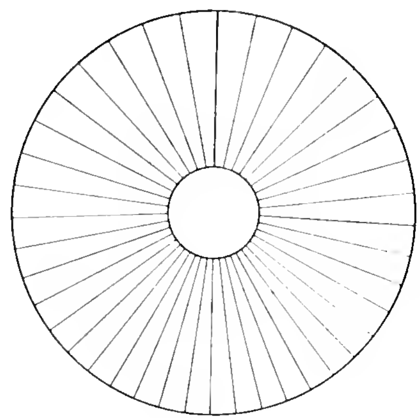

FIG. 9. $e=0.10$.

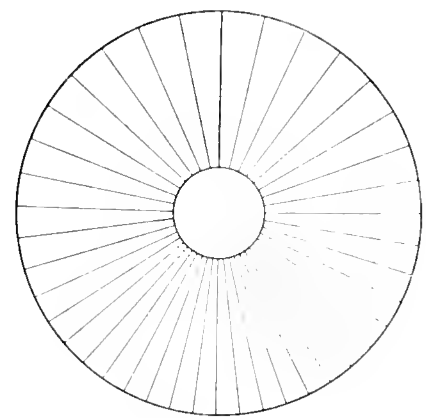

FIG. 10. $e=0.15$.

this point marked with a pencil. By operating thus with a number of points the curve can very rapidly be drawn to the changed apse-longitude.

If it is desired to change the scale of the velocities (i.e., the value of K) and the apse-longitude at the same time, this may be done by a slight modification of the construction above. Draw CA (Fig. 12) as before equal to K and $CB = K_1$ at an angle β with CA (to right or left according as increase or decrease of apse-longitude is

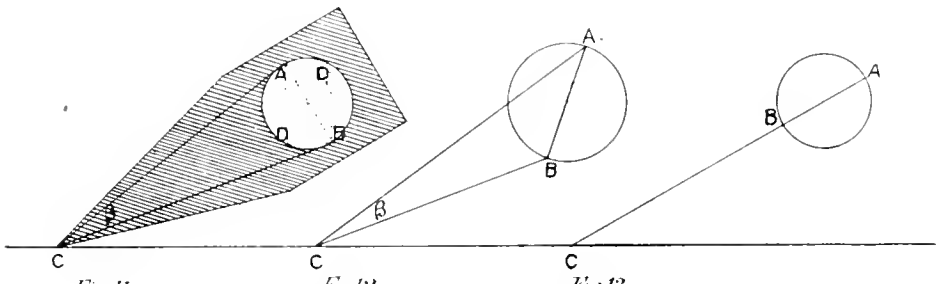

Fig 11 *Fig 12* *Fig 13*

required). Draw the circle on AB as diameter, and proceed as before to draw the amended curve.

If it is desired to change K to K_1 without changing ω, CA and CB are drawn in the same line (Fig. 13) and the circle is described on the diameter AB as before.

These constructions suggest another method of drawing an ephemeris.

Let a number of standard curves be drawn for different eccentricities, and for any convenient apse-longitude, which may be 0 or 90°, or have any other value. Such a curve will differ from the graph of the observations both in the scale of the abscissas and also in that of the ordinates, and in general in different ratios.

Both abscissas and ordinates may be reduced with the pantagraph to the scale of abscissas set by the length of the period of the binary, and then the further change of scale of ordinates to agree with that of the observed velocities may be made in the manner outlined above, and at the same time any required apse-longitude may be introduced. This method would have the advantage that the standard curve for a given eccentricity would need to be drawn but once, and therefore might be constructed very carefully. No convenient method of varying the eccentricity has yet been devised.

I wish to express my obligations to Mr. J. S. Plaskett for valuable assistance in preparing this paper for publication.

DOMINION ASTRONOMICAL OBSERVATORY,
January 31, 1908.

Since the above was published in the *Astrophysical Journal*, the following tables have been prepared. The first set contains the computed true anomalies for mean anomalies of every 9° around the orbit, with intermediate values in some places, used in constructing the protractors. The second set contains the fractions of the period corresponding to true anomalies of 10°. The former are computed for values of e between 0 and 1 at intervals of 0·05, the latter for values of e between 0 and 0·70 at intervals of 0·05 and between 0·70 and 1·00 at intervals of 0·025.

TRUE ANOMALY v.

M	e = ·05		·10		·15		·20		·25		·30	
	°	′	°	′	°	′	°	′	°	′	°	′
9	9	58	11	2	12	18	13	44	15	25	17	24
18	19	53	22	1	24	26	27	13	30	25	31	6
27	29	46	32	52	36	18	40	14	44	38	49	36
36	39	34	43	29	47	48	52	36	57	52	63	37
45	49	14	53	59	58	52	64	16	70	5	76	14
54	58	48	63	56	69	26	75	12	81	14	87	29
63	68	14	73	46	79	30	85	25	91	29	97	35
72	77	32	83	16	89	6	94	59	100	52	106	41
81	86	42	92	28	98	14	103	55	109	31	114	58
90	95	43	101	23	106	56	112	20	117	32	122	32
99	104	36	110	1	115	17	120	17	125	4	129	34
108	113	20	118	26	123	16	127	49	132	7	136	8
117	121	58	126	37	130	59	135	2	138	48	142	20
126	130	29	134	36	138	26	141	58	145	13	148	13
135	138	53	142	25	145	41	148	37	151	22	153	52
144	147	12	150	7	152	44	155	8	157	19	159	18
153	155	28	157	40	159	41	161	28	163	7	164	36
162	163	40	165	10	166	30	167	43	168	48	169	48
171	171	50	172	36	173	17	173	53	174	25	174	55
180	180	00	180	00	180	00	180	00	180	00	180	00
189	188	10	187	24	186	43	186	7	185	35	185	5
198	196	20	194	55	193	30	192	17	191	12	190	12
207	204	32	202	20	200	19	198	32	196	53	195	24
216	212	48	209	53	207	16	204	50	202	41	200	42
225	221	7	217	35	214	19	211	23	208	38	206	8
234	229	31	225	24	221	34	218	2	214	47	211	47
243	238	2	233	23	229	1	224	58	221	12	217	40
252	246	40	241	34	236	44	232	11	227	53	223	52
261	255	24	249	59	244	43	239	43	234	56	230	26
270	264	17	258	37	253	4	247	40	242	28	237	28
279	273	18	267	32	261	46	256	5	250	29	245	2
288	282	28	276	44	270	54	265	1	259	8	253	19
297	291	46	286	14	280	30	274	35	268	31	262	25
306	301	12	296	4	290	34	284	48	278	46	272	31
315	310	46	306	10	301	8	295	44	289	55	283	46
324	320	26	316	31	312	12	307	24	302	8	296	23
333	330	14	327	8	323	42	319	46	315	22	310	24
342	340	7	337	59	335	34	332	47	329	35	325	54
351	350	2	348	58	347	42	346	16	344	35	342	36
360	360	00	360	00	360	00	360	00	360	00	360	00

TRUE ANOMALY v.

M	e											
	·35		·40		·45		·50		·55		·60	
°	°	′	°	′	°	′	°	′	°	′		′
3	.....		7	38	8	49	10	29	12	17	14	52
6	.....		15	10	17	32	20	30	24	14	29	2
9	19	46	22	36	26	00	30	13	35	26	41	59
12	.....	.....	29	46	34	8	39	24	45	48	53	31
15	.....		36	42	41	50	47	58	55	10	63	35
18	38	23	43	22	49	10	55	52	63	35	72	23
21	.....		.....	.....	55	58	63	6	71	8	80	1
24	.....		.....	.....	62	22	69	46	77	55	86	42
27	55	10	61	24	68	18	75	50	83	59	92	36
36	69	54	76	37	83	46	91	14	98	55	106	44
45	82	43	89	28	96	22	103	22	111	35	117	16
54	93	53	100	20	106	48	113	11	119	28	125	32
63	103	41	109	43	115	38	121	25	126	59	132	22
72	112	23	117	56	123	18	128	28	133	24	138	8
81	120	12	125	14	130	4	134	40	139	1	143	12
90	127	18	131	49	136	7	140	11	144	1	147	41
99	133	50	137	52	141	38	145	12	148	35	151	46
108	139	54	143	26	146	46	149	50	152	46	155	31
117	145	36	148	40	151	30	154	10	156	40	159	2
126	151	00	153	35	155	59	158	14	160	22	162	20
135	156	10	158	18	160	17	162	7	163	52	165	30
144	161	8	162	50	164	24	165	52	167	14	168	31
153	165	59	167	14	168	24	169	30	170	30	171	29
162	170	42	171	32	172	19	173	2	173	43	174	20
171	175	22	175	47	176	10	176	32	176	53	177	11
180	180	00	180	00	180	00	180	00	180	00	180	00
189	184	38	184	13	183	50	183	28	183	7	182	49
198	189	18	188	28	187	41	186	58	186	17	185	40
207	194	1	192	46	191	36	190	30	189	30	188	31
216	198	52	197	10	195	36	194	8	192	46	191	29
225	203	50	201	42	199	43	197	53	196	8	194	30
234	209	00	206	25	204	1	201	46	199	38	197	40
243	214	24	211	20	208	30	205	50	203	20	200	58
252	220	6	216	34	213	14	210	10	207	14	204	29
261	226	10	222	8	218	22	214	48	211	25	208	14
270	232	42	228	11	223	53	219	49	215	59	212	19
279	239	48	234	46	229	56	225	20	220	59	216	48
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315	277	17	270	32	263	38	256	38	248	25	242	44
324	290	6	283	23	276	14	268	46	261	5	253	16
333	304	50	298	36	291	42	284	10	276	1	267	24
336	.....	.....	.....	.....	297	38	290	14	282	5	273	18
339	.....		.....		304	2	296	54	288	52	279	59
342	321	37	316	38	310	50	304	8	296	25	287	37
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348	.....		330	14	325	52	320	36	314	12	306	29
351	340	14	337	24	334	00	329	47	324	34	318	1
354	.....		344	50	342	28	339	30	335	46	330	58
357	.....	.....	352	22	351	11	349	40	347	43	345	8
360	360	00	360	00	360	00	360	00	360	00	360	00

TRUE ANOMALY v.

M	e = ·65		·70		·75		·80		·85		·90		·95	
°	°	′	°	′	°	′	°	′	°	′	°	′	°	′
1·5	.....		11	49	15	41	22	1	33	19	55	37	98	31
3	18	23	23	16	30	29	41	31	58	53	85	17	120	18
4·5	.....		33	58	43	40	57	26	76	37	101	18	130	10
6	35	22	43	49	55	7	70	8	89	4	111	19	136	10
7·5	.....		52	38	64	53	.....		.....		.....		.....	
9	50	13	60	34	73	12	88	16	105	12	123	30	143	28
12	62	48	73	49	86	25	100	25	115	20	130	58	147	59
15	73	20	84	20	96	23	109	11	122	26	136	10	151	11
18	82	11	92	50	104	8	115	50	127	46	140	6	153	38
27	101	34	110	44	119	56	129	10	138	25	147	59	158	40
36	114	34	122	19	130	00	137	35	145	11	153	4	161	56
45	124	4	130	43	137	12	143	38	150	4	156	46	164	23
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144	169	46	170	56	172	5	173	13	174	22	175	35	177	00
153	172	23	173	16	174	7	174	56	175	48	176	42	177	46
162	174	58	175	31	176	6	176	40	177	13	177	49	178	31
171	177	29	177	47	178	4	178	20	178	37	178	55	179	16
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189	182	31	182	13	181	56	181	40	181	23	181	5	180	44
198	185	2	184	29	183	54	183	20	182	47	182	11	181	29
207	187	37	186	44	185	53	185	4	184	12	183	18	182	14
216	190	14	189	4	187	55	186	47	185	38	184	25	183	00
225	192	58	191	28	190	1	188	35	187	7	185	35	183	48
234	195	46	193	56	192	11	190	26	188	40	186	48	184	37
243	198	43	196	34	194	26	192	23	190	17	188	2	185	28
252	201	50	199	19	196	52	194	25	191	58	189	23	186	22
261	205	12	202	16	199	25	196	37	193	47	190	47	187	19
270	208	49	205	28	202	12	198	59	195	44	192	18	188	20
279	212	49	208	59	205	14	201	35	197	52	193	58	189	28
288	217	18	212	56	208	40	204	29	200	14	195	48	190	41
297	222	28	217	26	212	35	207	47	202	56	197	53	192	5
306	228	31	222	47	217	11	211	40	206	6	200	19	193	42
315	235	56	229	17	222	48	216	22	209	56	203	14	195	37
324	245	26	237	41	230	00	222	25	214	49	206	56	198	4
333	258	26	249	16	240	4	230	50	221	35	212	1	201	20
342	277	49	267	10	255	52	244	10	232	14	219	54	206	22
345	286	40	275	40	263	37	250	49	237	34	223	50	208	49
348	297	12	286	11	273	35	259	35	244	40	229	2	212	1
351	309	47	299	26	286	48	271	44	254	48	236	30	216	32
352·5	.....		307	22	295	7	.....		.....		.....		.....	
354	324	38	316	11	304	53	289	52	270	56	248	41	223	50
355·5	.....		326	2	316	20	302	34	283	23	258	42	229	50
357	341	37	336	44	329	31	318	29	301	7	274	43	239	42
358·5	.....		348	11	344	19	337	59	326	41	304	23	261	29
360·0	360	00	360	00	360	00	360	00	360	00	360	00	360	00

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t IN TERMS OF θ.

Formula :—

$$t = \frac{1}{2\pi}\left[2\tan^{-1}\left\{\sqrt{\frac{1-e}{1+e}}\tan\frac{\theta}{2}\right\} - \frac{e\sqrt{1-e^2}\,\mathrm{Sin}\,\theta}{1+e\,\mathrm{Cos}\,\theta}\right]$$

θ	$e = 00$	$e = 05$	$e = 10$	$e = 15$	$e = 20$
10°	·02778	·02511	·02263	·02033	·01818
20°	·05555	·05030	·04539	·04081	·03653
30°	·08333	·07562	·06840	·06162	·05528
40°	·11111	·10117	·09178	·08293	·07457
50°	·13889	·12699	·11539	·10488	·09461
60°	·16667	·15314	·14014	·12765	·11566
70°	·19444	·17963	·16532	·15139	·13789
80°	·22222	·20662	·19132	·17627	·16151
90°	·25000	23409	·21822	·20243	·18677
100°	·27778	26200	·24507	·23000	·21380
110°	·30556	·29039	·27490	·25905	·24290
120°	·33334	·31929	·30473	·28966	·27407
130°	36111	·34862	·33552	·32180	·30740
140°	·38889	·37836	·36720	·35538	·34285
150°	·41667	·40861	·39965	·39027	·38030
160°	·44445	·43881	·43274	·42621	·41916
170°	·47222	·46936	·46626	·46291	·45927
180°	·50000	·50000	·50000	·50000	·50000
190°	·52778	·53064	·53374	·53709	·54073
200°	·55555	·56119	·56726	·57379	·58084
210°	·58334	·59156	·60035	·60973	·61970
220°	·61112	·62164	·63280	·64462	·65715
230°	·63890	·65138	·66448	·67820	·69260
240°	·66668	·68071	·69527	·71034	·72593
250°	·69445	70961	·72510	·74095	·75710
260°	·72223	·73800	·75393	·77000	·78620
270°	·75000	·76591	·78178	·79757	·81323
280°	·77777	·79338	·80868	·82373	·83849
290°	·80555	82032	·83468	·84861	·86211
300°	·83334	·84686	·85986	·87235	·88434
310°	·86112	87300	·88461	·89512	·90539
320°	·88890	·89883	·90822	·91707	·92543
330°	·91667	·92438	·93160	·93838	·94472
340°	·94446	·94970	·95461	·95919	·96347
350°	·97222	·97489	·97737	·97967	·98182
360°	1·00000	1·00000	1·00000	1·00000	1·00000

θ	e = ·25	e = ·30	e = ·35	e = ·40	e = ·45
10°	·01616	·01430	·01256	01094	·00944
20°	·03254	·02881	·02532	·02208	·01905
30°	·04931	·04372	·03849	·03360	·02905
40°	·06669	·05926	·05229	·04575	·03962
50°	·08489	·07569	·06698	·05875	·05101
60°	·10420	·09323	·08283	·07291	·06353
70°	·12484	·11226	·10017	·08858	·07752
80°	·14710	·13305	·11910	10816	·09340
90°	·17127	·15596	·14092	·12616	·11175
100°	·19762	·18140	·16522	·14915	·13322
110°	·22645	·20975	·19285	·17578	·15860
120°	·25800	·24140	·22432	·20678	·18880
130°	·29235	·27655	·26008	·24282	·22478
140°	·32955	·31544	·30040	·28441	·26735
150°	·36940	·35780	·34523	·33170	31697
160°	41154	·40324	39420	·38433	·37333
170°	·45532	·45500	·44624	·44098	·43513
180°	·50000	·50000	·50000	·50000	50000
190°	·54468	·54900	55376	·55902	·56487
200°	·58846	·59676	·60580	·61567	·62667
210°	·63060	·64220	·65477	·66830	·68303
220°	·67045	·68456	·69960	·71559	·73265
230°	·70765	·72345	·73992	·75718	·77522
240°	·74200	·75860	·77568	·79322	·81120
250°	·77355	·79025	·80715	·82422	·84140
260°	·80238	·81860	·83478	·85085	·86678
270°	·82873	·84404	·85908	·89384	·88825
280°	·85290	·86695	·88060	·89384	·90660
290°	·87516	·88774	·89983	·91142	·92248
300°	·89580	·90677	·91717	·92309	·93647
310°	·91511	·92431	·93302	·94125	·94899
320°	·93331	·94074	·94771	·95425	·96038
330°	·95069	·95628	·96151	·96640	·97095
340°	·96746	·97119	·97468	·97792	·98095
350°	·98384	·98570	·98744	·98906	·99056
360°	1·00000	1·00000	1·00000	1·00000	1·00000

θ	$e = \cdot 50$	$e = \cdot 55$	$e = \cdot 60$	$e = \cdot 65$	$e = \cdot 70$
10°	·00805	·00676	·00557	·00449	·00351
20°	·01626	·01367	·01128	·00938	·00712
30°	·02480	·02088	·01727	·01393	·01091
40°	·03392	·02858	·02367	·01913	·01501
50°	·04376	·03698	·03067	·02486	·01954
60°	·05467	·04635	·03856	·03134	·02470
70°	·06699	·05701	·04763	·03885	·03074
80°	08115	·06944	·05833	·04782	·03801
90°	·09775	·08421	·07118	·05877	·04703
100°	·11751	·10210	·08708	·07252	·05855
110°	·14137	·12415	·10706	·09020	·07371
120°	·17042	·15170	·13267	·11347	·09422
130°	·20593	·18630	·16583	·14458	·12260
140°	·24915	·22968	·20887	·18647	·16246
150°	·30091	·28330	·26389	·24234	·21825
160°	·36120	·34760	·33219	·31452	·29400
170°	·42855	·42110	·41263	·40231	·39015
180°	·50000	·50000	·50000	·50000	·50000
190°	·57145	·57890	·58737	·59769	·60985
200°	·63880	·65240	·66783	·68548	·70600
210°	·69909	·71670	·73611	·75766	·78175
220°	·75085	·77032	·79113	·81353	·83754
230°	·79407	·81370	·83417	·85542	·87740
240°	·82958	·84830	·86733	·88653	·90578
250°	·85863	·87585	·89294	·90980	·92629
260°	·88249	·89790	·91212	·92748	·94145
270°	·90225	·91579	·92882	·94123	·95297
280°	·91885	·93056	94167	·95218	·96199
290°	·93301	·94299	·95237	·96115	·96926
300°	·94533	·95365	·96144	·96866	·97530
310°	·95624	·96302	·96933	·97514	·98046
320°	·96608	·97142	·97633	·98087	·98499
330°	·97520	·97912	·98273	·98607	·98909
340°	·98374	·98633	·98872	·99062	·99288
350°	·99195	·99324	·99443	·99551	·99649
360°	1·00000	1·00000	1·00000	1·00000	1·00000

θ	$e = \cdot 725$	$e = \cdot 750$	$e = \cdot 775$	$e = \cdot 800$	$e = \cdot 825$
10°	·00307	·00263	·00224	·00185	·00151
20°	·00620	·00533	·00453	·00375	·00307
30°	·00951	·00816	·00695	·00576	·00471
40°	·01310	·01124	·00958	00794	·00650
50°	·01717	·01466	·01251	01038	·00850
60°	02161	·01860	·01588	·01320	·01082
70°	·02693	·02322	·01987	·01654	·01358
80°	·03340	·02886	·02475	·02066	·01700
90°	·04145	·03596	·03093	·02592	·02139
100°	05183	·04519	·03903	·03288	·02724
110°	·06565	·05762	·05007	·04246	·03540
120°	·08463	·07496	·06568	·05625	·04732
130°	·11138	·09986	·08858	·07691	·06558
140°	·14982	·13655	12318	·10902	·09476
150°	·20507	19090	·17610	·15996	·14300
160°	·28235	·26945	·25550	·23974	·22232
170°	·38310	37506	·36612	·35568	·34363
180°	·50000	·50000	·50000	·50000	·50000
190°	·61690	·62494	·63388	·64432	·65637
200°	·71765	·73055	·74450	·76026	·77768
210°	·79493	·80910	·82390	·84004	·85700
220°	·85018	·86345	·87682	·89098	·90524
230°	·88862	·90014	·91142	·92309	·93442
240°	·91537	·92504	·93432	·94375	·95268
250°	·93435	·94238	·94993	·95754	·96460
260°	·94817	·95481	·96097	·96712	·97276
270°	·95855	·96404	·96907	·97408	·97861
280°	·96660	·97114	·97525	·97934	·98300
290°	·97307	·97678	·98013	·98346	·98642
300°	·97839	·98140	·98412	·98680	·98918
310°	·98293	·98534	·98749	·98962	·99130
320°	·98690	·98876	·99042	·99206	·99350
330°	·99049	·99184	·99305	·99424	·99529
340°	·99380	·99467	·99547	·99625	·99693
350°	·99693	·99737	·99776	·99815	·99849
360°	1·00000	1·00000	1 00000	1·00000	1·00000

θ	$e = ·850$	$e = ·875$	$e = ·900$	$e = ·925$	$e = ·950$
10°	·00118	·00090	·00063	·00041	·00024
20°	·00240	·00183	·00129	·00084	·00044
30°	·00369	·00281	·00197	·00130	·00068
40°	·00509	·00388	·00273	·00179	·00094
50°	·00667	·00505	·00358	·00234	·00124
60°	·00850	·00649	·00456	·00299	·00158
70°	·01070	·00817	·00578	·00378	·00201
80°	·01342	·01026	·00729	·00478	·00255
90°	·01694	·01301	·00927	·00610	·00325
100°	·02170	·01673	·01198	·00791	·00427
110°	·02840	·02204	·01590	·01054	·00576
120°	·03841	·03006	·02195	·01475	·00814
130°	·05400	·04293	·03191	·02177	·01228
140°	·07984	·06496	·04963	·03479	·02032
150°	·12446	·10494	·08368	·06150	·03814
160°	·20226	·17958	·15280	·12165	·08399
170°	·32905	·31135	·28852	·25811	·21343
180°	·50000	·50000	·50000	50000	·50000
190°	·67095	·68865	·71148	·74189	·78658
200°	·79774	·82042	·84720	·87835	·91600
210°	·87554	·89506	·91632	·93850	·96186
220°	·92016	93504	·95037	·96521	·97968
230°	·94600	·95707	·96809	·97823	·98772
240°	·96159	·96994	·97805	·98525	·99185
250°	·97160	·97796	·98410	·98946	·99424
260°	·97830	·98327	·98802	·99209	·99572
270°	·98306	·98699	·99073	·99390	·99675
280°	·98658	·98974	·99271	·99522	·99745
290°	·98930	·99183	·99422	·99622	·99800
300°	·99150	·99351	·99544	·99701	·99840
310°	·99333	·99495	·99642	·99766	·99875
320°	·99491	·99612	·99727	·99821	·99906
330°	·99631	·99719	·99803	·99870	·99932
340°	·99760	·99817	·99871	·99916	·99955
350°	·99882	·99910	·99937	·99959	·99976
360°	1·00000	1·00000	1·00000	1·00000	1·00000

APPENDIX 7.

REPORT OF THE CHIEF ASTRONOMER, 1908.

THE GEODETIC SURVEY

BY

C. A. BIGGER, D.L.S.

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ILLUSTRATIONS.

APPENDIX 7.

REPORT OF C. A. BIGGER, D.L.S., ON THE GEODETIC SURVEY.

OTTAWA, ONT., August 5, 1908.

W. F. KING, Esq., B.A., LL.D.,
Chief Astronomer,
Department of the Interior,
Ottawa.

SIR,—As an introduction to a description of the geodetic work accomplished in Canada a short historical sketch may be of interest.

Geodetic surveys for geographical purposes have been in active progress in many countries for more than a century. Their inception was due to the advancement and development of scientific research. A more exhaustive and intelligent discussion of the size and figure of the earth became necessary in order that the disputes between scientific societies in the different European countries might be satisfactorily settled. The early history of geodetic work—prior to the beginning of the nineteenth century—is most interesting reading, but for the purpose of this report, may be passed over with a summary of its development.

The study of the size and figure of the earth is carried on by triangulation along arcs of meridians upon different portions of the earth's sphere, and necessarily includes astronomical observations for latitude and azimuth, thus supplying one of the two co-ordinates for mapping purposes. A desire for the comparison of results led to the connection of these triangulations transversely, which, together with the choice of a principal meridian, furnished the other co-ordinate called longitude.

The progress of civilization created a demand for accurate maps and the triangulations referred to, supplied stations of known latitude and longitude, thus bringing before the public the practical benefits of such work.

The earlier geodetic triangulations were for many reasons unsuccessful; no definite data as to the curvature of the earth's surface were derived therefrom, but the knowledge obtained served as an incentive to more work, and the rivalry between the countries more advanced in scientific knowledge became intense, especially in the fourth decade of the eigtheenth century. In 1735 and 1736 expeditions were organized by the French Academy of Sciences and their work in Peru and Lapland proved that the polar is longer than the equatorial degree of latitude.

Towards the latter part of the eighteenth century triangulations were in active progress in Great Britain and on the continent of Europe, and during the first decade of the nineteenth century the Great Triangulation Survey of India and the Geodetic Survey of the United States of America were commenced. The methods developed by these two surveys are recognized as the best modern practice.

BEGINNING OF THE GEODETIC SURVEY.

Up to the present, maps of eastern Canada have been compiled from the plans of township surveys, co-ordinated—in some instances—by railway surveys. When greater accuracy was desired, latitude and longitude observations were made at isolated stations. The requests for these astronomical stations became so frequent that it was deemed unwise to further postpone the beginning of a geodetic survey,

as geographical stations—determined by astronomical observations—are subject to the influence of the unequal distribution of gravity, and their displacement from this cause alone may amount to several hundred feet.

WORK OF 1905.

In 1905, the Chief Astronomer received the authority of the Minister of the Interior to commence a triangulation in the vicinity of Ottawa, and the writer was given charge of the work. On the 23rd day of July the first signal was erected on King mountain, about 9 miles northwest of Ottawa. (Plate 1.) An observing tower eighty-seven feet high was erected the same season near Bowesville, south of Ottawa. (Plate 2.) And a portion of the country between the Ottawa and St. Lawrence rivers was explored for the purpose of selecting angular points for the triangulation.

WORK OF 1906.

In 1906, nine towers of an average height of seventy-five feet were erected and reconnaissance extended east and west from Ottawa. Up to the end of 1906 the work was of a desultory nature owing to the small amount of money available for that purpose.

During the winter of 1906 and 1907, the writer and one assistant continued the reconnaissance east from the city of Ottawa across the southern portion of the province of Quebec as far as the southeastern boundary of that province.

WORK OF 1907.

In 1907 the Geodetic Survey of Canada was organized upon a somewhat more extensive scale and much work was accomplished during that season.

At the outset it was decided that the triangulation should be of the highest order of precision and the standard adopted, viz.: that the average summation of the three observed angles of each triangle should be within $180 + \epsilon = 1''$ has been attained as will be seen by the following table. That precision fully equal to that of the principal

Stations.	Observed angles.	Spherical excess.	Plane angles.	Sum.	Error.
Bowesville	43° 18′ 54″·42	−0″·41	54″ 01		
King Mountain	79 14′ 47″·36	−0 ·41	46 ·95		
Carp	57 26 18 ·96	−0 ·41	18 ·55	59″·51	0″·49
Bowesville	48° 25′ 00″·52	−0″·75	59″·77		
Montague	47 30 57 ·00	−0 ·75	56 ·25		
North Mountain	84 04 03 ·92	−0 ·75	03 ·17	59″·19	0″·81
Bowesville	30° 31′ 48″·89	−0″·36	48″·53		
North Mountain	71 05 28 ·88	−0 ·36	28 ·52		
Ormond	78 22 43 ·43	−0 ·36	43 ·07	00″·12	0″·12
Bowesville	74° 29′ 29″·25	−0″·55	28″·70		
Navan	59 41 56 ·67	−0 ·55	56 ·12		
Ormond	45 48 34 ·87	−0 ·55	34 ·32	59″·14	0″·86

geodetic surveys has been achieved is very encouraging, especially in view of the fact that the opinion has been often expressed, sometimes with assumption of authority, that Canadians, from want of experience, could not cope with the work, and that it would be necessary for the proper carrying on of a geodetic survey in Canada to resort to other countries for instructions in methods and even for the personnel of the survey. All the observers now on the staff are graduates of Canadian universities.

GENERAL REMARKS.

It was confidently expected that the experience of other countries would place geodetic operations beyond the experimental stage. As far as the perfection of angular instruments is concerned, those expectations have been realized. The angles of the triangles tabulated were measured with a twelve-inch, two-microscope, Troughton & Simms theodolite reading directly to seconds of arc, designed for the Great Trigonometrical Survey of India. Unfortunately, for the progress of our work, the adoption of apparatus for signalling—reported highly satisfactory in other countries—proved disastrous; it was found to be wholly inadequate to cope with the atmospheric conditions prevalent in eastern Canada. The Geodetic Survey of Canada has been undertaken for practical purposes, viz.: the establishment of geographic positions for mapping, and for the present is confined to the older and more thickly populated sections, without any regard to their suitability for primary triangulation. Much of this work in other countries is carried on solely for the purpose of adding to their scientific knowledge and the localities for measuring arcs of meridians and parallels of latitude are chosen after duly considering the physical and atmospheric conditions to be encountered.

Although for the present the public utility of the work is dominant, it is hoped confidently that our survey may eventually be used to add to the knowledge of the 'figure and size of the earth' and that in this respect the scientific work of Canada may not remain behind that of other countries.

DESCRIPTION OF METHODS ADOPTED.

The triangulation, by means of which a geodetic survey is spread over a country, is expanded through three, four, five and even six sided figures—from a base line the length of which is carried through the figures by means of the triangles into which they are subdivided. The computation consists of an equal distribution of station errors and an apportionment of the remaining errors of closure of the triangles by means of an elaborate least square adjustment having for its object the determination of the most probable values of the measured angles. In this connection the following extract from 'Instructions' issued to observers is of interest.

EXTRACTS FROM INSTRUCTIONS ISSUED TO OBSERVERS.

'The most important geodetic observations are those determining the angles between the lines radiating from the station occupied. The skill, patience and constantly watchful care of an observer entrusted with this portion of the work count for their full value. Office computations of the most refined and exhaustive nature can only make the best possible use of the material in the records of observations sent in from the field; they cannot in any way compensate unskillful or indifferent observations, as errors introduced in this way are to a large extent local, especially when the observations are made under unfavourable local atmospheric conditions.'

The unfavourable atmospheric conditions referred to above are also dealt with in 'Instructions to Observers' as follows:—

'Observations in connection with primary triangulation for determining geographic positions must not be made when unfavourable atmospheric conditions exist. When the tests outlined by these instructions show that they may be made with confidence, observers and their assistants are expected to continue their work to the limit of physical endurance, that is, to that stage when personal equation becomes a variable. A pencil of light many miles in length near the surface of the earth is subjected to local atmospheric influences which will cause deflections uncertain in magnitude and direction, and, owing to the diversity of conditions along the lines of sight radiating from a trigonometrical station, the amount and trend of these local disturbances are impossible to estimate. A careful study of the physical

features along the lines of sight will enable the observer to reach fairly accurate conclusions as to where such deflections may be expected. The pencil of light in its passage from a distant heliotrope or lamp to the observer's telescope encounters atmosphere varying in temperature and density governed by adjacent hills, masses of timber or low-lying cultivated levels. 'When the line of sight is from hilltop to hilltop high above the intervening country, the conditions are most favourable, but if a hill rises on one side of the line, lateral displacement must be expected especially if wind is blowing from the hill across the line. When there is wind blowing towards the hill, pointings may be made with confidence.'

'Day observations of primary directions are not desirable, but during the autumn months they may be made when conditions appear favourable. For your guidance in this respect and as a criterion at all times, you are instructed to proceed as follows:—

'Direct your telescope to a distant heliotrope or lamp—preferably along the most unfavourable line—and observe carefully for not less than ten minutes, the action of the image. If the vibration is rapid and uncertain as to direction, but symmetrical in magnitude and covering a small area, careful bisections of this area may be made with confidence, but if you observe the image move slowly to one side and return with similar deliberation—even though the movement may appear uniform—your pointings would be of no value for primary work.'

Instructions embodying the principles governing the Geodetic Survey of Canada are in the hands of all observers. They are the measure of the standard of accuracy adopted, and their preparation has been influenced by a desire that the work should be as distinctly Canadian as possible. Extracts from these instructions are used for purposes of illustration, and also for the better understanding of this report.

DESCRIPTION OF METHODS ADOPTED—RESUMED.

Returning to the description of the form of the triangulation, the figures are so arranged that the computations of the sides may be made through at least two series of triangles. This is accomplished by central stations in the triangles as well as the five and six sided figures. The diagonals of the quadrilaterals forming two triangles upon the same base are observed. The strength of the figures is measured by the relationship between the angles opposite the given and required sides of the triangles composing them.

Assuming the probable error of an angle to be one second of arc, the uncertainty in length caused by that error, as indicated in the sixth decimal place of the logarithmic sines of the angles used in the computation, may be conveniently tabulated for use in the field. In Canada we have secured the best possible figures on the ground to be covered, always having in view the public utility of the survey, as measured by the number of geographical positions determined. The physical features of Canada are not suitable for the formation of geodetic figures upon rigid mathematical principles, but up to the present no difficulty has been experienced, probably owing to the thoroughness of the reconnaissance survey.

The field parties employed during the season of 1907 were as follows:—

One signal building party, consisting of a foreman, assistant foreman and five men to build signal towers.

One observing party, consisting of one observer, one recorder, one cook and eight light-keepers, to observe the angles of the triangles.

Two levelling parties, of one observer, one cook and four men each.

In addition to the above, two assistants were employed on reconnaissance for the purpose of extending the triangulation southwesterly towards Toronto.

SIGNAL TOWERS.

The erection of the high towers at the angular points to overcome the timber is most tedious and laborious. The plan adopted for these structures is a modification of one designed by Sergeant Beaton, of the Royal Engineers of England (see Col. Clarke's Geodesy, page 181). The towers of the present day are of much smaller timber, but owing to the stress introduced and the general form of construction, are more rigid than the older and more expensive structures. They consist of a tripod upon which the theodolite is mounted and a scaffold insulating the observer's weight from the instrument.

The main objections to high tripods are their unsteadiness in wind and liability to torsion caused by unequal heating of the members during the day, followed by cooling at night. The former has been largely overcome by use of sway braces to stop vibration set up by the diagonals, and the latter by using dry timber throughout, the lumber being cut and stored at a central point a year ahead of the construction party.

The building party of 1907 made good progress and at the end of that summer all the towers between a line joining Covey Hill and Montreal—to the east—and Pakenham and Edwardsburgh to the west, (see map accompanying this report)—were completed. Six towers were also built for the purpose of extending the United States Lake Survey from Lake Erie across the Niagara escarpment and Lake Ontario to Toronto, for the purpose of establishing geographical positions for maps under preparation by the Department of Militia and Defence.

The manner of erecting these towers is fully illustrated by plates from photographs taken at the different stages. This system is used for towers as high as eighty-seven feet. The sections above that height are raised from the ground by block and tackle. The highest tower erected to date is one hundred and two feet from the ground to the lamp stand. Towers of this height are at Maxville, Westport, Binbrook and Grand River. The largest timber in their bottom sections is seven by seven—the central sections six by six and the top sections five by five inches. They are apparently as rigid as the lower towers and perfectly satisfactory in every way. Nothing larger than six by six inches is used in the towers eighty-seven feet high. The following is a table of the number of feet, board measure, in the different heights of towers:—

	Feet B.M.
102-foot tower	6,200
87 "	4,600
77 "	4,200
67 "	3,300
47 "	2,200

THE OBSERVING PARTY.

During the season of 1907 a twelve-inch Troughton & Simms theodolite with two micrometers reading to single seconds was used for measuring the angles (see plates 8 and 9), and what is known as the direction method was adopted. The routine is as follows: The most prominent station visible from the observer's tower is chosen to be used as an initial. The telescope is pointed on this station and then on all the other stations in rotation around the horizon clockwise, until the station preceding the initial is reached. The instrument is reversed upon this station and pointings made in the reverse order back to the initial. The micrometers are read forward and backward in conjunction with each pointing. Assuming that twisting—or torsion—of the high tripods is regular and the pointings made at equal intervals of time, the mean of the pointings will be free from any error from this source.

A determination of the angles at a station consists of sixteen pairs of pointings upon each signal. The zero on the azimuth circle for the pointings upon the initial is moved eleven degrees or thereabouts at the beginning of each set. The pointings

in the day time are made upon heliotropes, and at night upon eight-inch acetylene reflectors in charge of men trained for that purpose. The observer instructs the light-keepers by means of the Morse alphabet and a pre-arranged code of signals.

The determination of the direction of each line involves thirty-two telescope, and one hundred and twenty-eight micrometer pointings. Special precautions have been taken to avoid errors in the micrometer pointings caused by imperfect filling of the graduations. In this connection the following is an extract from the 'Instructions to Observers':

'The illumination of the graduations on the azimuth circle must be sufficient to counteract side reflections. You are directed to use artificial light at all times and to arrange the reflector so that the electric hand lamp may be held parallel to the graduations and the light reflected therein so as to illuminate both its edges equally. The reflectors are to be adjusted in position before commencing work and must not on any account be moved, during the progress of an evening's pointings.'

Owing to the prevalence of high timber on the ridges in Ontario, the lines of sight invariably pass close to the tree tops, so that the atmospheric conditions are extremely unfavourable for geodetic work.

PRECISE LEVELS.

Two precise level parties were employed during 1907. The lines levelled followed the main line of the Canadian Pacific Railway from Sherbrooke to St. Johns, with branch lines along the Grand Trunk Railway from Lennoxville and St. Johns; on the Canadian Pacific Railway from Foster, and the Central Vermont Railway from Farnham; south to the international boundary, and also along the Grand Trunk Railway from Lacolle Junction to Coteau Junction. The methods adopted are similar to those of the United States Coast and Geodetic Survey, and are without any special features of interest. The permanent bench marks are copper bolts in the masonry of the culverts and bridges of the railway. They will be described in our next report, which will contain the results obtained during 1907 and 1908. The progress of the work has been hampered by the insufficiency of the optical parts of the instruments in use, necessitating short sights in order to obtain perfect definition. The limit of error allowed is $0'.017\ \sqrt{M}$, 'M' being the distance in miles. New instruments have been ordered from Messrs. Cooke & Sons, York, England. Much delay in their manufacture has been caused by the specification requiring the use of an alloy of thirty-six parts nickel and sixty-four parts iron for the telescope tubes and base castings and an alloy of like proportions of nickel and steel (called Invar) for the more important parts such as level tubes and mounts, the telescope draw tubes and the diaphragms carrying the reticules and their adjusting screws. The new instruments will be in use shortly and owing to the increased optical efficiency more rapid progress will be made, since speed in levelling is regulated largely by the length of the sights.

During the winter of 1907 and 1908 reconnaissance surveys were carried on in western Ontario, central Ontario and in the province of Quebec. A progress map is submitted showing the work accomplished to date. The solid lines join the towers which have been occupied by the observing parties, the dash and dot lines, the towers built but not occupied, and the dotted lines the points selected for towers to be built this season. These latter points are, of course, subject to revision as the work progresses.

A much more comprehensive and extensive scale of operations has been inaugurated for the present season of 1908. Two observing parties are in the field extending the observations both east and west; an examination of the map will show the work accomplished to date—indicated by the solid lines. This season has been extremely unfavourable for observing. The prevailing low barometer allows the smoke of the cities to spread out over the surface, effectually preventing the use of instruments on the longer lines of the triangulation.

The instructions for 1908 require the observers to close the circle, that is, to reverse on the initial station instead of on the next preceding one. This enables them to form a more accurate estimate of their work as they proceed. It also discloses any twisting of the tripods. As far as the results up to the present are concerned there is no indication of torsion, the closing of the circle upon the initial seldom being more than two-tenths of a second more or less than 360°.

The permanent station marks in earth are as follows: An underground mark consisting of a six-inch glazed sewer tile, twenty-four inches long, on end, flange down, in an excavation two feet square and six feet deep is placed under the instrument point. This pipe and the surrounding space is filled with concrete up to the top of the pipe and a copper bolt six inches long and three-sixteenths of an inch in diameter, dull pointed at top, placed therein, centered under the instrument point. Over this and separated from it by a layer of sand, six inches thick, a surface mark of the same nature is imbedded in earth instead of concrete. The top of this latter mark is eighteen inches below the surface. In addition to the underground marks an artificial stone monument is erected, usually upon the nearest limit between township lots. Upon the base of this monument a copper plate will be placed showing the latitude and longitude of the monument. The azimuth and distance from the station mark to the monument will be published as part of the description of the station.

On mountain tops, or where solid rock occurs, the geodetic point is marked by a round copper bolt, three-quarters of an inch in diameter, 'fox-wedged' and leaded in the rock, surrounded by an equilateral triangle with eight-inch sides, cut with a chisel.

The top of the bolt is stamped with the official die of the Geodetic Survey of Canada as follows:—

Three other copper bolts the same size, at the points of arrows indicating by their direction the central point are placed around the station as reference marks.

Signal building is also progressing more rapidly this season. Two parties (in all eleven men) are at work in central Ontario making rapid and satisfactory progress, and it is confidently expected that all the towers included in the triangulation outlined on the map herewith will be completed by the 15th November. A small party of three men are preparing the stations east of the line joining Montreal and Covey Hill. Their work at the primary stations consists of placing the copper bolts, building lamp stands and preparing three concrete foot blocks for the legs of the tripod of the twelve-inch instrument to rest upon. At some of the stations it may be necessary to build towers. One of the party has been trained in that branch of the work, and with the aid of two additional men, hired temporarily, they can build a tower any height required. The officer in charge of the party in the mountainous districts has been instructed to avoid tower building as much as possible, as it is more economical to clear away the timber.

In addition to the preparation of the primary stations this party is putting in a number of secondary stations at points previously occupied by officials of the Department of Militia and Defence. Their connection with the primary stations, as well as their usefulness for defining the positions of church spires, factory chimneys or other prominent objects of a semi-permanent nature are deemed of importance. No towers are built over secondary stations, and the ordinary tripod signal for day observing is erected instead of a lamp stand for night work. This party is also entrusted with revision of reconnaissance.

PRECISE LEVELS—RESUMED.

During 1908 two levelling parties are in the field, one extending the levels from Sherbrooke along the line of the Canadian Pacific Railway to the international boundary, and the other along the Grand Trunk from Coteau to St. Polycarpe Junction thence along the Canadian Pacific Railway via Kemptville Junction to Prescott, thence westerly along the main line of the Grand Trank Railway. They are making good progress but their efficiency will be much greater when they are supplied with the new English levels referred to. We are indebted to the Boston and Maine, Grand Trunk and Canadian Pacific Railways for permission to use hand-cars on their roads.

BASE LINES.

A base line has been selected at Coteau Junction. It follows the centre line of the right-of-way of the Grand Trunk Railway's main line. Its length is about eight miles and its northeasterly extremity is about two miles east of Coteau Junction and the southwesterly terminus, a short distance west of River Beaudette station. The measurement of the base has been deferred until the completion of the standardizing building at the observatory, in order that the iced bar apparatus may be used therein. Invar tape lines fifty metres long will be used for the field work, and their length referred to a comparator measured by the iced bar apparatus in the standardizing building. 'Invar,' the new alloy of sixty-four parts of steel and thirty-six parts of nickel, is a great boon to geodetic work. Its temperature coefficient is so small that it may be used without the uncertainty of results due to the difficulty of ascertaining the mean temperature of the sections of a long ribbon of steel. Base lines from which geodetic triangulations are expanded, are now, owing to the increased facilities for their measurements, introduced at more frequent intervals, preferably at the junction of comparatively weak figures with those of great strength. For the purpose of our work in Canada it is considered better practice to select the sites for the base lines after the observing towers for the main figures are built, so that the expansion may be as direct and perfect as can be secured throughout the system. The absolute length of a base line is, in the opinion of the writer, of minor importance when compared with the strength of the geometrical figures through which this measurement is carried and with the determination of their angles; an error in the length of a base line produces no distortion. Every possible precaution is exercised in the field and the 'Instructions to Observers' are intended to be exhaustive in this respect. As the measurement of angles progresses, the positions of church spires, brick factory chimneys or other structures of a semi-permanent nature are determined with sufficient precision for geographical purposes. Zenith distances are measured to the tops of towers in order that their relative elevations may be known. Precise level lines will be connected with the towers at convenient points in order that with the aid of the zenith distances measured, the height of the geodetic stations above the level of the sea may be computed.

In conclusion, I desire to acknowledge the zeal and faithfulness of my staff of assistants. Those who have been entrusted with the control of the different branches of the survey have displayed an amount of pride in their work, certain to secure the very best results. The Geodetic Survey of Canada is in every sense a national undertaking, and it is our aim to make the work a credit to our country.

I have the honour to be, sir,
Your obedient servant,

C. A. BIGGER.

25a—31

FIG. 1.—Signal on King Mountain.

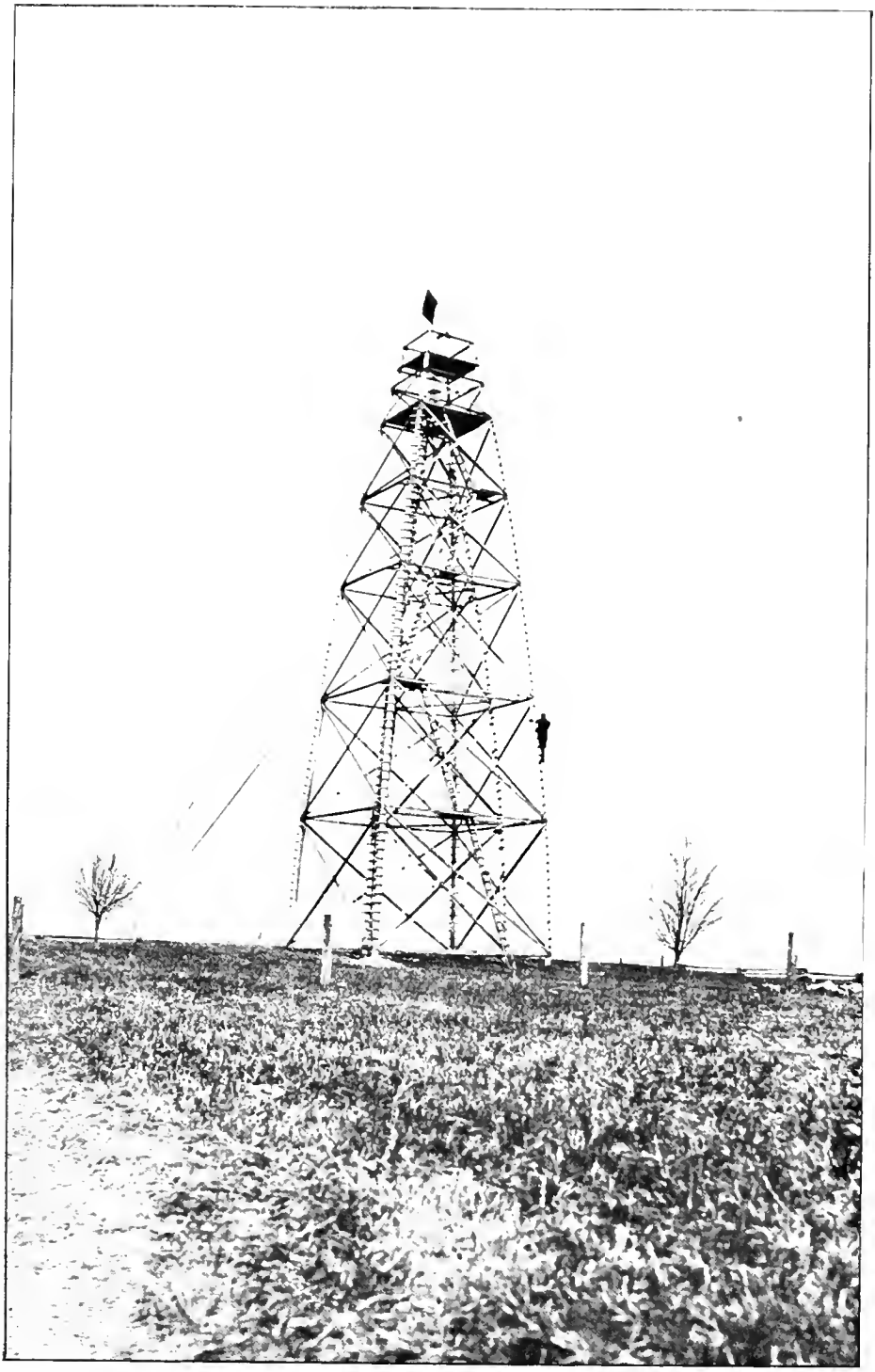

Fig. 2—Observing Tower, eighty-seven feet high, near Bowesville.

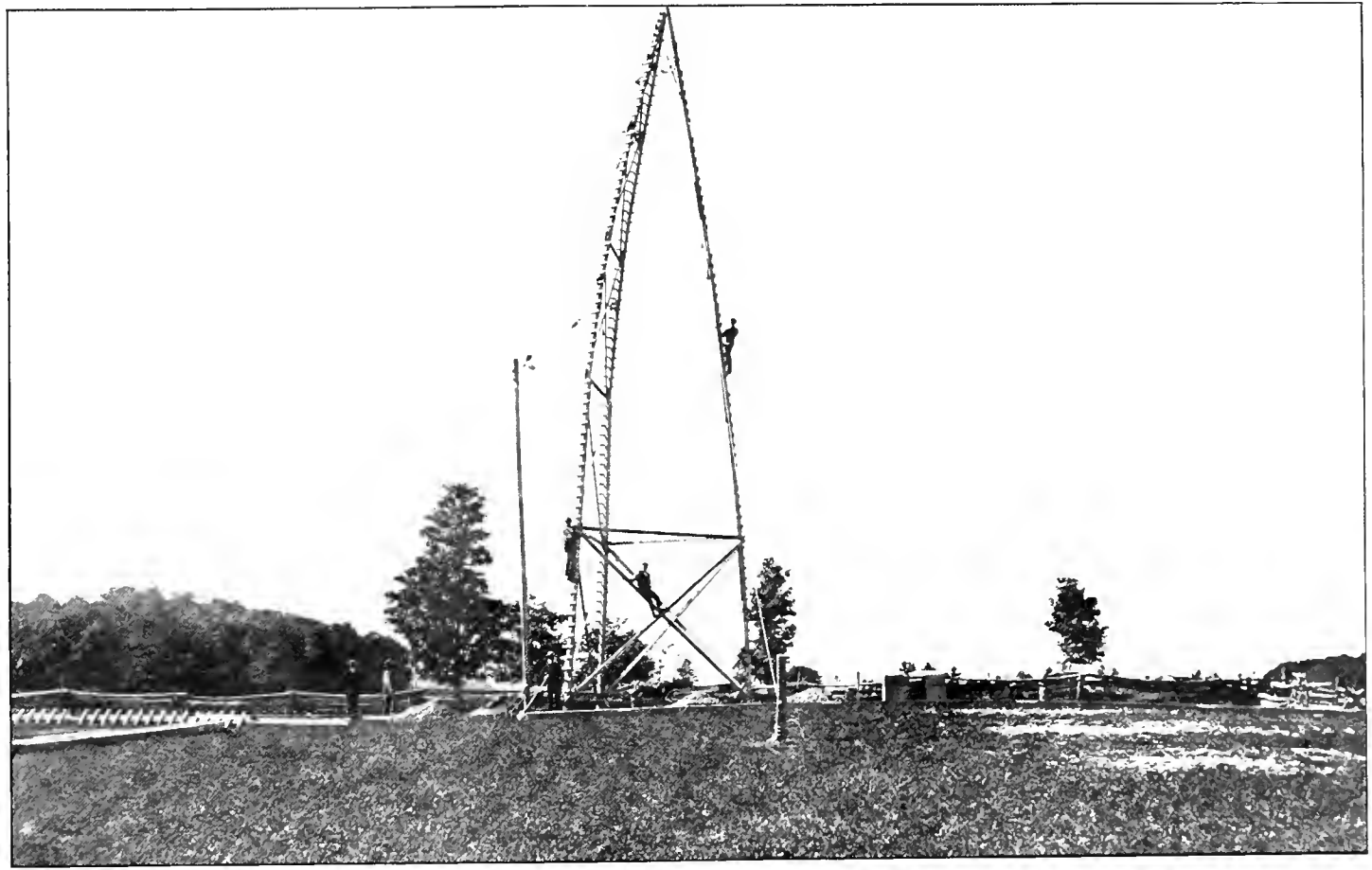

FIG. 3—Manner of erecting eighty-foot tripods.

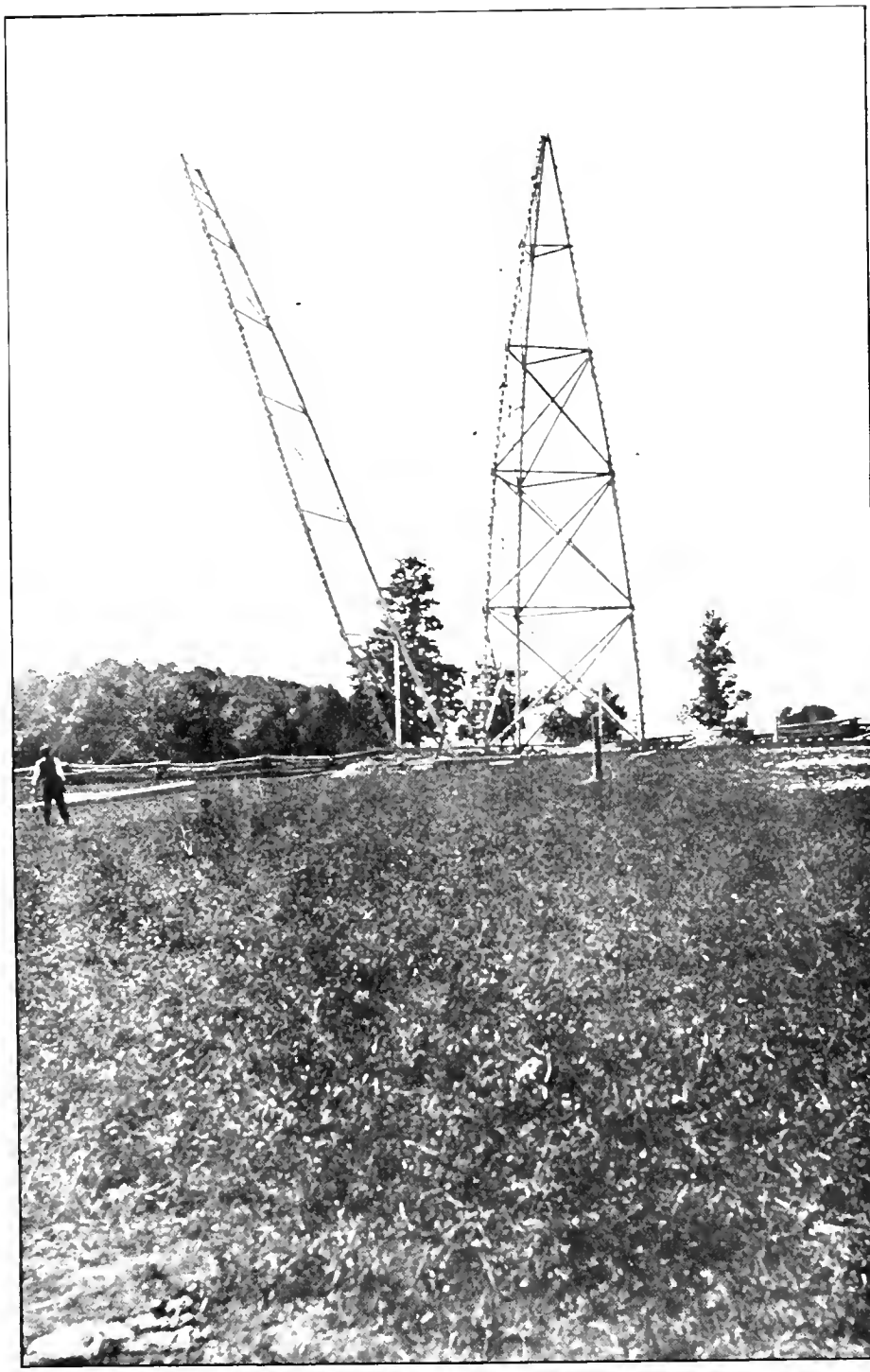

Fig. 4—Using tripod as a derrick to raise first side of scaffold.

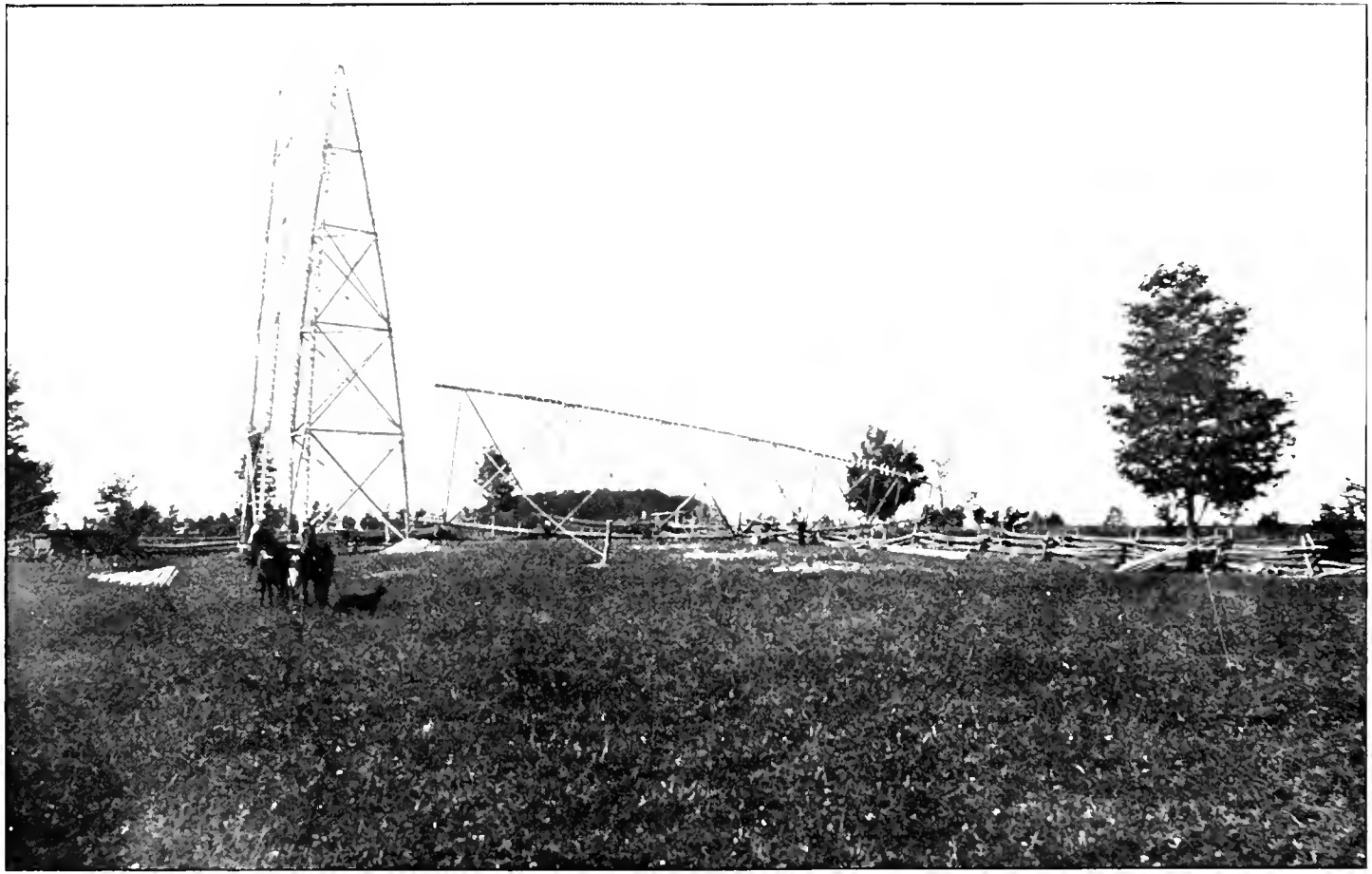

Fig. 5—Turning side of scaffold on the ground before raising.

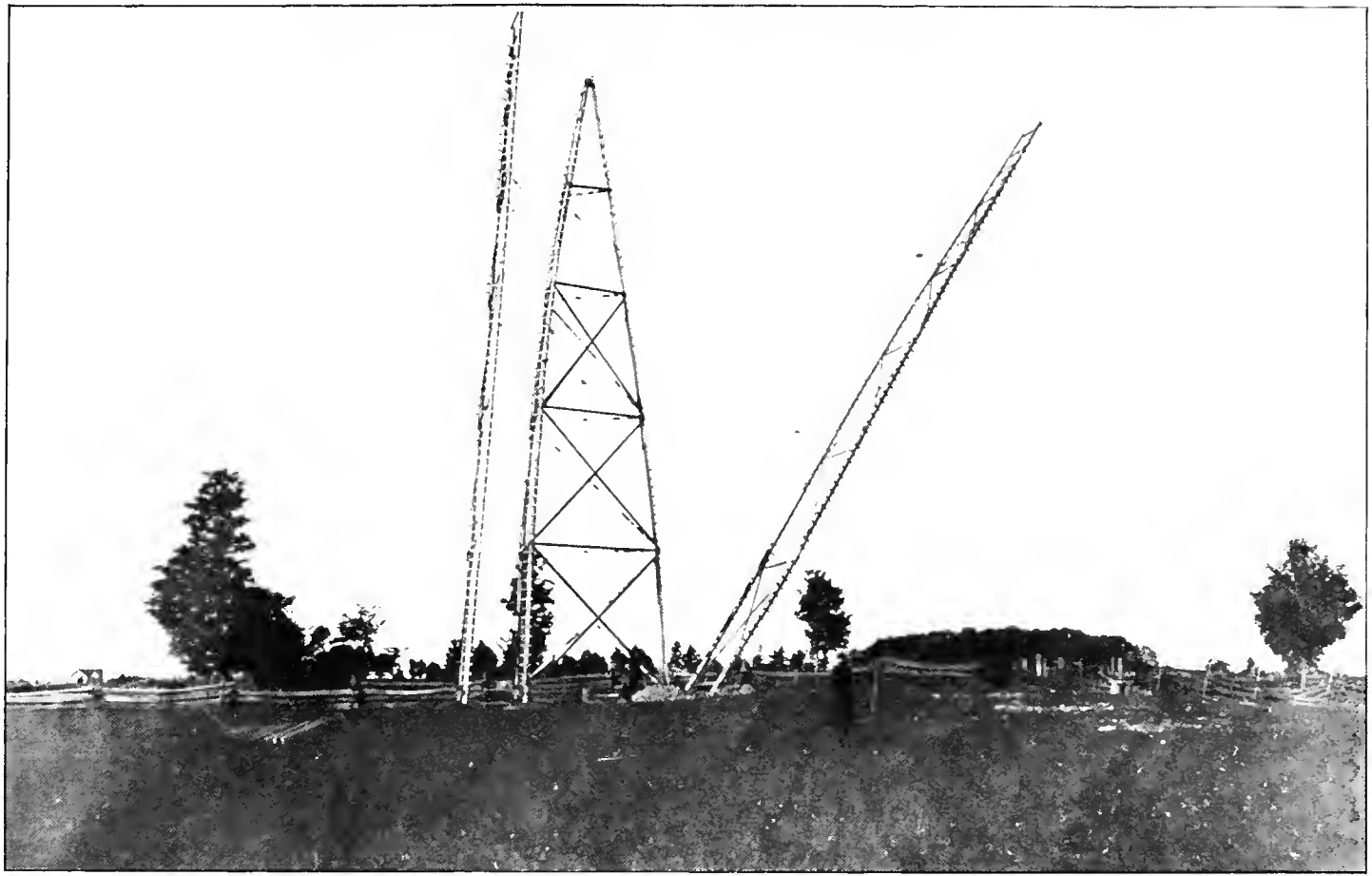

FIG. 6—Raising second side of scaffold.

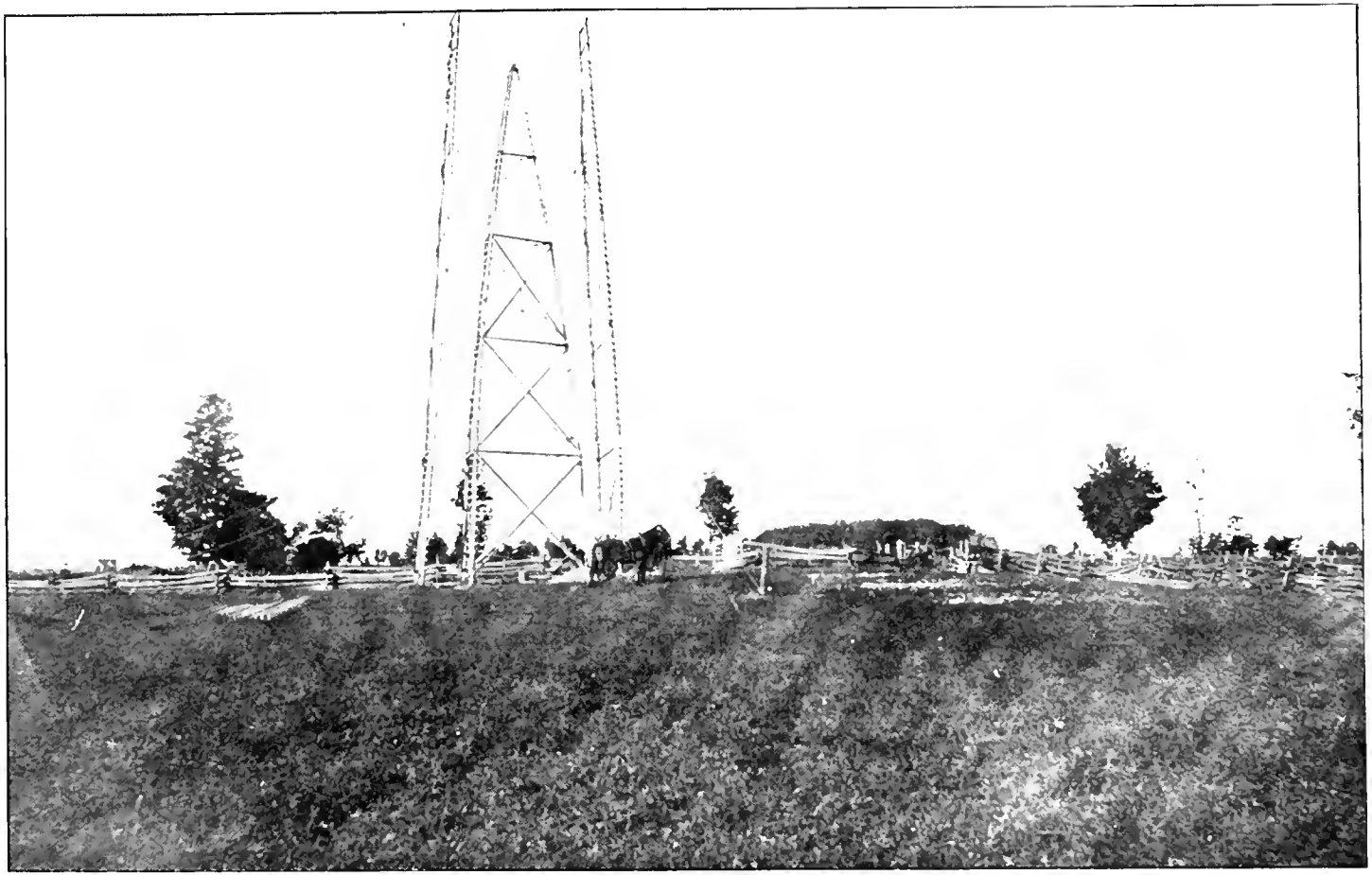

Fig. 7—Both sides of scaffold in place ready for spiking on ties and diagonals to complete the tower.

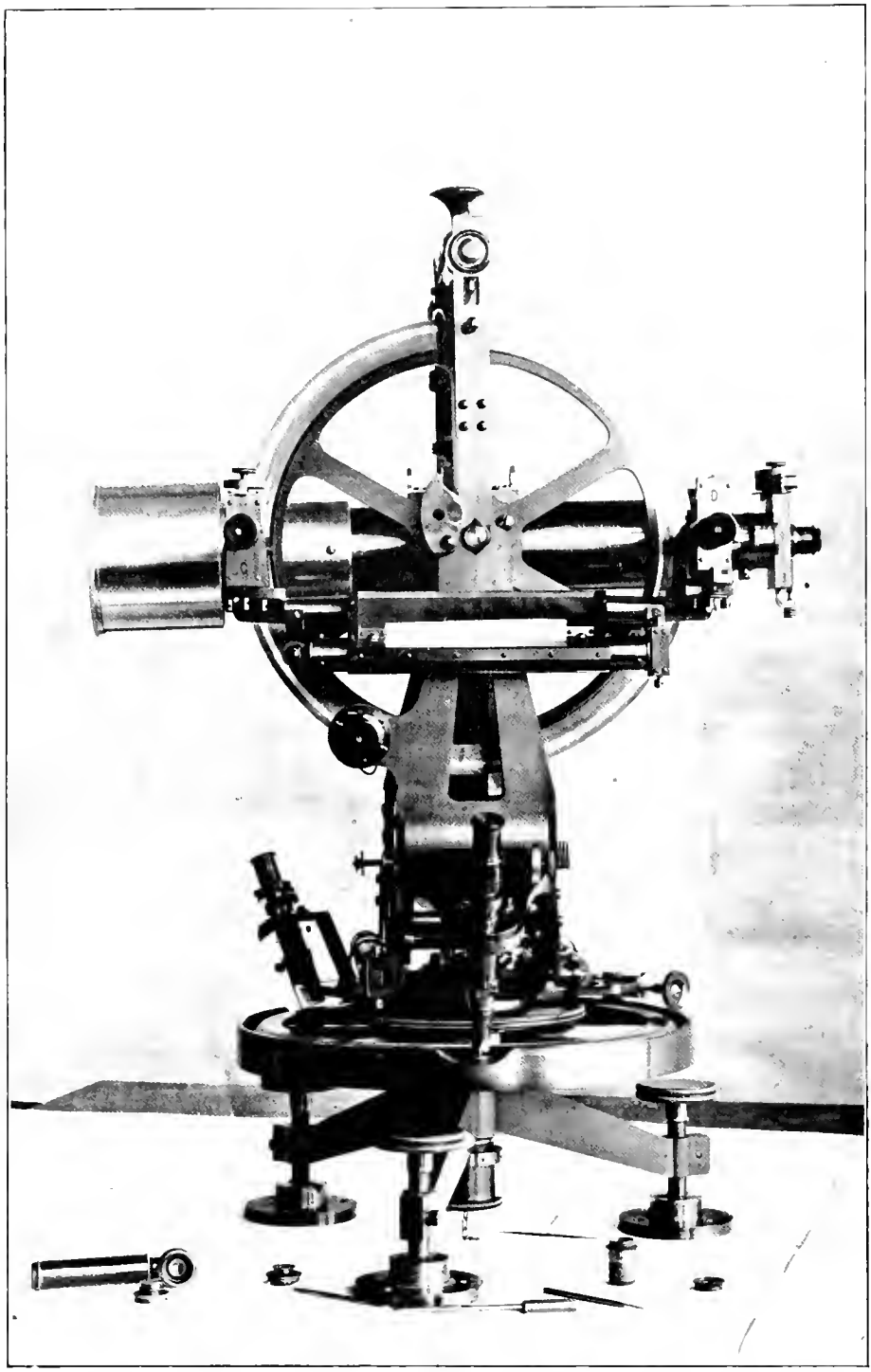

Fig. 8.—Side view of 12-inch Alt-azimuth Theodolite used for measuring horizontal and vertical angles.

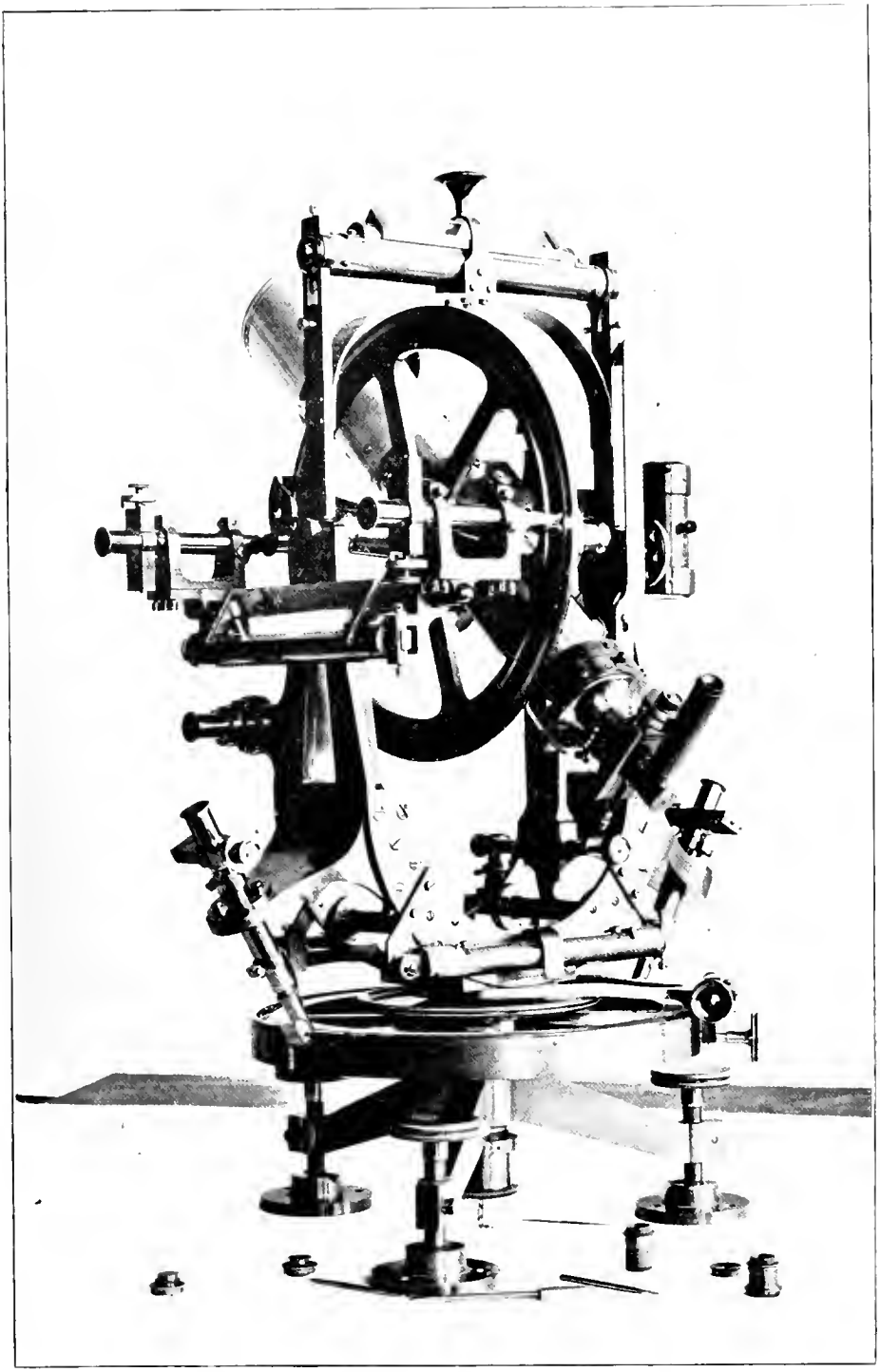

FIG. 9.—Half side view showing attachments of 12-inch Alt-azimuth Theodolite.

DEPARTMENT OF THE INTERIOR

ANNUAL REPORT

OF THE

TOPOGRAPHICAL SURVEYS BRANCH

1907-1908

PRINTED BY ORDER OF PARLIAMENT

OTTAWA
PRINTED BY C. H. PARMELEE, PRINTER TO THE KING'S MOST EXCELLENT MAJESTY
1909

[No. 25b—1909]

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OF THE

SURVEYOR GENERAL OF DOMINION LANDS

1907-1908

DEPARTMENT OF THE INTERIOR,
TOPOGRAPHICAL SURVEYS BRANCH,
OTTAWA, August 31, 1908.

The Deputy Minister of the Interior,
Ottawa.

SIR,—I have the honour to submit the following report on the operations of the Topographical Surveys Branch for the fiscal year ended March 31, 1908.

In what was formerly called the fertile belt, that is to say the country lying south of the North Saskatchewan river, the subdivision surveys are practically completed; in fact they extended for some distance north of the river. The homesteads within this area are being rapidly taken up and the newcomers will soon have to look elsewhere for free lands. What direction settlement will take cannot be foreseen with accuracy; it will depend not only upon climatic and soil conditions as yet imperfectly known, but also upon other considerations such as the opening of communications, building of railroads, &c. The department must be prepared to meet the demand for surveys wherever it arises and for this purpose the initial meridians and base lines have to be located over a very large extent of country. These lines governing all subsequent operations, have to be established with the greatest care and accuracy. The difficulties of transportation are enormous. The lines run through dense woods and the extensive marshes peculiar to the northern country are a great impediment. The progress of the work is slow and as a result the cost is very great. The figures which are given in appendix No. 2 show that it varies from $79 to $218 per mile, and averages $140.

Incidentally it may be mentioned that these surveys are a source of wonder to the inhabitants of the outlying settlements. They cannot understand why survey parties are sent out hundreds of miles away in the wilderness while the settlers are waiting for the subdivision of their lands; the only explanation which occurs to them is that there is gross ignorance at Ottawa of the needs of the West. There is, however no other way of extending the surveys; the benefits of our splendid system of township subdivision are the direct result of these outlying operations.

In comparing items in this report with those in the report for the fiscal year ended March 31, 1907, it is to be noted that in some cases the latter covered a period of nine and in some cases fifteen months, owing to the change then made in the date of the beginning of the fiscal year; in the present report all items are given for a period of twelve months only.

SURVEYS FOR THE YEAR ENDED MARCH 31, 1908.

The spring of 1907 was very backward and the summer unusually wet, which had the effect of greatly retarding survey operations. The sloughs, creeks and rivers were filled with water, rendering the task of moving an outfit a very difficult one especially in the case of the surveyors paid by the day, who have often long distances to travel from one survey to another. On account of the frequent rains and continuous cloudy weather much difficulty was also experience in making the necessary observations to determine the astronomical bearings of lines surveyed.

Another cause of trouble to surveyors in charge of parties was the difficulty of retaining the services of good men on their parties under such unfavourable conditions. Owing to the scarcity of feed for horses some surveyors were compelled to close operations much earlier than usual.

The result has been that the amount of survey work done during the year was not as great as estimated at the beginning of the season. The average amount of survey per party, however, compares well with those of previous years.

During the year the complete subdivision was made of two hundred and twenty-three whole and of eighteen fractional townships, while a partial subdivision was made of one hundred and twenty-six other townships. In addition to this a complete resurvey was made of thirty-two whole townships and of one fractional, as well as a partial resurvey of one hundred and thirty-one others.

Sixty-three survey parties were employed, fifty-seven of which were engaged on township work and six on miscellaneous surveys. Of these parties thirty-three were paid by the day while thirty worked under contract.

Of the parties under daily pay, six were employed in Manitoba, four in Saskatchewan, thirteen in Alberta, six in British Columbia, one on the boundary between British Columbia and Yukon Territory and one in the Northwest Territory, while two others were part of the time in one province and part in another. Five of the parties working under contract were located in Manitoba, ten in Saskatchewan and twelve in Alberta, while three were part of the time in one province and part in another.

Five of the parties under daily pay, in charge of Messrs. P. R. A. Belanger, E. W. Hubbell, G. J. Lonergan, Geo. McMillan and C. F. Miles were for the greater part of the season employed in inspecting surveys made under contract, thirty-four of which were examined during the year. In addition to inspection these parties investigated errors reported in survey, and where necessary made corrections. The errors reported in almost every case existed in surveys made years ago when the methods employed were not of a nature to produce the accuracy attained under our present methods.

TOWNSHIP SURVEYS.

The reports of the surveyors working under daily pay are given as appendices No 13 to No. 43. These convey, though inadequately, some idea of the methods of carrying on surveys and the dangers and difficulties encountered.

Mr. Johnson in his report says, 'To those who have packed steadily for a month over high mountains any description is superfluous, and, to those who have not, no words of mine could make them realize what it is like.'

The field of survey operations extended from the eastern boundary of Manitoba to the western boundary of Alberta, and in the railway belt as far west as the Pacific ocean. It also extended from the international boundary as far north as the twenty-second base line, about 500 miles.

Mr. C. F. Aylsworth, D.L.S., who was employed on resurvey work in eastern Manitoba, reports that the country around Beauséjour is not very thickly settled, as the land is partly boggy and in many places very stony. A great many large ditches have recently been dug which render land, formerly flooded, now fit for cultivation.

Mr. B. J. Saunders, D.L S., was engaged on surveys of block outlines in eastern Manitoba in the vicinity of Fort Alexander. This settlement which is an old Hudson's Bay trading post is very prosperous and is well equipped with schools, churches, saw-mills, &c. The Indians of the adjoining reserve are very industrious and find employment in fishing, cutting cord-wood and railway ties, and other similar work.

About thirty miles north of Fort Alexander there is a gold prospect which has made but little progress owing to lack of capital. During the past winter an iron ore location was being worked on Black island at the mouth of Manigotagan river.

Mr. C. E. Bourgault, D.L.S., was employed on survey work around the south end of lake Manitoba. He also did some resurvey near the town of Sewell, and retraced the colonization road north from Teulon.

Base line work in central Manitoba was done by Mr. W. Christie, D.L.S.

Mr. W. J. Deans, D.L.S., made some correction and retracement surveys along the second meridian. He remarks on the phenomenal growth of the town of Yorkton since his former visit there in 1899. The surrounding country contains several well cultivated farms, while the farmhouses are fitted up with many modern conveniences.

Mr. W. R. Reilly, D.L.S., made some surveys along the Saskatchewan river near the fourth meridian. The soil is good for growing wheat, but early frosts are apt to do some damage occasionally. Mr.Reilly advocates mixed farming as being more profitable, for if the wheat be damaged the farmer has something to fall back on.

Mr. David Beatty, D.L.S., resurveyed some townships in eastern Alberta about one hundred and fifty miles north of Medicine Hat. He speaks of the generally good quality of the soil, but reports a scarcity of good water.

Mr. L. E. Fontaine, D.L.S., was engaged in making a traverse and taking levels of Milk river along its course through Canadian territory.

Mr. T. A. Davies, D.L.S., was employed on retracement and correction surveys in central Alberta.

Mr. C. C. Smith, D.L.S., made some subdivision and resurveys in southern Alberta west of Macleod. This is the great ranching country of the West, but it is fast being fenced up into farms. The land is good and easily worked. Timber for fuel and building purposes can be easily obtained in Porcupine hills, and all conditions tend to make the district very desirable for homesteading.

Mr. W. F. O'Hara, D.L.S., who was working in the Pincher Creek district, reports the existence of a large oil-field, the development of which is yet in its initial stage, although the companies operating there have met with very encouraging results. From tests which have been made the petroleum is said to be of the highest grade.

Mr. W. T. Green, D.L.S., was working in the foothills south of Calgary. He speaks of the extraordinary growth of the town of Claresholm. Five years ago this place could boast of only a station-house, while to-day it is a thriving centre of industry. The surrounding country consists of the best of land, well watered, and suitable for either farming or ranching.

Base line surveys west of the fifth meridian were performed by Messrs. A. H. Hawkins, D.L.S., and Geo. Ross, D.L.S. Mr. Hawkins produced the thirteenth base and Mr. Ross the fourteenth.

Mr. A. Saint Cyr, D.L.S., ran the sixth meridian south from the sixteenth base line to Bullrush mountains. Some idea of the difficulties encountered by surveyors may be obtained from a perusal of his report. He was forced to travel from Edmonton around by Lesser Slave lake in order to reach his destination, as the snow was too deep and feed too scarce to travel directly west to the sixth meridian. As the snow had not yet melted in the bush and the ice along the route was in a treacherous condition it was necessary for him to carry both sleds and wagons in his outfit. To add to the difficulties of his journey some of the ferry boats had been swept away by the high spring floods, which rendered fording the rivers difficult and dangerous. Bad

trails up steep hills often covered by fallen trees to a height of several feet also retarded his progress considerably.

Mr. J. B. Saint Cyr, D.L.S.. was employed on subdivision and settlement surveys around Dunvegan and Peace River crossing. The fact that surveys are required so far north goes to prove the extensive settlement of the west. The soil in the Peace River district is of the best quality and the oats and wheat grown are of the highest grade. Timber for fuel and building purposes is easily obtained and the district bids fair to become one of the most prosperous in the west.

Mr. A. W. Ponton, D.L.S., was engaged on the production of the fifth meridian from the twentieth to the twenty-second base line.

Surveys required around the west end of Lesser Slave lake were performed by Mr. H. W. Selby, D.L.S. This district being so far north is generally considered to be subject to summer frosts, but Mr. Selby reports that very little damage was done by frost there last year, although much damage was done in other districts of the west farther south. The great drawback to the settlement of the country is the lack of railroad transportation.

BRITISH COLUMBIA SURVEYS.

During the season of 1907, three regular parties were employed on numerous scattered surveys within the railway belt of British Columbia. In all, 530 miles of line were run, generally in very rough country. On this work Mr. J. E. Ross, D.L.S., spent nearly eleven months, and Mr. A. G. Stacey, D.L.S., eight months, while Mr. A. W. Johnson, D.L.S., took the field early in March and returned in August. The details of these surveys will be found in the reports of the surveyors and elsewhere in this volume. The excessive amount of field work does not leave to these surveyors much time for the completion of their returns, and it is probable that at least one more party will be required during the coming season. Mr. Ross was engaged on survey work east of Kamloops, while Mr. Stacey was employed on surveys west of Kamloops. This city is the distributing centre for the north Thompson district and is a place of considerable activity. It operates its own electric lighting plant and waterworks system and has the provincial asylum and hospital located there. The town of Ashcroft is situated about forty miles west of Kamloops. All traffic for the northern interior passes through this place, and great freight wagons, drawn by four or five teams, and a well-equipped stage travel two hundred and fifty miles north.

Vegetation in the Kamloops district is several weeks ahead of that in Ontario, and where irrigation is employed the soil proves very productive. Fruit raising is a very important and growing industry, and of late years exhibits from this district have carried off the highest awards at international exhibitions on both sides of the Atlantic.

Mr. Johnson made some surveys in the railway belt between Yale and Port Moody.

MISCELLANEOUS SURVEYS.

Mr. P. A. Carson, D.L.S., continued the triangulation in the railway belt northeast from Beavermouth.

Mr. A. O. Wheeler, D.L.S., made a photographic survey of the railway belt in the Dogtooth and Selkirk mountains for mapping purposes.

Mr. Lewis Bolton, D.L.S., was engaged in settlement surveys around The Pas and Cormorant lake

Mr. W. Thibaudeau, C.E., made a preliminary investigation of the water-power on the Winnipeg river from the eastern boundary of Manitoba to lake Winnipeg. In this district there is a large amount of spruce and poplar suitable for the manufacture of pulp and the falls along Winnipeg river furnish an unlimited amount of

power for the development of the pulpwood industry. Little was known of the value of this water-power except by some companies in Winnipeg who secured sites along the river, built a control dam at Kenora to regulate the flow of water in the river, established generating stations and supplied power to the city of Winnipeg at a very small cost. It was accordingly deemed advisable to ascertain the available water-power on this river and Mr. Thibaudeau was sent to investigate it. Comparing the water-power on the Winnipeg river with that on the Niagara the former is about forty-three per cent of that available on the Canadian or Horseshoe falls, but it is more advantageous on Winnipeg river as it is distributed over a very large area.

Mr. J. N. Wallace, D.L.S., ran part of the boundary between British Columbia and Yukon Territory in the neighbourhood of the Dalton trail.

The country along the line of the Grand Trunk Pacific railway west of the sub-divided townships was explored by Mr. P. G. Stewart. He travelled through twenty-six townships between ranges 7 and 16, and townships 51 and 57 west of the fifth meridian. The country generally is rolling, partly opened and partly timbered with poplar, spruce and jackpine. On the hills the land is sandy, while in the valleys it is clay loam. The hills range as high as three hundred feet, while the valleys generally are about six hundred feet wide. Some of the valleys along the larger streams, such as the McLeod river, are about half a mile wide. Mr. Stewart estimates the amount of timber in the townships explored at between two hundred and thirty and two hundred and forty million feet.

The following is a comparison of the mileage surveyed since 1905:—

——	April 1, 1907, to Mar. 31, 1908.	Jan. 1, 1906, to Mar. 31, 1907.	Jan. 1, 1905, to Dec. 31, 1905.
	Miles.	Miles.	Miles.
Township outlines	1,674	1,306	1,591
Section lines	13,710	8,962	10,544
Traverse	3,193	1,848	1,809
Resurvey	2,917	4,948	2,579
Total for season	21,494	17,064	16,523
Number of parties	59	56	46
Average miles per party	364	305	359

The following table shows the mileage surveyed by the parties under daily pay and by the parties under contract:—

Work of parties under daily pay.

——	April 1, 1907, to Mar. 31, 1908.	Jan. 1, 1906, to Mar. 31, 1907.	Jan. 1, 1905, to Dec. 31, 1905.
	Miles.	Miles.	Miles.
Township outlines	542	756	1,008
Section lines	975	1,035	939
Traverse	1,313	643	421
Resurvey	2,782	4,815	2,499
Total for season	5,612	7,249	4,867
Number of parties	29	29	26
Average miles per party	194	250	187

Work of parties under contract.

	April 1, 1907, to Mar. 31, 1908.	Jan. 1, 1906, to Mar. 31, 1907.	Jan. 1, 1905, to Dec. 31, 1905.
	Miles.	Miles.	Miles.
Township outlines	1,132	550	583
Section lines	12,735	7,927	9,605
Traverse	1,880	1,205	1,388
Resurvey	135	133	80
Total for season	15,882	9,815	11,656
Number of parties	30	27	20
Average miles per party	529	364	583

NOTE.—Owing to the nature of their work, the parties under Messrs. P. A. Carson, P. G. Stewart, W. Thibaudeau and A. O. Wheeler are not included in the statement of mileage for the year ended March 31, 1908.

The following statement shows the average cost per mile of surveys done by contractors and by surveyors under daily pay for the year ended March 31, 1908:—

	Surveys made under day pay.	Surveys made by contract.
Total mileage surveyed	5,612	15,882
Total cost	$247,220 96	$336,230 08
Average cost per mile	$44 05	$21 18

DESCRIPTIONS OF TOWNSHIPS.

Descriptions of the townships subdivided have been compiled from the surveyors' reports received during the year ended March 31, 1908. They are given as Appendix No. 44. The townships are put in order of township, range and meridian, and the descriptions are preceded by a list of all townships described.

A map accompanying this report shows all the townships in the provinces of Manitoba, Saskatchewan and Alberta subdivided prior to April 1, 1907, coloured in buff, those subdivided between April 1, 1907, and March 31, 1908, are shown in green, while those resurveyed during the same period are shown in red.

REMUNERATION OF SURVEYORS.

At the inception of the survey of Dominion lands, nearly forty years ago, Dominion land surveyors were paid five dollars per day. Shortly after six dollars per day was allowed to surveyors of base lines. These rates remained in force until 1901, when they were increased to $6.50 and $7.50, respectively. The advance proved inadequate; in order to induce properly educated men to qualify as Dominion land surveyors, so that there should be no difficulty in securing the services of competent surveyors when they are wanted, a further increase to $8 and $10, respectively, was granted by Order-in-Council of March 30, 1908. The increase, it will be observed, is for ordinary surveyors 60 per cent over the rate of forty years ago; for surveyors of base lines it is a little over 60 per cent. Considering the enhanced cost of everything, the increase does not appear too large. By the same Order-in-Council the salary of the inspectors of surveys was fixed at $9 per day in the field and $5 per day at office work.

RESERVATION FOR ROADS.

The system of survey of Dominion lands provides road allowanees along section lines. When a section line strikes a lake, the cut banks of a river or other obstacle, the road has to be located elsewhere. The location of these deviations is plaeed under the control of the provinces by the Manitoba Supplementary Provisions Act and the Saskatchewan and Alberta Roads Act. It was represented that the establishment of these deviations involved great expenditure, and that a considerable part of this expenditure consisted in payments for the land to homesteaders and others who, although directly benefited by the new road, frequently exacted a large price for land which they had just acquired for nothing or at a small price. This difficulty was adjusted by Order-in-Counеil of November 20, 1907, which directs that every homestead entry shall be granted and every lease or sale of Dominion lands made subject to the right of the province to take, without compensation, such land as may be required for road purposes, not exceeding 2½ per cent of the area of such Dominion lands.

STAR DIAGRAMS FOR LATITUDE OBSERVATIONS.

In extending the principal meridians and the base lines, surveyors have to observe the latitude from time to time for the purpose of checking their measurements and detecting accidental errors. The most convenient and precise method of observation for this purpose is known as Talcott's method, and consists in measuring differenees of stars' zenith distances. The new model of transit theodolite for base lines has been especially designed to make use of this method. The most tedious part of a latitude observation by Talcott's method is the preparation of the observing list, especially when several star catalogues have to be consulted. To facilitate the preparation of these observing lists and save the surveyor's time, star charts have now been compiled. By the use of these charts an observing list of stars for the hours of darkness may be prepared in a very short time. These charts give the mean places of all stars up to and including the fifth magnitude listed in the Berliner Jahrbuch, Greenwich Ten Years' Catalogue of Stars for 1890 and Ambronn's Sternverzeichnis for 1900. Stars smaller than fifth magnitude are not visible with the telescope of the base line transit theodolite. The charts are in four sets of six hours' right ascension each, as follows: No. 1, 0 to 6 hours; No.2, 6 to 12 hours; No. 3, 12 to 18 hours; No. 4, 18 to 24 hours. Each set consists of two sheets, an upper and a lower, each 16 inches by 19½ inches, the lower sheet of thick opaque paper printed in black and the upper sheet of thin transparent paper printed in red. Each sheet is ruled in sections, the arguments being the star's declination for the horizontal lines and right ascension for vertical lines.

As the sections are roughly one-half inch in declination by three-eighths of an inch in right ascension, interpolation by the eye to the nearest ten minutes in declination and the nearest two minutes of time in right aseension is quite easy. On the lower sheet the mean places of stars from 5° south deelination to 65° north deelination are plotted in their correct positions, the declinations increasing from bottom to top. On the upper sheet are plotted stars from 45° north declination to 90° with the lower transits of stars from 65° north to 90°, the declinations inereasing from top to bottom. The right aseensions inerease the same from left to right on upper and lower sheets. One symbol is used for stars from 0·0 to 1·0 magnitude, another for stars from 1-1 to 2-0 and so on a different symbol being used for every magnitude. This is of great assistance in quickly identifying the star when afterwards looking for it among the different star eatalogues. If now the transparent or upper sheet is plaeed on the opaque or lower sheet so that the horizontal lines of the upper sheet for that particular deelination which is equal to the latitude is directly over the same line of declination through its whole length on the lower sheet, all stars on the upper and lower sheets on the same horizontal lines have the same zenith distance north and south from the observation spot, the black symbols showing through from the lower

sheet representing stars of south zenith distance and the red of upper sheet stars of north zenith distance. The vertical lines show the times of transit of the several stars. Hence the working methods:—The approximate latitude of the observation spot and the hours of right ascension during which it is desired to observe being known, those sets are selected which include the desired hours of right ascension. Place the upper sheet of each set on the lower with the vertical or right ascension lines corresponding and bring into coincidence the horizontal or declination line of both sheets for that particular declination which is equal to the latitude. Then select those pairs of south and north zenith stars within the limits of right ascension desired whose zenith distance is not too great, whose difference of zenith distance is no more than one-half the run of the micrometer and which have a suitable interval between transits. Having taken out the stars for limits of time allowed, there will probably be found long intervals in places between different pairs. These may be filled in by extending the limit allowed for the difference of zenith distance to the full run of the micrometer. The pairs having thus been selected, the stars are identified in the several catalogues, and their mean places in right ascension and declination are deduced from the epoch of the star catalogue to the beginning of the year which is sufficiently close for the purposes of the observing list.

CORRESPONDENCE.

The correspondence consisted of :

Letters received	10,092
Letters sent	12,942

The staff consists of the secretary, one clerk, four stenographers and typewriters and two messengers.

ACCOUNTS.

The accountant's record shows :

Number of accounts dealt with	633
Amount of accounts	$766,000
Number of cheques forwarded	3,051

The staff consists of an accountant and an assistant accountant.

OFFICE STAFF.

A list of the office staff of the Topographical Surveys Branch at Ottawa is given as Appendix No. 10.

Many changes have taken place during the year. In the Metcalfe street office Mr. F. Lynch has been added to the secretary's staff and Mr. A. Paquette has been appointed messenger in place of Mr. J. J. O'Leary, who was transferred to the School Lands Branch. Messrs. A. G. Stacey, H. L. Seymour, C. C. Fitzgerald, M. Kimpe, E. H. Phillips, J. M. Empey, R. B. Owens, J. N. Goodall, R. V. Heathcott, J. W. Rochon, F. L. Marriott, H. J. Smith, J. C. Ball and S. H. Shore have resigned. Messrs. F. G. D. Durnford and E. E. Brice have been transferred to the Lands Patent Branch and Messrs J. M. Mudie and W. C. Gillis to the survey records office. Mr. Gillis was appointed to the Metcalfe street office during the year, as were also Messrs. A. Vickery, H. P. Moulton and N. Bawlf all three of whom subsequently resigned. Miss A. Whitehead was employed for a short time during the year as extra typewriter. Messrs. F. W. Rice, A. L. Cumming, W. L. MacIlquham, E. M. Dennis and G. B. Dodge have been absent part of the time acting temporarily as assistants to surveyors, while Messrs. W. T. Green, D.L.S., P. A. Carson, D.L.S., and T. A. Davies, D.L.S., have also been absent part of the time in charge of survey parties in the field.

The additions to the staff during the year are as follows: In the Metcalfe street office, Messrs. A. D. McRae, A. G. Stewart, A. W. Grant, E. C. Rochon, M. J. McLaughlin, G. A. Gaudry, A. Vickery, H. P. Moulton, W. C. Gillis, N. Bawlf, J. R. Akins, F. H. Maynard, H. S. Day, H. E. Sutherland, F. H. Kitto, L. Goodday, F. H. H. Williamson, G. C. Webb, C. H. Wilding, R. P. Bray, E. W. Harrison, A. W. Ault, C. B. Binks, C. H. Holbrook, R. J. Dawson, Jas. Watters and E. Davy; in the office of the geographer, Messrs. J. Beveridge, J. P. McElligott, J. Pigeon and J. R. Merrifield; and in the lithographic office, Mr. J. H. Deslauriers.

OFFICE OF THE CHIEF DRAUGHTSMAN.

A summary of the work executed in the office of the chief draughtsman is given as Appendix No. 5.

The last twelve months have seen a considerable increase in the draughtsmen's work. This is due partly to the fact that the surveys were on a larger scale, but perhaps still more to the constant increase in the miscellaneous business of the office, such as answers to inquiries, both from inside and outside the department, as to surveys made or proposed, areas, corner monuments, errors found or suspected in lines, petitions for resurveys, etc. The draughting office has gradually become of late years, and unavoidably so, to a great extent a correspondence office, a large portion of the letters sent out having to be drafted in this part of the branch.

The staff is larger by three than at the date of the last report, now including eighty-one men, whose time is fully occupied with necessary work in connection with the surveys. The frequent changes of personnel and the location of a part of the force in a separate building at some distance is still the cause of a certain amount of delay, and makes proper oversight of business more difficult. The staff is distributed in five divisions.

First Division—Instructions and General Information.

The staff of this division, which consists of nineteen employees, is in charge of Mr. T. E. Brown, B.A. Instructions were drafted for eighty-one survey parties, which involved the preparation of 879 sketches and 77 tracings and maps ; 1,002 progress sketches were received from surveyors in the field, as well as 577 books of field notes, 334 plans, 56 timber reports and 473 statutory declarations; 494 books of field notes of township surveys were transmitted to the survey records office after complete examination, also 476 notes and plans of miscellaneous surveys. Plans were printed for 518 townships, 5 settlements or townsites and 59 sectional sheets. Preliminary plans of 369 townships were issued. A noteworthy feature about the work of this division is the great increase in the number of communications on miscellaneous subjects received and dealt with. The number for the year was 1,296, involving the preparation of 283 sketches and 77 maps and tracings; 3,427 draft letters and memoranda were written.

Second Division—Examination of Surveyors' Returns.

This division is in charge of Mr. T. S. Nash, D.L.S., and the staff consists of twenty-eight employees. The returns of all the surveys of Dominion lands in Manitoba, Saskatchewan and Alberta are examined here. Plans of these surveys are compiled and the accounts for the surveys performed under contract are made out.

Surveyors are required to send in from time to time sketches showing the progress of their work in the field. These sketches show the bearings and lengths of all the lines that have been surveyed together with all the important topography of the country. If on examination they are found incomplete, supplementary sketches are required from the surveyor. During the year 722 progress sketches were examined. When the final returns of surveys are received they are given a cursory examination,

and if found generally incomplete they are sent back to the surveyor for correction. This, however, seldom happens, the returns now received being nearly always carefully made. After cursory examination the work of compiling is begun. This consists in gathering together all the returns of previous surveys in the township, settlement or townsite as the case may be and plotting the whole together as a new plan. During this process a minute examination is made of the field notes of the new survey, the surveyor is notified of all clerical errors, omissions or discrepancies found in his notes and is required to correct them before his survey is finally accepted. A more detailed description of the above work was given in the report for the year ended June 30, 1906. The same system with improvements in the minor details is still in use. During the year 347 subdivisions, 157 township outline and 23 miscellaneous survey returns were examined, 348 memoranda on examination were sent to surveyors, 323 answers to memoranda were received and noted, 857 letters were drafted and 556 plans compiled.

In addition to the examination and compilation mentioned above, a large amount of work is involved in the examination of plans of road diversions in Alberta and Saskatchewan surveyed under instructions from the provincial governments and in the examination of railway right-of-way plans for approval by the Surveyor General before being filed in the records office. During the year 233 plans of road diversions and 112 right-of-way plans were examined.

Third Division—Drawing for Reproduction.

The staff of this division which consists of fourteen employees is in charge of Mr. C. Engler, D.L.S. The most important work of this division is the preparation of copies properly drawn for reproduction by photo-zincography or photo-lithography of the rough plans compiled in the second and fourth divisions. The letters and figures of the plans are stamped with type held in position by means of the stamp described in the annual report for 1906-7. In this way uniformity of style is ensured and at the same time a beginner quickly acquires the skill necessary for speed and neatness. This has proved a decided advantage during the past few years owing to the constantly changing personnel of the staff of this division. The great majority of the plans drafted are township plans. Uniformity exists among these so that the work can be done systematically and occupies much less time than that upon plans of a miscellaneous character.

During the year 568 township plans and 130 miscellaneous plans were made. Although the number of miscellaneous plans is less than one-fourth of the number of township plans yet the time spent upon the former was almost as great as upon the township plans. A noteworthy feature about the miscellaneous plans is their variety. They comprise settlement, group lot and townsite plans, which are made something after the style and manner of township plans. Occasionally maps and plans are made to illustrate some subject under consideration by the House of Commons or the Senate.

There are also drawings of the diagrams of the altitude and bearing of the pole star. These have to be made with the greatest accuracy as the slightest error in drawing destroys the value of the diagrams. These diagrams are issued periodically with the astronomical field tables, the drawings for which are also prepared in this division.

Diagrams and explanatory drawings for the Manual of Survey, and artists' drawings for the illustration of pamphlets, have also been made. In the line of mechanical drawings, may be mentioned all drawings of survey instruments or of additions or alterations to the same, as well as drawings to scale of furniture or apparatus of a special nature required for this branch. Among the drawings of an artistic nature were two for the office, one of a crest and one of a letter head. In this class also may be mentioned the making of diplomas and certificates for the board of examiners for

Dominion land surveyors and the engraving of graduations on instruments when special scales are required. On the small printing press, which forms part of the equipment of this division, a great deal of work has been done. The demand for this work has been so steady that it has been necessary to employ a man experienced in typesetting and presswork. He also takes care of the type used for stamping plans, the printers' ink, the composition rollers, etc. The press is used for printing titles and foot notes, which are pasted on the plans in proper position. In the same way are added the names of any large lakes, rivers, Indian reserves, etc., which cannot be stamped on the plan in the ordinary way. As all the plans are photographed, no traces of the edges of the pieces of paper added by pasting can be seen on the printed plan as the photographer removes them all in retouching the negative. The press is also used to print labels, numbers and letters for shelves, file backs and cupboards in the office, as well as any small blank forms required, circular letters to surveyors when it is impossible to obtain these from the Government Printing Bureau in time to serve the purposes for which they are required.

In order to be able to make suitable titles for all the different maps and plans and also to stamp all the letters and figures on the plans themselves, it has been necessary to procure a variety of type. Eighty-eight styles in all have been procured, but as only a small font of each style is necessary the expense of buying the type has not been great. The expense saved on a single plan by printing a title instead of drafting it often equals the total cost of the type required to print it.

Fourth Division—British Columbia Surveys.

This division consists of eight employees in charge of Mr. Rowan-Legg. The examination of the returns sent in by the three regular surveyors who were working in the railway belt has been proceeded with and is now well advanced. As most of the traverse surveys in British Columbia were made for the purpose of establishing section corners and land boundaries, this portion of the work had to be carefully checked by latitudes and departures, which entailed a great amount of work.

The returns of the survey by Mr. J. E. Ross, D.L.S., tying in various points along the right-of-way of the Revelstoke and Arrowhead Lake branch of the Canadian Pacific railway to points on the Dominion lands system of survey have been checked, and the areas of adjacent surveyed Dominion lands as well as of the right-of-way are now obtainable. Returns of small surveys consisting of mineral and other lots, private surveys and special surveys have also been received from Messrs. E. A. Cleveland, J. A. Kirk, W. A. Bauer and others. These have been or are being examined. Four plans of the Canadian Pacific railway right-of-way from Spatsum to Port Moody were also examined.

Owing to the recent more strict enforcement of the regulations for the survey of timber berths, it was found that more returns were being received by the Timber, Grazing and Irrigation Branch than could be dealt with. It was therefore decided that part of the examination of such returns should be undertaken by the staff of this office. The British Columbia division commenced this work, on the berths lying within the belt, in November, 1907, and completed, during the ensuing five months, the examination of sixty returns of surveys of this class.

In 1906 Mr. A. W. Johnson, D.L.S., made a resurvey of the town of Hope and the compilation of a plan of it was commenced in this office, but it was found that further surveys were required to furnish the information necessary to complete the plan.

In 1907 Mr. Johnson made a resurvey of the Pitt meadow lands and a special plan was made in order that these lands might be dealt with as soon as possible.

When compiling plans of many of the townships in the railway belt in British Columbia it is found that so many details, in connection with the showing of mineral

claims, provincial lots, &c., have to be given that a plan, made to a scale of forty chains to one inch, is too crowded and indistinct. To obviate this difficulty in such cases, plans of quarter townships are made on a scale of twenty chains to one inch, which show the information clearly and make more useful plans. During the year 573 letters and memoranda have been received and dealt with, 330 sketches and plots made, sixty plans compiled for printing and 709 draft letters and memoranda prepared.

Fifth Division—Mapping.

The number of employees in this division is ten, the staff being in charge of Mr. J. Smith. The principal work of the fifth division is the preparation of sectional maps for publication, as shown in Appendix No. 6 and the registering and compiling of surveys in the Yukon Territory as shown in appendices Nos. 3 and 4.

In addition to the above, other maps that may be required by the department are drawn and proofs of maps being printed are examined.

The method of producing a sectional map is as follows : All available information, such as Dominion lands surveys, railroad locations, road surveys, &c., is drawn on good mounted paper on a scale of two miles to an inch; a clean tracing on cloth is then made, reproduced and printed by photo-lithography on a scale of three miles to an inch, then a reduced copy is made by photo-lithography on a scale of six miles to an inch.

During the present rapid development of the northwest provinces these prints are quickly 'out of date' and another edition becomes necessary. The original drawing is then revised, all new information being added and corrections made, the tracing is then corrected to agree with the original and the printing is repeated.

The corrections sometimes entail so much erasing, on the original and tracing, that after a few editions it is necessary to make entirely new drawings. During the past year two originals and four tracings had to be redrawn on this account.

The work on the Yukon surveys consists of keeping a register of all returns of surveys received, the examination of the field notes and plans and the plotting of the work on a general plan so as to show the relative positions of different claims and to ascertain if they encroach on claims previously surveyed. The plans accompanying the surveyors' returns are usually on a scale of two hundred feet to an inch and the general plan on a scale of forty chains to an inch.

In addition to the sectional maps and Yukon work a map of Churchill harbour was drawn for photo-lithography and a large diagram was made for office use showing the closings of surveys on base lines from the sixteenth to the twentieth base between the fifth and sixth meridians.

SURVEY RECORDS OFFICE.

A card system of indexing files relating to trails and roadways, in the provinces of Manitoba, Saskatchewan and Alberta, has been introduced. All communications in connection with these trails or roadways and the preparation of replies giving the areas deducted from the different quarter sections affected, as given by the Patents branch, are dealt with in this office. As the files are kept in this office and are rapidly increasing in number, the index above referred to enables us to readily find the correspondence relating to any of these trails or roadways.

A loose leaf alphabetical index of the plans kept in this office, numbering about 14,000, has been established, which enables a ready reference to all the plans recorded. The installation of these indexing systems was rendered necessary by the large increase in volume of the work of the office.

The following plans, showing the Dominion lands agencies, were prepared in this office and forwarded to their respective destinations:—

1. Five homestead maps showing Dominion lands agencies and sub-agencies in the provinces of Manitoba, Saskatchewan and Alberta.

2. Thirteen homestead maps showing on each one sub-agency and the lands district agency to which it is subordinate.

3. Sixteen maps on a scale of one mile to an inch showing on each one sub-agency of Dominion lands, with the lands disposed of as shown on the latest homestead map preceding the date of compilation.

All these maps are mounted and bound on cotton for the use of the different agents in the provinces of Manitoba, Saskatchewan and Alberta.

A statement of the work executed by this office during the year is given in Appendix No. 7.

PHOTOGRAPHIC OFFICE.

The amount of work executed in the photographic office during the year has been the largest in the history of the office. Several changes are being made in the equipment, which it is hoped will result in a further increase in the quantity of work and an improvement in quality.

The photo-zincograph process has produced a marked improvement in the plans turned out. A new power press now being installed in the lithographic office for handling large plates will, it is expected, result in a still greater improvement.

During the summer one of the photographers made a trip through Nova Scotia for the purpose of procuring for the immigration branch photographs illustrative of the industries of the province. Hitherto they had to depend for these photographs on the local photographers, and the results were not always satisfactory.

A schedule of the work executed in the photographic office is given as Appendix No. 8.

LITHOGRAPHIC OFFICE.

This office was equipped with a power press and several hand presses. The increase of the work has been such that a second power press became necessary; this is now being installed. It is a rotary transfer press, taking zinc plates 28 x 48 inches. The impression is transferred from the zinc to a rubber blanket and from the latter to the paper. As an adjacent to the press, a machine for graining zinc plates had to be set up, as well as a large flat bed-press equipped with an electric motor. It is hoped that when the whole is in proper working order any lithographs that may be required will be turned out with despatch and efficiency.

The new power press requires two additional men—a printer and a feeder. One of the vacancies has already been filled by the appointment of J. H. Deslauriers as transferrer; he takes the place of J. Bergin, who has been put in charge of the press as printer. By reason of the general increase in the work, another lithographic artist will be needed; this will bring the staff to nine, as follows:—

One foreman.
Two lithographic artists.
One transferrer.
Two power press printers.
Two power press feeders.
One stone polisher and zinc grainer.

Part of the plant had to be placed in the Imperial Building on Queen street, which is somewhat inconvenient.

A statement of the work executed is given as Appendix No. 9.

GEOGRAPHIC BOARD.

Mr. A. H. Whitcher, D.L.S., the secretary, is attached to the staff of the Surveyor General. The board consists of representatives from the different departments, and its duties are to decide the proper spelling of names throughout the Dominion. The

decisions of the board are published in the *Canada Gazette*, and are then printed in bulletin form for distribution. The seventh annual report of the board is in course of preparation.

BOARD OF EXAMINERS FOR DOMINION LAND SURVEYORS.

Special meetings of the board were held on April 29, from May 2 to June 3, inclusive, on November 12 and on December 4, 1907; and the regular annual meeting from February 10 to March 16, inclusive, 1908.

During the meeting in May examinations were held at Ottawa, Kingston, Toronto and Calgary. Dr. Klotz presided at Kingston; Professor L. B. Stewart, D.L.S., at Toronto; and A. O. Wheeler, D.L.S., at Calgary.

During the regular meeting in February examinations were held at Ottawa, Vancouver, Calgary, Edmonton, Winnipeg, Toronto, Montreal and St. John. E. B. Hermon, D.L.S., presided at Vancouver; A. O. Wheeler, D.L.S., at Calgary; J. N. Wallace, D.L.S., at Edmonton; J. L. Doupe, D.L.S., at Winnipeg; Professor L. B. Stewart, D.L.S., at Toronto; T. Shanks, D.L.S., at Montreal, and T. S. Nash, D.L.S., at St. John.

At these examinations ninety-seven candidates presented themselves for the full preliminary examination, fifty of whom were successful, as follows:—

J. R. Akins, Ottawa, Ont.
C. B. Allison, South Woodslee, Ont.
M. S. Archibald, Truro, N.S.
E. Bartlett, Smithville, Ont.
H. E. Bates, Mystic, Conn., U.S.A.
G. A. Bennet, New Glasgow, P.Q.
G. H. Broughton, Edmonton, Alta.
H. R. Carscallen, Toronto, Ont.
F. T. P. Cond, Toronto, Ont.
G. C. Cowper, Welland, Ont.
W. P. Dobson, Fordwich, Ont.
M. Dennis, O'Leary, P.E.I.
S. D. Fawcett, Ottawa, Ont.
J. N. Finlayson, Merigomish, N.S.
F. S. Fowler, Winnipeg, Man.
J. R. Graham, Ottawa, Ont.
C. A. Grassie, Smithville, Ont.
C. D. Henderson, Toronto, Ont.
C. M. Hoar, Hopewell Cape, N.B.
H. W. Harris, Kingston, Jamaica.
R. W. Haggen, Revelstoke, B.C.
F. J. Heuperman, Edmonton, Alta.
O. Inkster, Edmonton, Alta.
E. B. Jost, Guysboro', N.S.
L. B. Kingston, Ottawa, Ont.
H. M. Lamb, Montreal, P.Q.
A. Lighthall, Montreal, P.Q.
W. G. McGeorge, Chatham, Ont.
J. H. McKnight, Simcoe, Ont.
L. A. McLean, Hensall, Ont.
J. W. Menzies, Ottawa, Ont.
P. Melhuish, Montreal, P.Q.
C. A. Morris, Vancouver, B.C.
J. S. Mairn, Truro, N.S.
L. Odell, Odell, Ont.

S. K. Pearce, Calgary, Alta.
I. Pounder, Ottawa, Ont.
H. G. Phillips, Saskatoon, Sask.
P. E. Palmer, Dorchester, N.B.
D. F. Robertson, Ottawa, Ont.
L. T. Rutledge, Glen Williams, Ont.
W. B. Redfern, Toronto, Ont.
W. A. Siegner, Tavistock, Ont.
J. J. Stock, Ottawa, Ont.
H. B. Stuart, Calgary, Alta.
R. T. H. Sailman, Malvern, Jamaica.
C. H. Taggart, Ottawa, Ont.
W. E. Taylor, Owen Sound, Ont.
W. R. White, Drayton, Ont.
J. K. Wyman, Rockland, Ont.

Thirty-five candidates presented themselves for the limited preliminary examinations, seventeen of whom were successful, as follows :—

C. D. Brown, Winnipeg, Man.
W. P. Copp, Sackville, N.B.
A. S. Campbell, Kingston, Ont.
W. Dale, Toronto, Ont.
D. J. Fraser, Ottawa, Ont.
J. H. W. Flanagan, Chelsea, London, S.W., Eng.
G. H. Herriot, Souris, Man.
H. Matheson, Armow, Ont.
H. B. Miller, Montreal, P.Q.
J. M. Mudie, Ottawa, Ont.
G. H. McCallum, Smith's Falls, Ont.
G. J. McKay, Owen Sound, Ont.
G. W. MacLeod, Parkhill, Ont.
W. H. Powell, Little Harbour, N.S.
O. Rolfson, Walkerville, Ont.
A. C. T. Sheppard, Ottawa, Ont.
W. D. Stavert, Edinburgh, Scotland.

Twenty-eight candidates presented themselves for the final examination for Dominion land surveyor, of whom twenty-one were successful, as follows :—

H. G. Barber, Ottawa, Ont.
E. P. Bowman, West Montrose, Ont.
W. B. Bucknill, Winnipeg, Man.
A. J. Elder, Ottawa, Ont.
A. Findlay, Winnipeg, Man.
A. C. Garner, South Qu'Appelle, Sask.
R. V. Heathcott, Edmonton, Alta.
M. Kimpe, Edmonton, Alta.
F. H. Kitto, Edmonton, Alta.
H. F. J. Lambart, Ottawa, Ont.
B. F. Mitchell, Hamilton, Ont.
J. E. Morrier, Ottawa, Ont.
T. H. Plunkett, Toronto, Ont.
H. T. Routly, Toronto, Ont.
C. Rinfret, St. Stanislas, P.Q.
E. W. Robinson, Victoria, B.C.

H. M. R. Soars, Edmonton, Alta.
W. M. Stewart, Hamilton, Ont.
A. S. Stewart, Edmonton, Alta.
I. J. Steele, Ottawa, Ont.
W. H. Young, Lethbridge, Alta.

At the February examination one candidate took Part I of the D.T.S. examination. He was not successful.

Oaths of office and allegiance and bonds for the sum of one thousand dollars each as required by clause 36 of the Dominion Lands Act were received from twenty-one candidates who had previously passed the necessary examinations for commissions as Dominion land surveyors and had complied with the other requirements of the Act.

Eighteen commissions as Dominion land surveyors were issued as follows:—

E. P. Bowman, West Montrose, Ont.
F. F. Clarke, Toronto, Ont.
P. C. Coates, Golden, B.C.
A. J. Elder, Ottawa, Ont.
A. C. Garner, South Qu'Appelle, Sask.
R. V. Heathcott, Edmonton, Alta.
M. Kimpe, Edmonton, Alta.
F. H. Kitto, Edmonton, Alta.
H. F. J. Lambart, Ottawa, Ont.
A. J. Latornell, Edmonton, Alta.
J. E. Morrier, Ottawa, Ont.
G. B. McColl, Winnipeg, Man.
N. Ogilvie, Ottawa, Ont.
W. M. Stewart, Hamilton, Ont.
W. H. Waddell, Hamilton, Ont.
J. Waldron, Moosejaw, Sask.
E. W. Walker, Regina, Sask.
W. H. Young, Lethbridge, Alta.

Every Dominion land surveyor in active practice is required by clause 47 of the Dominion Lands Act to be in possession of a subsidiary standard measure of length furnished by the secretary of the board of examiners. Nineteen such standards were issued directly to surveyors during the year, and 24 were supplied to the Surveyor General of British Columbia for use by the surveyors of that province.

A list of the surveyors who have been furnished with standard measures up to March 31, 1908, will be found in Appendix No. 11.

The correspondence of the board amounted to:—

Letters, &c., received	1,328
Letters sent	1,050

The examination questions used at the examination in February, 1908, are submitted as Appendix No. 12.

A meeting of the board was called on April 29 to make arrangements for the special examination in May. The affidavits of the candidates for the final examination were received, and several communications disposed of.

At the meeting from May 2 to June 3, 31 candidates presented themselves for examination. The answer papers of these were read, and the revision of the curriculum of studies for the D. T. S. examination, which had been begun at the February meeting, was completed.

The meeting of November 12 was called to deal with several communications to the board.

At the meeting of December 4 the interpretation of clause 32 of the Dominion Lands Act was discussed. The question had been referred to the Deputy Minister of Justice, who gave as his opinion that graduates in surveying within the meaning of clause 32, are not required to pass any examination previous to being articled. The Dominion Lands Surveys Act, which came into force on March 17, 1907, makes it clear that all must now take this examination.

At the meeting in February 130 candidates were examined, the largest number that has ever appeared before the board.

The Dominion Lands Surveys Act removed certain privileges formerly granted by the Dominion Lands Act to surveyors from other parts of His Majesty's dominions who desire to qualify as Dominion Land Surveyors; and the rules of the board had to be amended accordingly. Another amendment to the rules prescribes the use of Chambers' tables at all examinations before the board.

APPENDICES.

The following schedules and statements are appended:—

No. 1. Schedule of surveyors employed and work executed by them from April 1, 1907, to March 31, 1908.

No. 2. Schedule showing for each surveyor employed from April 1, 1907, to March 31, 1908, the number of miles surveyed, of township section lines, of township outlines, traverses of lakes and rivers and resurvey; also the cost of same.

No. 3. List of lots in the Yukon Territory surveys of which have been received from April 1, 1907, to March 31, 1908.

No. 4. List of miscellaneous surveys in the Yukon Territory, returns of which have been received from April 1, 1907, to March 31, 1908.

No. 5. Statement of work executed in the office of the chief draughtsman.

No. 6. List of new editions of sectional maps issued from April 1, 1907, to March 31, 1908.

No. 7. Statement of work executed in the survey records office from April 1, 1907, to March 31, 1908.

No. 8. Statement of work executed in the photographic office from April 1, 1907, to March 31, 1908.

No. 9. Statement of work executed in the lithographic office from April 1, 1907, to March 31, 1908.

No. 10. Names and duties of employees of the Topographical Surveys branch at Ottawa.

No. 11. List of Dominion Land Surveyors who have been supplied with standard measures.

No. 12. Examination papers of the board of examiners for Dominion Land Surveyors.

No. 13 to 43. Reports of surveyors employed.

No. 44. Descriptions of surveyed townships submitted by Dominion Land Surveyors from April 1, 1907, to March 31, 1908.

MAPS.

The following maps accompany this report.

1. Map showing surveys and resurveys made from April 1, 1907, to March 31, 1908.

2. Topographical Survey of Canada,—Trigonometrical sections,—triangulation in British Columbia to accompany the report of P. A. Carson, D.L.S.

3. Topographical map of part of the main range of the Rocky Mountains adjacent to the Canadian Pacific railway to accompany the report of A. O. Wheeler, D.L.S.

4. Map showing part of the sixth meridian, north of Jasper House, to accompany the report of A. Saint Cyr, D.L.S.

5. Plan of part of the province of Manitoba showing the water-powers on the Winnipeg river to accompany the report of W. Thibaudeau, C.E.

6. Map showing the drainage basin of the Winnipeg river to accompany the report of W. Thibaudeau, C.E.

7. Map of the Winnipeg river from lake Winnipeg to English river, and from English river to First fall, to accompany the report of W. Thibaudeau, C.E.

8. Plan of a group of eight falls on the Winnipeg river to accompany the report of W. Thibaudeau, C.E.

9. Diagram of the Winnipeg river showing cross-section, discharge, &c., to accompany the report of W. Thibaudeau, C.E.

10. Profile of Winnipeg river from lake Winnipeg to English river and Pinawa channel to accompany the report of W. Thibaudeau, C.E.

I have the honour to be, sir,
Your obedient servant,

E. DEVILLE,
Surveyor General.

TOPOGRAPHICAL SURVEYS BRANCH.

SCHEDULES AND STATEMENTS.

APPENDIX No. 1.

SCHEDULE of Surveyors employed and work executed by them, from April 1, 1907, to March 31, 1908.

Surveyor.	Address.	Description of Work.
Aylsworth, C. F	Madoc, Ont	Resurvey of parts of townships 14, 15 and 16, range 7, and parts of townships 15, 16 and 17, range 8, all east of the principal meridian.
Baker, J. C	Vermilion, Alta	Contracts Nos. 2 and 24 of 1907; subdivision of townships 53, ranges 10, 11, 12, 13 and 17, townships 54, ranges 9 and 10, the southerly two-thirds of townships 54, ranges 11, 12, 13, 14, 15 and 16, the northerly two-thirds of township 53, range 16, and the east outlines of townships 55 and 56, ranges 10 and 11, and townships 53, ranges 14 and 15, all west of the fifth meridian.
Beatty, David	Parry Sound, Ont	Retracement survey of townships 27, 28, 29, 30 and 31, range 6, townships 27 and 28, range 7, and traverse in township 32, range 6, west of the fourth meridian; retracement and restoration survey in township 50, range 27, west of the third meridian.
Belanger, P. R. A	Ottawa, Ont	Inspection of contracts Nos. 17, 18 and 19 of 1906, Nos. 2, 16, 22 and part of 24 of 1907, completion of inspection of contracts Nos. 16 and 21 of 1906. Miscellaneous surveys between the second and third meridians and retracement in township 53, range 3, west of the fifth meridian.
Bolton, Lewis	Listowel, Ont	Miscellaneous surveys at The Pas and along Cormorant lake, in the Northwest Territories.
Bourgault, C. E	St. Jean Port Joli, Que	Subdivision and resurvey in townships 14 and 15, range 5, and township 14, range 6; retracement survey in townships 18 and 22, range 4, township 19, range 3, townships 21 and 22, range 5, and township 22, range 6; resurvey of the north boundary of Spruce Woods timber reserve in townships 10, ranges 15 and 16, all west of the principal meridian. Survey of the colonization road, north from Teulon, across townships 16 and 17, range 2, and township 17, range 1, east of the principal meridian, and across townships 17, 18, 19 and 20, range 1, west of the principal meridian.
Bray, Edgar	Oakville, Ont	Contract No. 11 of 1907; subdivision of township 37, range 2, and parts of township 37, range 1, and townships 38, ranges 1 and 3, all west of the second meridian.
Carson, P. A	Ottawa, Ont	Triangulation surveys in British Columbia in connection with the Trigonometrical Section of the Topographical Survey of Canada.
Cautley, R. H	Edmonton, Alta	Contract No. 23 of 1907; subdivision of townships 33 and 34, ranges 14, 15, 16, 17, 18, 19 and 20, west of the fourth meridian.
Cautley, R. W	Edmonton, Alta	Contract No. 28 of 1907; subdivision of townships 41, ranges 15, 16 and 17, and townships 42, ranges 10, 11 and 16, all west of the second meridian.
Chilver, C. A	Glen Lyon, Man	Contract No. 6 of 1907; subdivision of townships 37, ranges 5 and 6, townships 38, ranges 4, 5, 6, 10 and 11; survey of the east outlines of townships 37 and 38, range 7, townships 39, ranges 5, 6, 7 and 10, and of townships 40, ranges 5, 6 and 7, all west of the second meridian.

APPENDIX No. 1.

SCHEDULE of Surveyors employed, and work executed by them, from April 1, 1907, to March 31, 1908.—*Continued.*

Surveyor.	Address.	Description of Work.
Christie, W.	Chesley, Ont.	Survey of the eighth base line across ranges 1, 2, 3, 4, 5, 11, 12, 13, 14 and part of 10; the ninth base line across ranges 10, 11, 12, 13, 14, 15, 16, 17, 18 and part of 19, all west of the principal meridian; survey of the principal meridian across townships 26, 27 and 28.
Côté, J. L.	Edmonton, Alta.	Contract No. 9 of 1907; subdivision of townships 65 and 66, ranges 19, 20, 21 and 23, township 66, range 22, north of Athabaska river; survey of the east outlines of townships 67 and 68, ranges 19, 20, 21, 22 and 23, all west of the fourth meridian.
Davies, T. A.	Ottawa, Ont.	Retracement and restoration survey in townships 51, 52, 53 and part of 50, range 26, west of the third meridian; township 41, range 16; townships 41, 42 and 43, range 17; townships 43 and 44, range 18, and township 44, range 19, west of the fourth meridian; correction survey in township 50, range 2; township 52, range 8; township 44, range 17; township 45, range 18, and township 43, range 20, west of the fourth meridian; part subdivision of township 52, range 22, west of the third meridian.
Deans, W. J.	Brandon, Man.	Retracement and restoration survey of township 24, range 30, west of the principal meridian, and township 21, range 1, west of the second meridian; traverse of Whitesand river from the second meridian to the Assiniboine river and of lakes in township 24, range 2, township 32, range 9, and township 34, range 3, west of the second meridian; correction survey in township 14, range 7, west of the second meridian; survey of Doukhobor villages in townships 30, ranges 1 and 5, township 31, range 3, and townships 31 and 32, range 6, west of the second meridian; survey of townships 29 and 30, between Whitesand and Assiniboine rivers and of the south and east boundaries of Coté Indian reserve.
Dumais, P. T. C.	Hull, Que.	Contract No. 33 of 1907; resurvey of parts of township 18, range 20, and township 20, range 22, west of the principal meridian.
Edwards, Geo.	Ponoka, Alta.	Contract No. 19 of 1907. Subdivision of townships 27, 28, 29 and 30, ranges 14, 15 and 16, and parts of townships 27, ranges 17 and 18, all west of the fourth meridian.
Fairchild, C. C.	Brantford, Ont.	Contract No. 8 of 1907. Subdivision of townships 29, 30, 31 and 32, ranges 18, 19 and 20, and townships 29, 30 and 31, range 21, all west of the fourth meridian.
Fawcett, Adam	Gravenhurst, Ont.	Contract No. 30 of 1907. Subdivision of townships 27, 28, 29, 30 and 31, range 14, part of township 31, range 15, and part resurvey of township 30, range 15, all west of the principal meridian.
Fontaine, L. E.	Levis, Que.	Traverse of Milk river through Canadian territory. Survey of part of township 4, range 6, west of the fourth meridian.
Green, W. T.	Ottawa, Ont.	Miscellaneous surveys in townships 13 and 15, range 1; townships 14, ranges 1 and 2; townships 20 and 22, range 4 and township 21, range 5; traverses of Bow and Cascade rivers, of the Canadian Pacific railway canal in township 25, range 11, and of Highwood river in township 18, range 1, all west of the fifth meridian; traverse of Little Bow river in township 13, range 24, west of the fourth meridian; resurvey of Brewster Leasehold in the Rocky Mountains Park.

APPENDIX No. 1.

SCHEDULE of Surveyors employed and work executed by them, from April 1, 1907, to March 31, 1908.—*Continued.*

Surveyor.	Address.	Description of Work.
Grover, G. A.	Norwood, Ont.	Contract No. 27 of 1907. Subdivision of townships 42 and 43, range 9; townships 40 and 43, range 10 and townships 39, 40 and 43, range 11; survey of the east outlines of townships 42 and 44, range 10 and of townships 41, 42 and 44, range 11, all west of the second meridian.
Hawkins, A. H.	Listowel, Ont.	Survey of the thirteenth base line across ranges 18 to 23 inclusive; the twelfth base line across ranges 9 to 14 inclusive, and resurvey of twelfth base line across ranges 1 to 8 inclusive, between the fifth and sixth meridians.
Holcroft, H. S.	Toronto, Ont	Contract No. 5 of 1907. Subdivision of townships 49, 50, 51 and 52, range 15, and townships 51 and 52, range 16, west of the third meridian.
Hopkins, M. W.	Edmonton, Alta.	Contract No. 4 of 1907. Subdivision of townships 59 and 60, ranges 1, 2, 3 and 4, and townships 59, 60, 61 and 62, ranges 5 and 6; survey of the east outlines of townships 57 and 58, ranges 2 and 3, and townships 63 and 64, ranges 6 and 7, all west of the fourth meridian.
Hubbell, E. W.	Ottawa, Ont.	Miscellaneous surveys in township 46, range 21; townships 44 and 46, range 22; township 46, range 23; township 27, range 24; townships 45 and 49, range 26; townships 17, 20, 21 and 22, range 29 and township 18, range 30, west of the second meridian, and in townships 33, 34 and 35, range 1, and township 34, range 2, west of the third meridian; traverse in township 25, range 25, west of the second meridian. Inspection of contracts Nos. 5, 15, 20 and 21 of 1907. Completion of inspection of contract No. 12 of 1906.
Johnson, A. W.	Kamloops, B. C.	Subdivision survey in township 4, range 28, and townships 2, 4, 9, 10 and 11, range 29, and resurvey in township 3, range 28 and township 4, range 29, west of the sixth meridian, and in townships 5 and 6, range 4, and in townships 4, 5 and 6, range 5, west of the seventh meridian. Traverses in townships 3 and 4, range 28, west of the sixth meridian, and in townships 5 and 6, range 4, and in townships 4, 5 and 6, range 5, west of the seventh meridian. Survey of Pitt meadows in townships 40 and 42, east of the coast meridian. Survey of part of the townsite of Yale, and correction survey of the townsite of Hope in townships 7 and 5, respectively, range 26, west of the sixth meridian.
Kimpe, M.	Edmonton, Alta.	Contract No. 16 of 1907. Subdivision of township 58, range 8; townships 57 and 58, range 9; townships 58 and 59, range 10; townships 59, ranges 11 and 12, and townships 60, ranges 10, 11 and 12, south of Athabaska river. Survey of east boundaries of townships 59 and 60, range 9; township 57, range 10; townships 57 and 58, ranges 11 and 12, and townships 57, 58, 59 and 60, range 13, all west of the fifth meridian.
Kirk, J. A.	Revelstoke, B. C.	Subdivision in township 26, range 20, west of the fifth meridian, and township 23, range 2, west of the sixth meridian.
Knight, R. H.	Edmonton, Alta	Contract No. 22 of 1907. Subdivision of township 61, range 1; townships 60 and 61, range 2, and township 61, ranges 3, 4 and 5. Survey of the east boundary of township 61, range 6, all west of the fifth meridian.

APPENDIX No. 1.

SCHEDULE of Surveyors employed, and work executed by them, from April 1, 1907, to March 31, 1908.—*Continued.*

Surveyor.	Address.	Description of Work.
Lonergan, G. J.	Buckingham, Que.	Inspection of part of contract No. 15 of 1905, contracts No. 24 of 1906, and Nos. 4, 8, 9, 10, 18, 19 and 23 of 1907. Traverse in township 36, range 18 west of the fourth meridian. Miscellaneous resurveys in township 57, range 10: township 59, range 12; township 26, range 17; township 52, range 21; and townships 51, ranges 25 and 26; part subdivision of township 27, range 17, and township 51, range 21, all west of the fourth meridian.
Magrath, C, A.	Lethbridge, Alta.	Contract No. 18 of 1907. Subdivision of townships 7 and 8, range 12, and township 8, range 13, all west of the fourth meridian.
Miles, C F.	Toronto, Ont.	Inspection of contracts Nos. 17, 25 and 41 of 1907, and parts of contracts Nos. 10, 13 and 25 of 1906. Survey of the townsites of Ernfold and Chaplin in township 17, range 7, and township 17, range 5, respectively, west of the third meridian. Correction survey in township 6, range 14, west of the second meridian. Retracement surveys in township 23, range 26, west of the second meridian. And in townships 21 and 24, range 1, township 24 and part of township 23, range 2, west of the third meridian.
Molloy, John	Winnipeg, Man.	Contract No. 32 of 1907. Subdivision of township 8, range 14; townships 1, 2, 3, 4, 5, 6, 7 and 8, range 15, all east of the principal meridian.
Montgomery, R. H.	Prince Albert, Sask.	Contract No. 13 of 1907. Subdivision of townships 50, ranges 15, 16 and 17, north of the Saskatchewan river; townships 50, ranges 18, 19, 20 and 21; townships 51, ranges 19, 20 and 21; north one-third of township 49, range 19. Survey of the east outlines of townships 51 and 52, ranges 15, 16, 17 and 18, and townships 52, ranges 19, 20 and 21, all west of the second meridian.
McLennan, A. L.	Toronto, Ont.	Contract No. 20 of 1907. Subdivision of townships 51, ranges 24 and 25; townships 52, ranges 23, 24, 25, 26 and 27, west of the second meridian; and townships 52, ranges 1 and 2, west of the third meridian.
McFarlane, W. G.	Toronto, Ont.	Contract No. 1 of 1907. Subdivision of townships 42 and 43, range 12; the south one-third of townships 45, ranges 1, 2, 3, 4, 5, 6 and 7, and the south two-thirds of townships 45, ranges 8, 9, 10 and 11. Survey of the east outline of township 41, range 12, and miscellaneous subdivision in township 44, range 1, and township 45, range 12, all west of the second meridian. Subdivision of the west half of township 41, range 25; the east half of townships 41 and 43, range 26; the north one-third of townships 44, ranges 28, 29, 30 and 31; miscellaneous subdivision in townships 42, ranges 25 and 26; townships 44, ranges 26, 27 and 32, and in township 45, range 32, all west of the principal meridian.
McGrandle, H.	Wetaskiwin, Alta.	Contract No. 10 of 1907. Subdivision of township 60, range 23; townships 66, 67 and 68, range 24. Survey of the east outline of townships 65, 66, 67 and 68, range 25, all west of the fourth meridian.
McMillan, Geo.	Ottawa, Ont.	Inspection of contracts Nos. 2, 9 and 27 of 1906, and contracts Nos. 3 and 12 of 1907. Resurvey of river lots in township 18, range 10, east of the principal meridian. Completion of the survey of the townsite of Gimli. Retracement and restoration survey of Manitoba House settlement in township 22, range 11, and in township 21, range 10, west of the principal meridian.

APPENDIX No. 1.

SCHEDULE of Surveyors employed and work executed by them, from April 1, 1907, to March 31, 1908.—*Continued.*

Surveyor.	Address.	Description of Work.
O'Hara, W. F.	Ottawa, Ont.	Survey of the second base line across ranges 2, 3 and part of 4. Subdivision of part of township 5, range 2, and parts of townships 5 and 6, range 3, all west of the fifth meridian.
Ord, L. R.	Winnipeg, Man.	Contract No. 34 of 1907. Subdivision of townships 64, ranges 21, 22, 23 and 24, and survey of the east outline of township 64, range 25, west of the fourth meridian.
Parsons, J. L. R.	Toronto, Ont.	Contract No. 17 of 1907. Subdivision of townships 1 and 2, ranges 17 and 18; townships 4, ranges 23 and 24; townships 9, ranges 25, 26 and 27; township 6, range 29, and townships 4, 5 and 6, range 30. Survey of the east outlines of townships 1 and 2, range 19, all west of the second meridian. Subdivision of townships 4, 5 and 6, range 1; townships 4, 5, 7, 8, 9, 10, 11 and 12, range 2; townships 5, 11 and 12, range 3; townships 12, ranges 4 and 5; townships 11 and 12, ranges 6, 7, 8, 9 and 10; survey of the east boundaries of townships 6, 7 and 8, range 3, all west of the third meridian.
Pearce, W.	Calgary, Alta.	Resurvey of township 24, range 22, and the east boundaries of sections 27 and 34, township 27, range 27, west of the fourth meridian.
Ponton, A. W.	Macleod, Alta.	Survey of the fifth meridian from the twentieth base to the twenty-second base; subdivision in township 10, range 29, west of the fourth meridian.
Reilly, W. R.	Regina, Sask.	Subdivision of townships 54, ranges 27 and 28. Retracement of township 34, range 6; part of township 38, range 13, and townships 51, 52 and 53, range 27, west of the third meridian. Mounding in townships 41 and 42, range 27, west of the second meridian. Traverse of two lakes, one in township 20, range 22, west of third meridian, and one in township 52, range 1, west of the fourth meridian.
Ross, Geo.	Welland, Ont.	Survey of the fourteenth base line across ranges 13 to 28, inclusive, west of the fifth meridian.
Ross, Jos. E.	Kamloops, B.C.	Traverse of the Columbia river through townships 30 and 31, range 25; townships 31 and 32, range 26, and township 32, range 27, west of the fifth meridian. Subdivision in townships 19, ranges 6 and 7; townships 18, ranges 7 and 8; townships 17, 18 and 19, range 9; townships 17, 18, 19 and 20, range 10; townships 17 and 18, range 11; township 18, range 12; townships 17, 18 and 19, range 14. Resurvey in townships 19, ranges 15 and 17, and townships 19 and 20, range 18, all west of the sixth meridian. Traverse in township 19, range 6; townships 18 and 19, ranges 7 and 9; townships 17, ranges 10, 12 and 13; townships 17 and 18, range 14; township 19, range 15, and township 20, range 18, all west of the sixth meridian.
Roy, G. P.	Quebec, Que.	Contract No. 21 of 1907. Subdivision of township 47, range 11; townships 49, ranges 12 and 13; townships 49, 50 and 51, range 14. Survey of the east outline of township 52, range 14, all west of the third meridian.
Saint Cyr, A.	Ottawa, Ont.	Survey of the sixth meridian from the sixteenth base line to the fourteenth base line; East outline of townships 51 and 52, range 27, west of the fifth meridian; and traverse from the southeast corner of township 51, range 27, west of the fifth meridian, to the northeast corner of township 48, range 1, west of the sixth meridian.

APPENDIX No. 1.

SCHEDULE of Surveyors employed, and work executed by them, from April 1, 1907, to March 31, 1908.—*Continued.*

Surveyor.	Address.	Description of Work.
Saint Cyr, J. B.....	Montreal, Que....	Subdivision of township 78, range 3; part of township 80, range 4, and parts of townships 71 and 72, range 6; survey of east outlines of townships 77, 79 and 80, ranges 3 and 4; township 78, range 4; township 80, range 5, and township 72, range 7, all west of the sixth meridian. Survey of Flyingshot Lake settlement, Spirit River settlement, and Peace River settlement, situated respectively in township 71, range 6, townships 78, ranges 5 and 6, west of the sixth meridian, and township 84, range 21, west of the fifth meridian.
Saunders, B. J.....	Edmonton, Alta..	Survey of the meridian between ranges 8 and 9 across townships 19A, 19, 20, 21, 22, 23, 24, 25 and 26; the fourth base line across ranges 16 and 17, and part of 15; the sixth and seventh base lines across ranges 8 and 9, all east of the principal meridian.
Selby, H. W.....	Toronto, Ont....	Subdivision of townships 74 and 75, ranges 14 and 15, and parts of townships 77, ranges 15 and 16. Survey of the east outlines of townships 73, ranges 14 and 15, all west of the fifth meridian.
Smith, C. C.....	Brampton, Ont.....	Subdivision survey in township 10 range 29 west of the fourth meridian; also part survey of townships 10 and 11 ranges 2 and 3, and subdivision in townships 7 and 8 ranges 5 and 6 west of the fifth meridian; survey of the townsite of Grassy Lake in township 10 range 13, west of the fourth meridian.
Stacey, A. G.....	Ottawa, Ont.....	Miscellaneous surveys in townships 20 ranges 18 and 19, townships 19, 20 and 21 range 20, townships 19 and 21 range 21, townships 16, 19 and 20 range 22, townships 15, 16, 20 and 21 range 23, township 20 range 24, townships 17, 22 and 23 range 25 and townships 20, 21 and 22 range 26, all west of the sixth meridian; traverse in townships 20 ranges 18 and 19, township 21 range 20, townships 19 and 21 range 21, township 20 range 22, townships 15, 20 and 21 range 23 and townships 22 and 23 range 25, all west of the sixth meridian.
Stewart, P. G.....	Britannia Bay, Ont.....	Exploration survey of townships 52 ranges 7 to 16 inclusive, townships 53 ranges 13 to 16, townships 54 ranges 11 to 15, townships 55 ranges 11 to 14, and townships 56 ranges 11 to 13, all west of the fifth meridian.
Teasdale, C. M.....	Concord, Ont.....	Contract No. 41 of 1907; partial subdivision of township 10 range 4, and subdivision of township 11 range 4, and townships 10 and 11 range 5, all west of the third meridian. Contract No. 26 of 1907; subdivision of townships 25 and 26 ranges 8 and 9, all west of the principal meridian.
Thibaudeau, W.....	Ottawa, Ont.....	Preliminary investigation of the water-powers on the Winnipeg river, between lake Winnipeg and the eastern boundary of Manitoba.
Tyrrell, J. W.....	Hamilton, Ont.....	Contract No. 14 of 1907; subdivision of township 24 range 1, townships 24 and 25 ranges 2 and 3, and township 25 range 4; survey of the east outline of township 25 range 1, and resurvey of the north outline of township 24 range 4, all east of the principal meridian; subdivision of townships 24 ranges 1, 2, 3 and 5, all west of the principal meridian.
Waldron, J.....	Moosejaw, Sask.....	Contract No. 25 of 1907; subdivision of townships 8 ranges 16, 17, 18, 19 and 20, also part of township 8 range 21, west of the third meridian.
Wallace, J. N.....	Calgary, Alta.	Survey of the boundary between British Columbia and the Yukon Territory between Stations 'M' and 'N' across the Dalton trail.

APPENDIX No. 1.

SCHEDULE of Dominion Land Surveyors employed, and work executed by them, from April 1, 1907, to March 31, 1908.—*Continued.*

Surveyor.	Address.	Description of Work.
Warren, Jas.....	Walkerton, Ont.....	Contract No. 15 of 1907 ; subdivision of township 51 range 3, townships 50 and 51 range 4, township 48 range 6 and townships 48 and 49 range 7, and the east outline of township 49 range 8, all west of the third meridian.
Watt, G. H.....	Ottawa, Ont.....	Contract No. 12 of 1907 ; completion of subdivision of township 16 range 12, townships 13 and 14 range 13 ; subdivision of townships 15, 16 and 17 range 13, townships 13 and 14 range 14 ; survey of the south outline of township 15 range 14, all east of the principal meridian.
Wheeler, A. O.....	Calgary, Alta...	Topographer of the Department of the Interior. Photo-topographical survey of the railway belt west of Golden, British Columbia, in the Dogtooth and Selkirk mountains.

APPENDIX NO. 2.

SCHEDULE showing for each Surveyor employed from April 1, 1907, to March 31, 1908, the number of miles surveyed of township section lines, township outlines, traverses of lakes and rivers, and resurvey, also the cost of the same.

Surveyor.	Miles of section line.	Miles of outline.	Miles of traverse	Miles of resurvey	Total mileage.	Total cost.	Cost per mile.	Day or contract.
						$ cts.	$ cts.	
Aylsworth, C. F.				217·00	217·00	7,681 31	35 41	Day.
Baker, J. C.	556·43	107·45	95·50		759·38	21,725 50	28 84	Contract.
Beatty, David			44·64	363·00	407·64	4,078 98	10 00	Day.
Belanger, P. R. A.			2·00	100 00	102·00	8,477 68		"
Bolton, Lewis			24·92		24·92	1,898 59	76 19	"
Bourgault, C. E.	108·00	14·00	49·76	271·00	142·76	8,299 00	18 52	"
Bray, Edgar	120·86	20·23	1·11		142·20	4,360 71	30 66	Contract.
Cautley, R. H.	660·94		138 96		799·90	6,604 49	8 26	"
Cautley, R. W.	261·92		93·53		355·45	7,814 58	21 98	"
Chilver, C. A.	344·13	91·59	48 34		484·06	14,102 17	29 13	"
Christie W.	117·00	17·00			134·00	10,578 94	78 95	Day.
Côté, J. L.	390·79	96·61	55·13		542·53	15,998 60	29 49	Contract.
Davies, T. A.	2 00			625·00	627·00	9,554 30	15 24	Day.
Deans, W. J			71·88	278·50	350·38	5,627 53	16 06	"
Dumais, P. T. C.			51 64	91·79	146·43	3,028 77	20 68	Contract.
Edwards, George.	641·75		26·17		667·92	5,471 81	8 19	"
Fairchild, C. C.	749·78		96 55		846 33	7,959 81	9 40	"
Fawcett, A	196·52	25 51	29·57		251·60	5,700 62	22 65	"
Fontaine, L. E.	17·00		510·40		527·40	7,690 89	14 58	Day.
Green, W. T.	79·25	6 00	42·86	9·00	137·11	6,719 35	49 00	"
Grover, G. A.	361·69	47·81	53 60		463·10	12,454 53	26 89	Contract.
Hawkins, A. H.		120·00			120·00	16,750 00	139 58	Day.
Holcroft, H. S.	244·97	12·10	99·84		356·91	7,854 88	22 00	Contract.
Hopkins, M. W.	741·82	100 61	260 10		1102·53	27,197 83	24 66	"
*Hubbell, E. W.			1·45	249·50	250·95	10,178 80		Day.
Johnston, A. W.	6·30	20 60	102 80	29·80	159·50	10,855 73	68 05	"
Kimpe, M.	370·06	114 84	55·66		540·56	16,145 31	29 86	Contract.
Kirk, J. A.	17·40		4·00	2·50	23·90	974 40	40 77	Day.
Knight, R. H.	284·51	29 92	45 92		360·35	10,520 16	29 19	Contract.
*Lonergan, G. J.			8·15	63·50	71·65	7,280 38		Day.
Magrath, C. A.	138·00				138·00	992 28	7 19	Contract.
*Miles, C. F.			20 60	232·50	253·10	9,388 19		Day.
Molloy, John.	618 17	54·77			672·94	20,664 31	30 70	Contract.
Montgomery, R. H.	521·89	122·62	36·15		680·66	20,497 64	30 11	"
MacLennan, A. L.	359·63	12 03	38 05		409·71	10,831 61	26 43	"
McFarlane W. G.	562·89	25·00	17·23		605·12	18,048 36	29 82	"
McGrandle, H.	187·65	36 21	67 56		291·42	7,581 61	26 01	"
*McMillan, Geo.			86·44	24 50	110 94	10,935 56		Day.
O'Hara, W. F.	59·00		2 75		61·75	7,071 98	114 52	"
Ord, L. R.	193·22	30·20			223·42	6,104 47	27 32	Contract.
Parsons, J. L. R.	1821·48	66·13	107·25		1994·86	15,424 52	7 73	"
Pearce, W.				43 84	43·84	221 25	5 05	"
Ponton, A. W.	3·00	48 00			51·00	7,920 00	155 29	Day.
Reilly, W. R.	10·05		34·78	247·00	291·83	4,303 89	14 74	"
Ross, Geo.		90·77			90·77	13,275 34	146 25	"
Ross, J. E.	60·50	16·00	81·20	15·30	173·00	8,224 52	47 54	"
Roy, G. P.	303·07	24·17	77·30		404·54	9,893 90	24 45	Contract.
Saint Cyr, A.		60·50	18·00		78·50	17,100 00	217 83	Day.
Saint Cyr, J. B.	120·00	69·00	114·26		303·26	10,876 21	35 83	"
Saunders, B. J.	30·50	42·50			73·00	10,100 00	138 36	"
Selby, H. W.	176·00	28·00	9·00		213·00	8,254 24	38 75	"
Smith, C. C.	85·50		30·14		115·64	5,573 63	48 19	"
Stacey, A. G.	83·30	10·00	36·00	44·70	174 00	7,729 84	44 42	"
Teasdale, C. W.	339·30	17·80	93·82		450·92	6,766 40	15 00	Contract.
Tyrrell, J. W.	640·70	29·05	34·53		704·28	19,915 81	28 24	"
Waldron, J.	278·51	30·20	8·76		317·47	2,602 24	8 19	"
Wallace, J. N.			17·13	9·21	26·34	9,818 68	372 76	Day.
Warren, Jas.	257·99	6·00	96·94		360·93	9,265 29	25 67	Contract.
Watt, G. H.	586·18	31·15	147·60		764·93	20,480 62	26 78	"
Total	13709·65	1674·37	3192·97	2917·64	21494·63	583,451 04		

* Inspecting contract surveys a portion of the season.

APPENDIX No. 3.

LIST of lots in the Yukon Territory surveys of which have been received from April 1, 1907, to March 31, 1908.

GROUP No. 1.

Lot No.	Area in Acres.	Surveyor.	Year of Survey.	Date of Approval.	Claimant.	Remarks.
40	1·00	C. S. W. Barwell	1907..	Oct. 11, 1907..	D. A. McRea *et al*.....	Surface.

GROUP No. 2.

345	40 00	T. D. Green.. .	1907..	May 29, 1907..	Chris. H. Authier....	Surface.
346	1·29	"	1907..	" 29, 1907..	" "	"
352	91·14	C. W. MacPherson	1907..	Oct. 11, 1907..	H. H. Norwood Co.....	"
353	94·25	" ..	1907..	" 11, 1907..	" "	"
354	114·74	" ..	1907..	" 11, 1907..	" "	"
355	87·00	" ..	1907..	" 11, 1907..	" "	"
356	99·75	" ..	1907..	" 11, 1907..	" "	"
359	51·6	C. S. W. Barwell	1907..	" 7, 1907..	Wm. Elliott *et al*.....	Mineral claim.
360	38·9	" ..	1907..	" 7, 1907..	"	"
361	37·1	" ..	1907..	" 7, 1907..	"	"
362	47·4	" ..	1907..	" 7, 1907 .	"	"
367	29·9	" ..	1907..	" 7, 1907..	"	"
368	51 6	" ..	1907..	" 7, 1907 .	"	"
369	51·6	" ..	1907..	" 7, 1907..	"	"
370	51·6	" ..	1907..	" 7, 1907..	"	"
371	51·6	" ..	1907..	" 7, 1907..	"	"
372	51·6	" ..	1907..	" 7, 1907..	"	"
373	51·6	" ..	1907..	" 7, 1907..	"	"
374	51·6	" ..	1907..	" 7, 1907..	"	"
383	11·47	C. W. MacPherson	1907..	" 30, 1907..	O. R. Brenner.....	Surface.
384	11·47	" ..	1907..	" 30, 1907..	"	"
385	11·47	" ..	1907..	" 30, 1907..	"	"
386	11·47	" ..	1907..	" 30, 1907..	"	"
388	.....	C. S. W. Barwell	1904..	*	{ White channel Gold..... { Hill Hyd'c. Co. Ltd.....	"

GROUP No. 5.

66	32·36	H. G. Dickson..	1905..	June 22, 1907..	J. P. Whitney *et al*.....	Mineral claim.
67	26·93	" ..	1905..	" 22, 1907..	"	"
68	51·39	" ..	1905..	" 22, 1907..	"	"
69	50·10	" ..	1905..	" 22, 1907..	"	"
71	42·88	" ..	1907..	Oct. 21, 1907..	"	"
72	40·34	" ..	1907..	" 21, 1907..	"	"
73	48·17	" ..	1907..	" 21, 1907..	"	"
74	31·73	" ..	1907..	" 21, 1907..	"	"
75	42·35	" ..	1907..	" 21, 1907..	"	"
76	24·60	" ..	1907..	" 21, 1907..	"	"
77	25·46	" ..	1907..	" 21, 1907..	"	"
78	49·95	" ..	1906..	June 22, 1907..	Bryson N. White.....	"
79	40·08	" ..	1906..	" 22, 1907..	"	"
80	50·82	" ..	1906..	" 22, 1907..	"	"
81	17·82	" ..	1906..	" 22, 1907..	"	"
82	51·65	" ..	1906..	" 22, 1907..	"	"
83	51·65	" ..	1906..	" 22, 1907..	"	"
84	49·06	" ..	1907..	*	C. H. Johnston *et al*	"
85	44·80	" ..	1907..	*	"	"
86	49·16	" ..	1907..	*	"	"
87	49 15	" ..	1907..	*	"	"

* Not yet approved.

APPENDIX No. 3.

LIST of Lots in the Yukon Territory surveys of which have been received from April 1, 1907, to March 31, 1908.—*Concluded.*

Lot No.	Area in Acres.	Surveyor.	Year of Survey.	Date of Approval.	Claimant.	Remarks.
88	51·02	" ..	1907..	Jan. 23, 1908..	A. C. Robertson *et al*.....	Mineral Claim.
89	51·62	" ..	1907..	" 23, 1908..	"	"
90	18·03	" ..	1907..	" 23, 1908..	"	"
91	45·72	" ..	1907..	" 23, 1908..	"	"
92	51·65	" ..	1907..	*	J. Williams & A. La Rose....	"
93	51·65	" ..	1907..	*	" "	"
94	51·65	" ..	1907..	Jan. 23, 1908..	" "	"
95	51·54	" ..	1907..	" 23, 1908..	" "	"
96	49·84	" ..	1907..	" 23, 1908..	J. P. Whitney.....	"
97	27·17	" ..	1907..	Feb. 26, 1908..	W. S. Thomas..... ...	"
98	122·42	" ..	1907..	*	J. Williams & A. La Rose....	"
99	145·01	" ..	1907..	*	" " .. .	"
100	144·35	" ..	1907..	*	" "	"
101	159·03	" ..	1907..	*	" "	"
102	158·35	" ..	1907..	*	" "	"
103	32·80	" ..	1907..	Feb. 26, 1908..	W. S. Thomas.....	"
104	24·63	" ..	1907..	Jan. 23, 1908..	Clara L. Walters	"
105	44·05	" ..	1907..	" 22, 1908..	B. J. McGee..	"
106	46·62	" ..	1907..	" 22, 1908..	W. J. Elmendorf.....	"
107	11·78	" ..	1907..	" 22, 1908 .	"	"
108	51·65	" ..	1907..	" 23, 1908..	C. P. Seale.....	"
109	28·55	" ..	1907..	" 22, 1908..	Florence Young.....	"
142	33·61	N. A. Burwash..	1908..	*	A. B. Palmer....	"

GROUP No. 6.

23	51·65	H. G. Dickson..	1907..	*	R. H. Chadwick.....	Mineral claim.
80	36·55	" ..	1907..	*	"	"

GROUP No. 10.

22	10·00	C. S. W. Barwell	1907..	Sept. 13, 1907..	S. Rowlinson.....	Surface.
23	160·00	" ..	1907..	" 13, 1907..	C. E. Miller *et al*.....	"
24	160·00	" ..	1907..	" 13, 1907..	"	"
25	40·00	" ..	1907.	" 13, 1907..	Geo. Delion.....	"
26	120·00	" ..	1907..	Oct. 11, 1907..	A. B. Palmer....	"

* Not yet approved.

APPENDIX No. 4.

LIST of Miscellaneous surveys in the Yukon Territory, returns of which have been received from April 1, 1907, to March 31, 1908.

Year.	Surveyor.	Description of Survey.
1907.....	T. D. Green....	Base Line on Dago Gulch, a tributary of Hunker creek.
1907.....	H. G. Dickson..	" Burwash creek, a tributary of Kluane river.

APPENDIX No. 5.

STATEMENT of work executed in the office of the chief draughtsman.

Letters of instruction to surveyors	177
Progress sketches received and filed	1,002
Declarations of settlers received and filed	473
Plans received from surveyors	334
Field books received from surveyors	577
Timber reports received	56
Preliminary township plans prepared	369
Sketches made	1,352
Maps made	22
Tracings and miscellaneous plans made	154
Plans of Yukon lots received	76
Plans of miscellaneous Yukon surveys received	2
Tracings of Yukon survey plans made	87
Yukon lots reduced to 40 chains to 1 inch and plotted on group plans	96
Yukon traverses reduced to 40 chains to 1 inch and plotted on group plans	2
Returns of surveys examined—	
Township subdivision	362
Township outline	157
Road plans	233
Railway plans	112
Mineral claims	32
Timber berths	60
Correction and other miscellaneous surveys	55
Township plans compiled	604
Proofs of plans examined	539
Township plans printed	518
Townsites and settlements printed	5
Descriptions written	7
Pages of field notes copied	244
Traverse reductions made	28
Applications for various information dealt with	1,869
Fyles received and returned	1,980
Letters drafted	4,993
Books received from record office and used in connection with office work	4,870
Books returned to record office	5,254
Plans other than township plans received from record office and used in connection with office work	552
Plans returned to record office	572
Volumes of plans received from record office and used in connection with office work	78
Volumes of plans returned to record office	74
Books sent to record office to be placed on record	494
Plans other than township plans sent to record office to be placed on record	476

APPENDIX No. 5—*Continued.*

Sectional maps (3 miles to 1 inch)—	
Revised	73
Reprinted	28
New sheets compiled	6
New sheets printed	4
New drawings of old worn out sheets	2
New tracings of old worn out sheets	7
Sectional maps (6 miles to 1 inch)—	
Reprinted	24
New sheets printed	3
Proofs of sectional sheets examined	110

APPENDIX No. 6.

LIST of new editions of sectional maps issued from April 1, 1907, to March 31, 1908.
Scale 3 miles to an inch.

No.	Name.	No.	Name.	No.	Name.	No.	Name.
10	Port Moody	67	Maple Creek	215	RedDeer	269	Pr. Albert S.
11	Yale	68	Swift Current	216	Sullivan Lake	*313	Brulé.
15	Lethbridge	111	Kamloops	*263	Jasper	314	St. Ann.
16	Milk River	164	Morley	264	Brazeau	319	Pr. Albert N.
17	Cypress	165	Rosebud	265	Peace Hills	*320	Carrot River.
19	Willowbunch	168	The Elbow	266	Ribstone Creek	365	Victoria.
61	Lytton	171	Duck Mountain	267	Battleford	366	Saddle Lake.
66	Medicine Hat	172	Fairford	268	Carlton	*416	La Biche.

SCALE 6 MILES TO AN INCH.

10	Port Moody	66	Medicine Hat	111	Kamloops	314	St. Ann.
11	Yale	67	Maple Creek	165	Rosebud	317	Fort Pitt.
15	Lethbridge	68	Swift Current	171	Duck Mountain	318	Shell River.
16	Milk River	69	Moosejaw	172	Fairford	319	Pr. Albert N.
17	Cypress	71	Brandon	*263	Jasper	*320	Carrot River.
19	Willowbunch	72	Portage La Prairie	268	Carlton	365	Victoria.
61	Lytton			269	Prince Albert S		
				*313	Brulé		

* First edition.

APPENDIX No. 7

STATEMENT of work executed in the Survey Records Office from April 1, 1907, to March 31, 1908.

Files received and dealt with	10,466
Letters drafted	4,405
Plans, tracings, &c., copied or compiled	369
Statutory declarations copied or mailed	506
Plans sent to agents, registrars, &c	28,545
Pages of field notes copied	2,348
Prints of plans received and stored	110,785
Original plans received and recorded	1,068
Original field notes received and recorded	433
Letters written to agents	1,300
Registered parcels mailed	1,741

Work done for Topographical Surveys Branch.

Books searched for	8,018
Books sent	5,396
Books returned	6,250
Plans searched for	2,223
Plans sent	1,820
Plans returned	532
Volumes searched for	134
Volumes sent	77
Volumes returned	75

Work done for Patents Branch.

Plans searched for	812
Plans sent	1,427
Plans returned	924
Field notes searched for	226
Field books sent	57
Field books returned	63

Work done for other Branches.

Plans searched for	1,453
Plans sent	1,427
Plans returned	924
Field notes searched for	266
Field notes sent	240
Field notes returned	244

APPENDIX No. 8.

STATEMENT of work executed in the Photographic Office from April 1, 1907, to March 31, 1908.

FOR THE DEPARTMENT OF THE INTERIOR.

—	3¼ x 3¼	4 x 5	5 x 7	8 x 10	10 x 12	11 x 14	16 x 18	18 x 20	24 x 30	30 x 36	36 x 42	42 x 48	Total.
Bromide prints		133	435	38	27	758	38	82	36	34	18	8	1,607
Vandyke prints				2	4	17	39	51	49	7	15	12	196
Silver prints		583	2,673	2									3,258
Lantern transparencies	86												86
Dry plate negatives		234	732										966
Wet plate negatives				89		91	703	185					1,068
Zinc transfers						5		814					819
Total	86	950	3,840	131	31	871	780	1,132	85	41	33	20	8,000

FOR THE GEOLOGICAL SURVEY.

—	3¼ x 3¼	4 x 5	5 x 7	8 x 10	10 x 12	11 x 14	16 x 18	18 x 20	24 x 30	30 x 36	36 x 42	42 x 48	Total.
Bromide prints				4		33							37
Silver prints		52											52
Total		52		4		33							89

APPENDIX No. 9.

STATEMENT of work executed in the Lithographic Office from April 1, 1907, to March 31, 1908.

Month.	Maps.		Townships.		Forms.	
	No. of Jobs.	No. of Copies.	No. of Jobs.	No. of Copies.	No. of Jobs.	No. of Copies.
1907.						
April	6	12,400	50	10,000	6	3,450
May	9	8,500	40	8,000	8	9,000
June	4	925	39	7,800	5	2,025
July	19	40,650	32	6,400	5	12,550
August	2	650	58	11,600	4	1,600
September	6	2,050	23	4,600	3	350
October			63	12,600	12	9,490
November	14	2,175	42	8,400	6	2,825
December	8	3,025	45	9,000	3	600
1908.						
January	10	7,550	50	10,000	10	3,525
February	10	3,000	53	10,600	14	6,750
March	1	350	78	15,600	12	6,890
Total	89	81,275	573	114,600	88	59,055

Summary of work for the year.

—	No. of Jobs.	No. of Copies.	No. of Impressions.	Cost.	Cost per map or form.
				$ cts.	$ cts.
Maps	89	81,275	185,035	2,363 63	26 55
Townships	573	114,600	250,820	4,361 57	7 60
Forms, &c	88	59,055	63,555	1,270 80	14 45
Total	750	254,930	499,410	7,996 00	

APPENDIX No. 10.

Names and duties of employees of the Topographical Surveys Branch at Ottawa. (Metcalfe street, corner of Slater street).

Deville, E., D.T.S., LL.D., Surveyor General.

CORRESPONDENCE AND ACCOUNTS.

Brady, M., secretary.
Hunter, R. H., accountant.
Wilkinson, Percy, assistant accountant.
Percival, Miss M. F., stenographer and typewriter.
Cullen, M. J., stenographer and typewriter.
Moran, J. F., stenographer and typewriter.
Lynch, F., stenographer and typewriter.
Williams, E. R., clerk.
Pegg, A., messenger.
Paquette, Albert, messenger.

OFFICE OF CHIEF DRAUGHTSMAN.

Symes, P. B., chief draughtsman.
Shanks, T., B.A.Sc., D.L.S., assistant to chief draughtsman.

First Division—Instructions and General Information.

Brown, T. E., B.A., in charge of division.
Weekes, M. B., B.A.Sc., D.L.S., O.L.S.
Umbach, J. E., Grad. S.P.S., D.L.S.
Barber, H. G., Grad. S.P.S., D.L.S.
Green, W. T., B.A., D.L.S.
Rice, F. W., Grad. School of Mining.
McRae, A. D., B.A., B.Sc.
Carroll, M. J., Grad. S.P.S.
Stewart, A. G., Grad. School of Mining.
Grant, A. W., B.A.
Belleau, J. A., D.L.S.
Dodge, G. B.
Sylvain, J.
Cram, A.
Rochon, E. C.
Burkholder, E. L.
McLaughlin, M. J.
Gaudry, G. A.
Grey, G. A.

Second Division—Examination of Surveyors' Returns.

Nash, T. S., Grad. S.P.S., D.L.S., in charge of division.
Henderson, F. D., Grad. S.P.S., D.L.S.
Burgess, E L., Grad. S.P.S., D.L.S., O.L.S.

Dennis, E. M., B.Sc.
Akins, J. R., B.Sc.
Cumming, A. L., B.Sc.
Elder, A. J., Grad. S.P.S., D.L.S.
Hill, S. N., Grad. S.P.S.
Elwell, W., Grad. S.P.S.
Maynard, F.H., Grad. R.M.C.
Day, H. S., B.Sc.
Sutherland, H. E., B.Sc.
Morrier, J. E., D.L.S.
Davies, T. A., D.L.S.
Kitto, F. H., D.L.S.
McClennan, W. D.
Roger, A.
Clunn, T. H. G.
Robertson, D. F.
Spreekley, R. O.
Goodday, Leonard
Williamson, F. H. H.
Webb, G. C.
Wilding, C. H.
Bray, R. P.
Harrison, E. W.
Ault, H. W.
Macdonald, J. A.

Third Division—Drawing Plans for Printing.

Engler, Carl, B.A., D.L.S., in charge of division.
May, J. E.
O'Connell, J. R.
Moule, W. J.
Villeneuve, E. J.
Helmer, J. D.
Archambault, E.
Tremblay, A.
Hutton, J. B.
Brown A.
Binks, C. B.
Dawson, R. J.
Holbrook, C. H.
Watters, James.

Fourth Division—British Columbia Surveys.

Rowan-Legg, E. L., in charge of division.
Carson, P. A., B.A., D.L.S.
MacIlquham, W. L., B.Sc.
Gillmore, E. T. B., Grad. R.M.C.
Lawe, H., D.L.S.
Morley, R. W.
Weld, W. E.
Wilson, E. D.

Fifth Division—Imperial building, Queen street—Mapping.

Smith, Jacob, in charge of division.
Bégin, P. A.
Lepage, J. B.
Blanchet, A. E.
Davies, T. E. S.
Taggart, C. H.
Perrin, V.
Genest, P. F. X.
Bergin, W.
Davy, Eugene.

OFFICE OF THE GEOGRAPHER.

(Woods building, Slater street.)

White, J., geographer.
Baine, H. E.
Chalifour, J. E.
Dumouchel, G. E.
Taché, H.
Darrach, M.
Wilson, H. W.
Akerlindh, A.
Anderson, W.
Blatchley, H. M.
Bennie, J.
Wood, C. G.
Craig, R. W.
Chandler, S.
Groulx, A.
Gagnon, A. S.
Inkster, F. B.
Blue, W.
Beveridge, James.
MacElligot, J. P.
Martin, Miss M. Perley.
Pigeon, Jules.
Waine, Mrs. D. E.
Merrifield, J. R.

SURVEY RECORDS OFFICE.

(Canadian building, Slater street.)

Steers, C. J., clerk in charge.
Currie, P. W., B.A., B.Sc., D.L.S., assistant clerk in charge.
Surtees, W. S., draughtsman.
Sowter, T. W. E., draughtsman.
Smith, F. W., draughtsman.
Routh, C. F., draughtsman.
Ashton, A. W., draughtsman.
Lecourt, Eugène, draughtsman.
Moore, R. T., draughtsman.
Lambart, O. H., draughtsman and typewriter.
Belleau, Eugène, draughtsman.

Yeilding, Miss A., typewriter.
Mudie, J. M., draughtsman.
Gillis, W. C., draughtsman.
Landry, Narcisse, messenger.

LITHOGRAPHIC OFFICE.

(Metcalfe street, corner of Slater street.)

Moody, A., foreman.
Thicke, C., engraver and lithographer.
Thicke, H., power press printer.
Bergin, J., power press printer.
Deslauriers, J. H., transferrer.
Boyle, S., stone polisher.
Gagnon, J., press feeder.

PHOTOGRAPHIC OFFICE.

(Metcalfe street, corner of Slater street.)

Topley, H. N., photographer in charge.
Carruthers, H. K., photo-lithographer and photo-engraver.
Woodruff, J., photographer.
Whitcomb, H. E., photographer.
Morgan, W. E., photographer.
Kilmartin, A., photographer.
Devlin, A., photographer.
Ouimet, Geo., photographer.

GEOGRAPHIC BOARD.

(Woods building, Slater street.)

Whitcher, A. H., D.L.S., secretary.

APPENDIX No. 11.

LIST of Dominion Land Surveyors who have been supplied with Standard Measures.

Name.	Address.	Date of Appointment.	Remarks.
Austin, G. F.	Dewdney, Alta	April 14, 1872	
Aylen, J.	Aylmer, Que.	May, 29, 1885	
Aylsworth, C. F.	Madoc, Ont.	" 17, 1886	
Baker, J. C.	Vermilion, Alta	" 18, 1906	
Barwell, C. S. W.	Dawson, Yukon Territory	Aug. 21, 1894	
Bayne, G. A.	Winnipeg, Man.	April 14, 1872	
Beatty, D.	Parry Sound, Ont.	" 14, 1872	
Beatty, W.	Delta, Ont.	" 14, 1872	
Belanger, P. R. A.	Ottawa, Ont.	May 17, 1880	Inspector of Surveys, Topographical Surveys Branch, Dept. of Interior.
Bellean, J. A.	"	" 15, 1883	Topographical Surveys Branch, Dept. of Interior.
Bigger, C. A.	"	Mar. 30, 1882	Astronomer, Dept. of Interior.
Bolton, L.	Listowell, Ont.	April 14, 1872	
Boswell, E. J.	Winnipeg, Man.	Feb. 18, 1903	
Bourgeault, A.	St. Jean Port Joli, Que.	Mar. 29, 1883	
Bourgault, C. E.	" "	Feb. 21, 1888	
Bourget, C. A.	Levis, Que.	May 14, 1884	
Bowman, H. J.	Berlin, Ont.	Feb. 16, 1888	
Brabazon, A. J.	Ottawa, Ont.	May 12, 1882	
Brady, J.	Golden, B.C.	April 14, 1872	
Bray, S.	Ottawa, Ont.	Nov. 14, 1883	Dept. of Indian Affairs.
Bray, E.	Oakville, Ont.	April 14, 1872	
Bray, L. T.	Amherstburg, Ont.	Feb. 18, 1903	
Bridgland, M. P.	Calgary, Alta.	Mar. 10, 1905	Topog. Surveys Branch, Dept. of Interior.
Brownlee, J. H.	Victoria, B.C.	Apr. 15, 1887	
Burke, W.	Minnedosa, Manitoba	" 14, 1872	
Burnet, H.	Victoria, B.C.	June 22, 1885	
Burwash, N. A.	Whitehorse, Yukon Territory	Mar. 6, 1907	
Burwell, H. M.	Vancouver, B.C.	Feb. 17, 1887	
Carbert, J. A.	Medicine Hat, Alta.	May 12, 1880	
Carpenter, H. S.	Regina, Sask.	Feb. 20, 1901	Dept. of Public Works for Saskatchewan.
Carroll, C.	Prince Albert, Sask.	April 14, 1872	
Carson, P. A.	Ottawa, Ont.	Feb. 22, 1906	Topog. Surveys Branch, Dept. of Interior.
Cautley, R. H.	Edmonton, Alta.	May 1, 1905	
Cautley, R. W.	"	Sept. 2, 1896	
Cavana, A. G.	Orillia, Ont.	Nov. 16, 1876	
Charlesworth, L. C.	Edmonton, Alta.	Feb. 27, 1903	Dept. of Public Works, Alberta.
Chilver, C. A.	Walkerville, Ont.	" 22, 1907	
Christie, W.	Chesley, Ont.	Mar. 22, 1906	
Coates, P. C.	Golden, B.C.	Apr 19, 1907	
Cleveland, E. A.	Vancouver, B.C.	June 27, 1899	
Côté, J. A.	Quebec, Que.	May 14, 1884	
Côté, J. L.	Edmonton, Alta.	Mar. 21, 1890	
Cotton, A. F.	New Westminster, B.C.	May 11, 1880	
Craig, J. D.	Ottawa, Ont.	Feb. 24, 1902	Boundary Surveys, Dept of Int.
Cunnings, J. G.	Calgary, Alta.	" 17, 1904	
Dalton, J. J.	Weston, Ont.	April 17, 1879	Dominion Topographical Surveyor.
Davies, T. A.	Ottawa, Ont.	Feb. 22, 1906	
Deans, W. J.	Brandon, Man.	May 13, 1886	
Dennis, J. S.	Calgary, Alta.	Nov. 19, 1877	Dominion Topographical Surveyor, Inspector of Irrigation and British Columbia Land Commissioner, C.P.R.

APPENDIX No. 11.

List of Dominion Land Surveyors who have been supplied with Standard Measures.—*Continued.*

Name.	Address.	Date of Appointment.	Remarks.
Denny, H. C.	"	April 1, 1882	
Dickson, H. G.	Whitehorse, Yukon Territory.	May 19, 1889	
Dickson, J.	Fenelon Falls, Ont	April 14, 1872	
Dobie, J. S.	Regina, Sask.	Mar. 22, 1906	Dept. of Public Works for Saskatchewan.
Doupe, J.	Winnipeg, Man	April 14, 1872	
Doupe, J. L	"	Oct. 6, 1888	Asst. Land Commissioner, C. P.R.
Drewry, W. S.	New Denver, B.C.	Nov. 14, 1883	
Driscoll, A.	Edmonton, Alta.	Feb. 23, 1887	
Drummond, T.	Montreal, Que.	June 24, 1878	Dominion Topographical Surveyor.
Ducker, W. A.	Winnipeg, Man	Mar. 30, 1883	Swamp Land Commissioner.
Dumais, P. T. C.	Hull, Que.	" 29, 1882	
Edwards, Geo.	Ponoka, Alta.	April 14, 1872	
Ellacott, C. H.	Regina, Sask.	Feb. 22, 1899	
Empey, J. M.	Calgary, Alta	" 23, 1905	
Fairchild, C. C.	Brantford, Ont.	" 20, 1901	
Farncomb, A. E.	Red Deer, Alta	Mar. 12, 1902	
Fawcett, T.	Niagara Falls, Ont.	Nov. 18, 1876	Dominion Topographical Surv.
Fawcett, A.	Gravenhurst, Ont	Feb. 22, 1893	
Fontaine, L. E	Levis, Que.	Aug. 13, 1892	
Foster, F. L	Toronto, Ont	April 14, 1872	
Francis, J.	Poplar Point, Man.	June 17, 1875	
Garden, J. F.	Vancouver, B. C	May 13, 1880	
Garden, G. H.	Lethbridge, Alta	April 14, 1872	
Garden, C	Winnipeg, Man	" 14, 1872	
Garner, A. C.	South Qu'Appelle, Sask	May 27, 1907	
Gauvreau, L. P	Riviere du Loup, Que	April 14, 1872	
Gibbon, J.	Dawson, Yukon Territory	Feb. 12, 1891	
Gordon, M. L.	Vancouver, B.C.	" 18, 1904	
Gordon, R. J.	Stirling, Alta	Mar. 12, 1902	
Gore, T. S	Victoria, B. C	April 19, 1879	
Green, T. D.	Dawson, Yukon Territory	May 19, 1884	
Green, W. T.	Ottawa, Ont	Feb. 22, 1907	
Grover, G. A.	Norwood, Ont	Feb. 18, 1904	
Harris, J. W.	Winnipeg, Man	April 14, 1872	City Surveyor, Winnipeg.
Harvey, C.	Indian Head, Sask	Feb. 17, 1904	
Hawkins, A. H.	Listowel, Ont.	Mar. 6, 1906	
Heathcott, R. V.	Edmonton, Alta.	May 13, 1907	
Henderson, W.	Chilliwack, B.C	Nov. 17, 1883	
Holcroft, H. S	Toronto, Ont	Feb. 18, 1903	
Hopkins, M. W	Edmonton, Alta.	" 20, 1901	
Hubbell, E. W.	Ottawa, Ont.	May 19, 1884	Topographical Surveys Branch Dept. of Interior, President of D.L.S. Association.
Irwin, J. M.	Kenora, Ont	April 14, 1872	
James, S.	Toronto, Ont	April 14, 1872	
Jephson, R. J	Winnipeg, Man.	May 12, 1880	
Johnson, A. W	Kamloops, B.C.	Mar. 12, 1902	
King, W. F.	Ottawa, Ont.	Nov. 21, 1876	Dominion Topographical Surveyor, Chief Astronomer, Dept. of Interior.
Kimpe, M.	Edmonton, Alta.	May 13, 1907	
Kirk, J. A.	Revelstoke, B.C.	May 11, 1880	
Klotz, O. J.	Ottawa, Ont.	Nov. 19, 1877	Dominion Topographical Surveyor, Astronomer, Dept. of the Interior.
Knight, R. H	Edmonton, Alta.	Feb. 18, 1904	
Latimer, F. H.	Detroit, Mich.	" 13, 1885	
Laurie, R. C.	Battleford, Sask	April 27, 1883	
Lawe, H.	Ottawa, Ont.	" 14, 1872	
Lemoine, C. E.	Quebec, Que	Mar. 31, 1882	
Lendrum, R. W	Strathcona, Alta.	May 15, 1880	

APPENDIX No. 11.

LIST of Dominion Land Surveyors who have been supplied with Standard Measures.—*Continued.*

Name.	Address.	Date of Appointment.	Remarks.
Lonergan, G. J.	Buckingham, Que.	Feb. 28, 1901	Inspector of Surveys, Topographical Surveys Branch, Dept. of Interior.
Lumsden, H. D.	Ottawa, Ont.	April 14, 1872	Chief Engineer Trans. Ry.
MacPherson, C. W.	Dawson, Yukon Territory	Mar. 7, 1900	Director of Surveys, Y.T.
Magrath, C. A.	Lethbridge, Alta.	Nov. 16, 1881	Dominion Topographical Surveyor, Land Commissioner, Alberta Railway and Coal Co.
Malcolm, L.	Blenheim, Ont.	April 14, 1872	
Meadows, W. W.	Maple Creek, Sask.	Feb. 23, 1905	District Surveyor and Town Engineer.
Miles, C. F.	Toronto, Ont.	April 14, 1872	Inspector of Surveys, Topographical Surveys Branch, Dept. of Interior.
Moberly, H. K.	Innisfail, Alta.	Feb. 27, 1903	
Molloy, J.	Winnipeg, Man.	April 14, 1872	
Montgomery, R. H.	Prince Albert, Sask.	Feb. 23, 1905	
Moore, H. H.	Calgary, Alta.	Feb. 17, 1904	
McArthur, J. J.	Ottawa, Ont.	" 17, 1879	
McColl, G. B.	Winnipeg, Man.	Mar. 20, 1907	
McFadden, M.	Neepawa, Man.	Feb. 14, 1872	
McFarlane, W. G.	Toronto, Ont.	May 19, 1905	
McFee, A.	Innisfail, Alta.	Feb. 19, 1879	
McGrandle, H.	Wetaskiwin, Alta.	May 30, 1883	
McKenna, J. J.	Dublin, Ont.	April 14, 1872	
McKenzie, J.	New Westminster, B.C.	Nov. 18, 1888	Dominion Lands Agent, New Westminster.
McLean, J. K.	Ottawa, Ont.	April 1, 1882	Dept. of Indian Affairs.
MacLennan, A. L.	Toronto, Ont.	Feb. 23, 1905	
McMillan, G.	Ottawa, Ont.	" 22, 1906	Inspector of Surveys, Topographical Surveys Branch, Dept. of Interior.
McPherson, A. J.	Dawson, Yukon Territory	" 21, 1901	
McPhillips, G.	Windsor, Ont.	June 17, 1875	
McVittie, A. W.	Blairmore, Alta.	Mar. 30, 1882	
Nash, T. S.	Ottawa, Ont.	Feb. 18, 1904	Topographical Surveys Branch, Dept. of Interior, secretary-treasurer of the D.L.S. Assn.
Ogilvie, W.	Ottawa, Ont.	April 14, 1872	
O'Hara, W. F.	Ottawa, Ont.	Feb. 19, 1895	
Ord, L. R.	Winnipeg, Man.	April 1, 1882	
Parsons, J. L. R.	Regina, Sask.	Feb. 23, 1905	
Patrick, A. P.	Calgary, Alta.	Nov. 19, 1877	Dominion Topographical Surveyor.
Pearce, W.	Calgary, Alta.	May 10, 1880	
Phillips, E. H.	Saskatoon, Sask.	Feb. 24, 1902	Dept. of Public Works for Saskatchewan.
Ponton, A. W.	Macleod, Alta.	May 18, 1881	
Proudfoot, H. B.	Saskatoon, Sask.	Mar. 28, 1882	
Rainboth, E. J.	Ottawa, Ont.	May 19, 1881	
Rainboth, G. C.	Aylmer, Que.	April 14, 1872	Boundary Surveys, Dept. Interior.
Reid, J. L.	Ottawa, Ont.	" 14, 1872	Dept. of Indian Affairs.
Reilly, W. R.	Regina, Sask.	Nov. 17, 1881	
Richard, J. F.	Ste Anne de la Pocatière, Que.	May 13, 1882	
Rinfret, E.	Montreal, Que.	Feb. 20, 1900	
Ritchie, J. F.	Nelson, B.C.	Jan. 7, 1889	
Robertson, H. H.	Montmagny, Que.	April 14, 1872	
Roberts, S. A.	Victoria, B.C.	May 16, 1885	
Roberts, V. M.	Sturgeon Falls, Ont.	" 17, 1886	
Robinson, F. J.	Regina, Sask.	Feb. 22, 1906	Dept. of Public Works for Saskatchewan.
Rombough, M. B.	Morden, Man.	April 14, 1872	

APPENDIX No. 11.

LIST of Dominion Land Surveyors who have been supplied with Standard Measures.—*Concluded.*

Name.	Address.	Date of Appointment.	Remarks.
Rorke, L. V	Toronto, Ont	Aug. 13, 1891	
Ross, G	Welland, Ont	Nov. 21, 1882	
Ross, J. E	Kamloops, B.C	Feb. 12, 1901	
Roy, G. P	Quebec, Que	Nov. 17, 1881	
Saint Cyr, J. B	Ste. Anne de la Pérade, Que	Feb. 17, 1887	
Saint Cyr, A	Ottawa, Ont	" 17, 1887	
Saunders, B. J	Edmonton, Alta	Nov. 16, 1884	
Seager, E	Kenora, Ont	April 14, 1872	
Selby, H. W	Toronto, Ont	Nov. 15, 1882	
Seymour, H. L	Edmonton, Alta	Feb. 22, 1906	
Sewell, H. de Q	Toronto, Ont	May 16, 1885	
Shaw, C. A. E	Victoria, B.C	" 10, 1880	
Shepley, J. D	Leamington, Ont	Mar. 12, 1906	
Smith, C. C	Brampton, Ont	Feb. 22, 1906	
Speight, Thos	Toronto, Ont	Nov. 16, 1882	
Stacey, A. G	Ottawa, Ont	Feb. 22, 1906	
Starkey, S. M	Starkey's P.O., N.S	April 14, 1872	
Stewart, G. A	Calgary, Alta	" 14, 1872	
Stewart, L. B	Toronto, Ont	Nov. 22, 1882	Dominion Topographical Surveyor, Professor of Surveying, School of Practical Science.
Stewart, E	Ottawa, Ont	April 14, 1872	
Stewart, W. M	Hamilton, Ont	June 26, 1907	
Talbot, A. C	Calgary, Alta	May 13, 1880	
Taylor, A	Winnipeg, Man	June 9, 1904	
Teasdale, C. M	Concord, Ont	Mar. 9, 1906	
Thompson, W. T	Fort Qu'Appelle, Sask	Nov. 19, 1877	Dominion Topographical Surveyor.
Tracy, T. H	Vancouver, B.C	April 14, 1872	City Engineer, Vancouver.
Tremblay, A. J	Les Eboulements, Que	Feb. 18, 1890	
Towle, C. E	Magog, Que	April 14, 1872	
Turnbull, T	Winnipeg, Man	Mar. 29, 1882	
Tyrrell, J. W	Hamilton, Ont	Feb. 16, 1887	
Vaughan, J. W	Vancouver, B.C	June 11, 1878	
Vicars, J	Kamloops, B.C	May 17, 1886	
Waddell, W. H	Hamilton, Ont	Mar. 25, 1907	
Waldron, J	Moosejaw, Sask	April 2, 1907	
Walker, E. W	Regina, Sask	Mar. 27, 1907	Dept. of Public Works for Saskatchewan.
Wallace, J. N	Calgary, Alta	Feb. 20, 1900	
Warren, J	Walkerton, Ont	April 14, 1872	
Watt, G. H	Ottawa, Ont	Feb. 24, 1902	
Weekes, A. S	Clinton, Ont	" 11, 1892	
Weekes, M. B	Ottawa, Ont	" 18, 1903	
Wheeler, A. O	Calgary, Alta	Nov. 21, 1882	Topographer of the Department of the Interior.
White-Fraser, G. W. R	Ottawa, Ont	Feb. 21, 1888	Dominion Topographical Surveyor.
Wiggins, T. H	Regina, Sask	" 18, 1886	
Wilkins, F. W	Norwood, Ont	May 18, 1881	Dominion Topographical Surveyor.
Wilkinson, W. D	Toronto, Ont	Feb. 22, 1893	
Woods, J. E	Frank, Alta	Nov. 14, 1885	
Young, W. B	Winnipeg, Man	Mar. 25, 1905	
Young, W. H	Lethbridge, Alta	May 16, 1907	

APPENDIX No. 12.

EXAMINATION PAPERS OF THE BOARD OF EXAMINERS FOR DOMINION LAND SURVEYORS.

EXAMINATION FOR ADMISSION AS ARTICLED PUPIL—FULL PRELIMINARY.

XXXI.

February 11 to 14, 1908.

PENMANSHIP AND ORTHOGRAPHY.

Write out correctly the following:

The proputty witch sault posesses of preszerving annimle substainses from pewtrifacshun is reezolved by Liebig into too more jennerel lause, the strong atracshun of sault for watter, and the nessessity of the presents of watter as a condishon of pewtrefashun. The intermeadiet fennomennon witch is interpollated betwean the remoat caws and the efekt can hear be not mearly infered but sean ; for it is a fammilyer fakt that flesh uppon witch sault has bin throne is speadely fownd swiming in bryne.

Wun has, two a sertin exstent, a powwer to awlter his karaktar. Its being in the ultimmet ressort, fourmd for him, is not inkoneistent with its beeing, in part, fourmd by him as wun of the intermeadget ajence. His karektar is fourmd buy his serkumstanses (inklewding amung theas his partikuller orgenisashun), but his owen desyer to mold it in a partikkeller weigh, is one of thows sereumstanzes, and buy no menes the leest inflewenshel. We kannut, indede dirrektlie wil to bee diferant from wot wee arr. But neether did thows hoo arr supowsd to have fourmd ower karaktres, dyrrektlie wil that we shood bee wot wee arr. There wil hadd no dyrekt powwer exept ovar there owen axions. They maid us wot they did maike us, buy nott the end, butt the rekwisit menes; and we, wen ower habbits are not two invetteret, can, by simmillarly wiling the rekwisit menes, maike owerselfs diferant. If they cood plaice us under the inflewents of sertin serkumstanzes, we, in lyke manor, can plaice owerselfs under the inflewents of other serkumstanzes. Wee arr exaktlie as kaipabel of maiking ower owen karrakter, *if we wil*, as othars arr of maiking it four uss.

ARITHMETIC AND LOGARITHMS.

Marks.

(Time, 3 hours.)

1. Find the H.C.F. of 126025 and 40115; and of 12321 and 54345. 12

2. Find the Least Common Multiple of 50, 338, 675, 702 and 975. 12

3. How long would a column of men, extending 3420 feet in length, take to march through a street a mile long at the rate of 58 paces a minute, each pace being 30 inches? 12

4. Find the square root of 3 to seven places of decimals; and the cube root of 27054·036008. 16

5. If log sin $a = 9{\cdot}2873193$
   log tan $b = 1{\cdot}7854321\ n$
   log cos $c = 8{\cdot}9583428$
   Find a, b, and c and the angle whose tangent is tan b cos c.
   If, further, log tan $d = 1{\cdot}7854321$, find $b + d$. 16

6. Find from the Tables,
   log 23·487,
   log ·023487,
   log sec 97° 23′ 54″
   log sin 118° 23′ 37″·3 16

7. Find by logarithms the value of
   $(93{\cdot}285)^{\frac{2}{3}} \times (0{\cdot}85)^{-\frac{4}{5}} \times (\cdot 0035)^{\frac{1}{2}} \div (107{\cdot}34)^{\frac{5}{7}}$ 16

ALGEBRA.

(Time, 3 hours.)

Marks.

1. Reduce to its lowest terms
$$\frac{2\ a^4 + 3\ a^2x - 9\ a^2x^2}{6\ a^4x - 17\ a^3x^2 + 14\ a^2x^3 - 3ax^4}$$ 12

2. Find the least common multiple of
   $6\ (a^2 - b^2)\ (a - b)^3$, $9\ (a^4 - b^4)\ (a - b)^2$ and $12\ (a^2 - b^2)^3$. 13

3. Simplify :
$$\left\{ \frac{x^2+y^2}{x^2-y^2} - \frac{x^2-y^2}{x^2+y^2} \right\} \div \left\{ \frac{x+y}{x-y} \quad \frac{x-y}{x+y} \right\}$$ 15

4. A party were to divide their expenses equally. Had there been three persons more and each paid 5 cents more, the bill would have been $3.75 more; but if there had been 10 persons less, and each had paid 7 cents less, it would have been $9.56 less. How many persons were there and how much did each pay ? 15

Marks.

5. Solve the simultaneous equations :

$$x + y + z = a + b + c$$
$$bx + cy + az = cx + ay + bz$$
$$= ab + bc + ca$$

15

6. Solve the equations:

$$2\left(x^{\frac{1}{n}} + x^{-\frac{1}{n}}\right) = 5$$
$$(x^2 + a)\ (x + b) = ab$$

15

7. Divide 40 into two such parts that the sum of their squares shall be 818. 15

PLANE GEOMETRY.

First Paper.

Marks.

(Time, 3 hours.)

1. What is the difference between an axiom and a postulate? What is meant by 'reductio ad absurdum'? 12

2. If two triangles have two sides of the one equal to two sides of the other, each to each, and also the angles included by the equal sides equal, the triangles are equal in all respects. 12

3. In what cases does equality of three of the six parts (three sides, three angles) each to each in two triangles, involve equality of the triangles? 12

4. All the exterior angles of any rectilinear figure, made by producing the sides successively in the same direction, are together equal to four right angles? 12

5. The sum of the angles of a square is equal to four right angles. Is the converse true? If not, why not? 13

6. If a straight line be bisected and produced to any point, the square on the whole line thus produced, and the square on the part of it produced, are together double of the square on half the line bisected, and of the square on the line made up of the half and the part produced. 13

7. What algebraic proposition corresponds to the proposition in Question 6? State the geometric proposition corresponding to the algebraic one: $(a + b)\ (a - b) + b^2 = a^2$. 13

8. Wherein is a geometrical proof of the properties of squares or rectangles with relation to their areas, more complete than an algebraic one? 13

PLANE GEOMETRY.

Second Paper.

Marks.

(Time, 3 hours.)

9. Describe a square that shall be equal to a given rectilineal figure. 12

10. If in a circle two straight lines cut one another, which do not both pass through the centre, they do not bisect each other. 12

11. The opposite angles of any quadrilateral figure inscribed in a circle, are together equal to two right angles. 12

12. From a given circle cut off a segment which shall contain an angle equal to a given rectilineal angle. 12

13. To describe a circle about a given triangle. 13

14. What is meant by incommensurable magnitudes? Give a geometrical instance of incommensurability. 13

15. If an angle of a triangle be bisected by a straight line which cuts the opposite side, the segments into which this side is divided are in the same ratio as the other sides of the triangle; and conversely. 13

16. In equal circles, angles, whether at the centres or circumferences have the same ratio which the arcs on which they stand have to one another; so also have the sectors. 13

PLANE TRIGONOMETRY.

Marks.

(Time, 3 hours.)

1. Deduce the expression for the area of a triangle in terms of its sides. 16

2. Prove that

$$\sin (A + B) \sin (A - B) = \sin^2 A - \sin^2 B,$$

and that

$$\cos (A + B) \cos (A - B) = \cos^2 A - \sin^2 B.$$ 16

3. Given

$$a = 35{\cdot}3,\ b = 54{\cdot}7,\ A = 33^\circ\ 25'$$

solve the triangle. 17

4. Given

$$b = 17{\cdot}34,\ c = 29{\cdot}85,\ A = 125^\circ\ 43',$$

find a. (Do not solve by natural trigonometric functions.) 17

5. Given

$$A = 25^\circ\ 33',\ B = 117^\circ\ 08';\ a = 125{\cdot}33,$$

find c. 17

6. Given

$$a = 23{\cdot}5,\ b = 37{\cdot}7,\ c = 31{\cdot}2,$$

find the angles. 17

SPHERICAL TRIGONOMETRY.

(Time, 3 hours.)

Marks.

1. State Napier's rules for the solution of right-angled spherical triangles. Deduce similar rules for the solution of triangles in which one side is a quadrant. 20

2. Given $c = 145°$, $a = 25°$, $C = 90°$; solve the triangle. 20

3. Given $b = 123° 15'$, $c = 135° 10'$, $A = 15° 27'$; find a. 20

4. Given $B = 140° 10'$, $C = 55° 42'$, $a = 63° 26'$; find A. 20

5. Given $A = 125°$, $B = 135°$, $C = 85°$; find a. 20

NOTE.—Do not use natural trigonometric functions in the solution of triangles.

MENSURATION.

(Time, 3 hours.)

Marks.

1. The sides of a triangular field are 3·54, 12·62 and 11·38 chains. Find the area in acres. 14

2. The perimeter of a field which has the form of a triangle similar to that in question 1 is 41·31 chains. What is its area? 14

3. What fraction of the earth's surface lies between latitudes 50° and 60°, and between longitudes 90° and 120°? 14

4. On a certain map it is found that an area of 16,000 acres is represented by an area of 6·25 square inches. Determine the scale of the map in miles to the inch. 14

5. A right circular cylinder and a right circular cone stand on equal bases and are of the same altitude, the altitude being equal to the length of a diameter of either base. Find the ratio (*a*) of the curved surfaces; (*b*) of the whole surfaces of the cone and cylinder. 15

6. A cylindric tube 8 feet long and 2 feet 6 inches in diameter is closed at each end by a hemisphere. Find the area of the whole external surface. 15

7. The area of a field determined by chain measurement is afterwards found to be greater than it should be by one-fortieth part. What was the true length of the chain with which the first measurement was made? 14

EXAMINATION FOR ADMISSION AS ARTICLED PUPIL—LIMITED PRELIMINARY.

XIX.

February 11, 1908.

FIRST PAPER.

(Time, 3 hours.)

Marks.

1. Penmanship and Orthography. (Same as in the Full Preliminary Examination.) { 50 / 200 }

Marks.

2. Given log 1·944 = 0·28869627
and log 1·728 = 0·23754373
find the logarithms of 45 and 75. 50

3. Two travellers A and B set out at the same time from two places, P and Q, and travel so as to meet. When they meet it is found that A has travelled 30 miles more than B, and that it will take A and B 4 days and 9 days respectively to complete their journeys. Find the distance between P and Q. 50

4. Find the value of
$$\frac{\sqrt{a+bx}+\sqrt{a-bx}}{\sqrt{a+bx}-\sqrt{a-bx}} \text{ when } x=\frac{2ac}{b\ (1+c^2)}$$ 50

5. If a quadrilateral figure is bisected by one diagonal, the second diagonal is bisected by the first. 50

6. From the formula $c^2 = a^2 + b^2 - 2ab \cos C$, and the analogous formulæ for the squares on the other sides, prove that
$$\frac{a}{\text{Sin } A} = \frac{b}{\text{Sin } B} = \frac{c}{\text{Sin } C}.$$ 50

7. Prove that
$(\cos A + \cos B)^2 + (\sin A + \sin B)^2 = 4 \cos^2 \frac{1}{2}(A - B)$. 50

8. Similar triangles are to one another as the squares on their homologous sides. 50

Second Paper.

Marks.

(Time, 3 hours.)

9. Two chimneys are of equal height. A person standing between them in the straight line joining their bases observes the elevation of the nearer one to him to be 60°. After walking 80 feet in a direction at right angles to the straight line joining their bases, he observes the elevations of the two to be 45° and 30°. Find their height, and the distance between them. 50

10. If the surface areas of a sphere, a cube and a regular tetrahedron are equal to one another, find the ratios of the diameter of the sphere, to the side of the cube and the edge of the tetrahedron. 50

11. Prove that the straight line bisecting an angle of a triangle, either internally or externally, divides the opposite side into parts which are in the same ratio as the other sides of the triangle. 50

12. Apply the preceding proposition to find the locus of a point whose distances from two given points are in a given ratio. 50

13. Given $b = 99° 41'$; $c = 100° 50'$; $A = 65° 33'$, find a. (Do not use natural trigonometric functions.) 50

14. Given $c = 75° 31'$; $a = 90°$; $B = 30° 53'$, find the other parts. 50

15. Find the value of
$$\left(\frac{23}{31}\right)^{\frac{3}{4}} + \left(\frac{13}{17}\right)^{-\frac{1}{5}} + \left(\frac{3}{4}\right)^{\frac{2}{3}} - \left(\frac{28}{39}\right)^{\frac{1}{12}}$$ 50

FINAL EXAMINATION FOR DOMINION LAND SURVEYOR.

XXXIX.

(February 11 to 18, 1908.)

PENMANSHIP AND ORTHOGRAPHY.

(Time, 3 hours.)

Marks.

The same paper is used as in the full preliminary examination. { 50 / 200

ALGEBRA.

(Time, 3 hours.)

Marks.

1. Find the G. C. M. of $2x^5 - 11x^2 - 9$ and $4x^5 + 11x^4 + 81$; and the L. C. M. of $x^3 - 6x^2 + 11x - 6$, $x^3 - 9x^2 + 26x - 24$, and $x^3 - 8x^2 + 19x - 12$. 10

2. Simplify $\dfrac{\dfrac{m^2+n^2}{n} - m}{\dfrac{1}{n} - \dfrac{1}{m}} \left(\dfrac{m^2-n^2}{m^3+n^3}\right)$;

and $\cfrac{a}{b + \cfrac{c}{d + \cfrac{e}{f}}}$. 10

3. Solve $\left(\dfrac{x-a}{x+b}\right)^3 = \dfrac{x-2a-b}{x+a+2b}$;

and $4{\cdot}8x - \dfrac{{\cdot}72x - {\cdot}05}{{\cdot}5} = 1{\cdot}6x + 8{\cdot}9$ 10

4. Two persons, A and B, could finish a work in m days; they worked together n days when A was called off and B finished it in p days. In what time could each do it? 10

5. Solve the simultaneous equations:

$$x + y + z = a + b + c,$$
$$bx + cy + az = cx + ay + bz = ab + bc + ca.$$ 10

6. Show that the G. C. M. of two quantities is the G. C. M. of their common measures. 10

7. Solve $x^{-1} + x^{-\frac{1}{2}} = 6$,

and $x + \sqrt{(5x + 10)} = 8$. 10

8. Find that number whose square added to its cube is nine times the next highest number. 10

9. What are eggs a dozen when two more in 24 cents worth lowers the price two cents per dozen? 10

10. Divide a given line into two parts such that twice the square on one part may be equal to the rectangle contained by the whole line and the other part. 10

PLANE GEOMETRY.

(Time, 3 hours.)

	Marks.
1. Describe a circle about a given triangle.	18
2. Prove that the perimeter of a triangle is less than the perimeter of any triangle which is drawn completely surrounding it.	18
3. Construct a rectangle equal to the sum of two given triangles.	19
4. In a triangle, BAC is the greatest angle. Prove that if a point D be taken in AB and a point E in AC, DE is less than BC.	19
5. Construct geometrically $a\ (a—x) = x^2$ where a represents the length of a line.	19
6. If two chords of a circle when produced intersect at a point without the circle, the rectangle contained by the segments of one chord is equal to the rectangle contained by the segments of the other chord.	19
7. If one pair of opposite sides of a quadrilateral inscribed in a circle intersect at a fixed point, the other pair of opposite sides intersect on a fixed straight line.	19
8. If an angle of a triangle be bisected internally or externally by a straight line which cuts the opposite side, or that side produced, the ratio of the segments of that side is equal to the ratio of the other sides of the triangle.	19

SOLID GEOMETRY.

(Time, 3 hours.)

	Marks.
1. Name the regular solids and give for each the number of faces, corners and edges.	8
2. The sum of any two plane angles of a trihedral angle is greater than the third angle.	8
3. If two intersecting planes be at right angles to the same plane, their common section is at right angles to it.	8
4. Polygons formed by cutting the faces of a polyhedral angle by parallel planes are similar to one another.	8
5. If the edge of a tetrahedron is 10 inches, what is the radius in inches of the sphere of equal volume?	11
6. If the edge of a tetrahedron is 10 inches, what is the radius in inches of a sphere of equal surface?	11
7. If the annual rainfall in the Khasi Hills is 610 inches, what is the weight of water yearly received by an acre, a cubic foot of water weighing 62·5 lbs.?	10
8. A cylinder 10 inches in diameter and 20 inches high is half full of water; into it is placed vertically a wooden cone, base 8 inches in diameter, height 10 inches, specific gravity of the wood ·5; how high will the water rise in the cylinder?	11

SPHERICAL TRIGONOMETRY.

(Time, 3 hours.)

Marks.

1. Prove $\cos A = \dfrac{\cos a - \cos b \cos c}{\sin b \sin c}$ 13

2. Deduce $\tan \frac{1}{2}(A+B) = \dfrac{\cos \frac{1}{2}(a-b)}{\cos \frac{1}{2}(a+b)} \cot \frac{1}{2} C$. 14

3. Deduce $\tan \frac{1}{2} a = \sqrt{-\dfrac{\cos S \cos (S-A)}{\cos (S-B) \cos (S-C)}}$ 14

4. Prove Napier's rules 14

5. Given $a = 68° 20'$, $b = 52° 18'$; $C = 117° 12'$, find c. 14

6. The sides of a triangle are 105°, 90° and 75° respectively, find the sines of all the angles. 14

7. Given $B = 70°$, $C = 100°$, $a = 40°$, find A. 14

8. Given $a = 32° 12'$, $b = 30° 15'$, $c = 28° 18'$, find C. 14

9. Taking the radius of the earth as 4,000 miles, what is the approximate area of the triangle in square miles, whose spherical excess is 1″? 14

MEASUREMENT OF AREAS AND SUBDIVISION OF LAND.

First Paper.

(Time, 3 hours.)

Marks.

1. In a triangular field, $AB = 10$ ch., $BC = 14$ ch., $CA = 12$ ch.; through the point within the field distant 8 chs. from A, and 6 chs. from B, a line is drawn bisecting the field; find the length of the dividing line. 17

2. Divide a quadrilateral in a given ratio by a straight line starting from a given point in one of the sides. 17

3. If the diameter of the sun is 800,000 miles, that of the earth 8,000, and their distance apart 92,000,000 miles, what is the limiting value in latitude of the circle of illumination at the time of the equinoxes, and what proportion of the earth's surface is directly illuminated, neglecting refraction. 17

4. Through the northerly part of Sec. 3, Tp. 33, R. 5, W. of 3rd M., runs a railway, width of right-of-way 100 ft.; the centre line crosses the western boundary of the section 10:20 ch. from the N.W. corner, and continues on a course N. 60° E. The part of the section lying south of the railway is to be divided into equal parts by a straight line running from the quarter section post on the southern boundary. What is the azimuth and length of the dividing line? 17

5. A kite-shaped race track is 50 ft. wide. The centre-line, half a mile long, is composed of two tangents, including an angle of 60°, and a circular arc connecting them. What is the length of the tangents, and what is the area of the track? 16

6. What is the ratio of the perimeters enclosing an area of n acres, by a circle, equilateral triangle, square, pentagon, hexagon and octagon? 16

MEASUREMENT OF AREAS AND SUBDIVISION OF LAND.

SECOND PAPER.

(Time, 3 hours.)

Marks.

7. The following are the notes of a survey:
   1. S. 69° 15′ E. 7·06 chains.
   2. N. 37° 15′ E. 5·93 "
   3. N. 39° 30′ W. 6·00 "
   4. S. 57° 45′ W. 4·65 "
   5. S. 30° 00′ W. 4·98 "

   Find the area by the method of Latitudes and Departures, first 'balancing' the survey. 40

8. Express the conditions necessary for a closed survey by two equations.
   (*a*) From these show what missing data in a survey can be supplied.
   (*b*) Show when ambiguity may arise, and how the supplying of missing data affects balancing the survey. 20

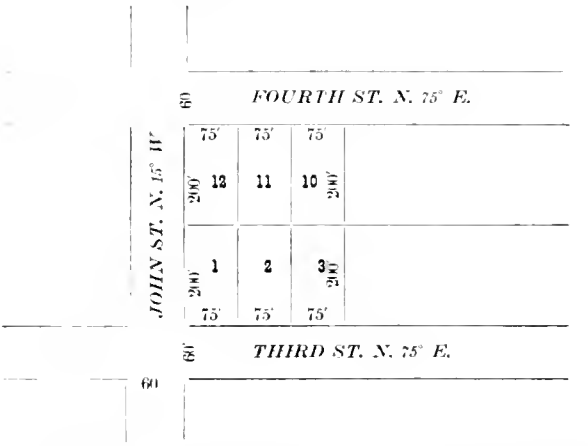
9. Explain by diagram fully the rule: 'Twice the area of the figure is equal to the algebraic sum of the products of the double meridian distances of the several courses into the corresponding latitudes.' 20

10. What is the method of balancing a survey:
    (*a*) On the assumption that the error of closure is as much due to erroneous bearings as to erroneous chaining?
    (*b*) On the assumption of erroneous chaining alone?
    What is the true area of the above field if the chain was one link too short? 20

DESCRIPTIONS.

Marks.

(Time, 3 hours.)



The above is part of the registered plan of the town of Holly in the County of Tweed and Province of Alberta. *A* sells to *B* a part of lot No. 1, and adjoining John and Third streets. The part sold is to have a frontage of forty feet on Third street to extend to the rear of the lot and the dividing line to be parallel to John street. Make a description for a deed. 25

Marks.

2. Using the plan of question 1. Supposing *A* to own lots Nos. 1 and 2, he sells lot No. 2 to *B*, and gives the right of ingress and egress to *B* by a lane, 16 feet wide, running along the whole of the rear limit of lot No. 1. Make the necessary description for the conveyance. 25

3. Moose Creek flows across the N. E. ¼ S. 12, T. 13, R. 15 W. in an easterly direction. *B* desires to buy the northerly part of the quarter section lying north of the creek, together with the creek. From measurement the southerly bank of the creek interseets the eastern and western quarter section lines respectively at 22^{ch} 12 and 20^{ch} 18 from the northern quarter section line. The whole area to be conveyed is supposed to contain 85 acres. Make a description for a deed. 25

4. Make a description for the remaining part of the quarter section given in question 3. 25

ASTRONOMY.

First Paper.

Marks.

(Time, 3 hours.)

1. Explain fully the equation of time, why it varies and when it is a maximum. A diagram is desirable. 14

2. The longitude of Ottawa is 5h. 02m. 52s. What kind of time is this? Why? 14

3. In latitude 45° 25′, longitude 75° 43′, what is the standard time of eastern elongation of Polaris, on May 27, 1904? 14

4. Without tables or computation give the approximate local mean time of eastern elongation of Polaris for any place in Ontario on the 20th of each month in the year. 14

5. For the same place and time as question 3, what was the azimuth of δ Urs. Min. at western elongation?
$\delta = 86° 36' 46''$; $a = 18$h. 02m. 36s. 14

6. On the same date the observed altitude of Arcturus when on the prime vertical was 45° 38′. What is the latitude of the place? 15

7. What is the standard time of sunrise for the place and time of question 3? 15

ASTRONOMY.

Second Paper.

(Time, 3 hours.)

Marks.

8. On the 4th Base Line, R. V-VI, W. of 3rd M. on May 27, 1904, in the forenoon the mean of the observed altitudes of the upper and lower limb of the sun was 42° 13′ 30″ when a watch showed 9h. 02m. 14s. What was the azimuth of the sun, and what was the error of the watch on standard time? 17

9. In question 8, what was the true local sidereal time of observation? 17

10. What is the longitude of the place for which the time shown by the watch in question 8, was at that instant the local sidereal time? 17

11. On the 20th June, 1904, the altitude of the sun's centre at its lower or northern culmination was 10° 32′. What was the latitude of the place of observation? 17

12. What is the standard time of rising for Arcturus for the time and place in question 8? 13

13. What is the right ascension of a star that crosses the meridian of place and date of question 8 at 10 p.m. local mean time? 16

MANUAL OF SURVEY.

First Paper.

(Time, 3 hours.)

Marks.

1. Where are the Initial Meridians now in use? 3

2. Between what townships is the 73rd correction line? 3

3. How is the deficiency or surplus on the meridians between two base lines disposed of? 4

4. Define a bearing and an azimuth. 11

5. To what meridian is a bearing referred in subdividing a township, and how is it deduced from an observed azimuth? 11

6. What is to be done when the road allowance on a correction line is less than 80 links wide? 5

7. In closing a correction line on an initial meridian, what is to be done when the meridian intersects the jog? 7

8. Give the rules to be observed in measuring a distance by means of a triangle. 5

9. When is a quarter section considered as sufficiently surveyed for disposal? 5

10. What are the limits of error in a township subdivision survey? 8

11. Describe the different kinds of posts, mounds, pits and trenches used in the present system of survey; show how and where they are placed. 20

12. How is a settlement surveyed? 11

13. How is a group lot surveyed? 7

MANUAL OF SURVEY.

SECOND PAPER.

Marks.

(Time, 3 hours.)

14. By what considerations is a surveyor to be guided in deciding whether a road allowance shall or shall not be left along the boundary of an Indian reserve when subdividing a township? 4

15. What connections have to be made in a township subdivision survey? 4

16. For what purposes are traverses made in connection with surveys of Dominion lands? 5

17. Define the *bank*, the *shore* and the *bed* of a body of water. 8

18. What are the rights of the owner of a piece of land fronting on a lake or river? 11

19. What are the bodies of water to be surveyed in subdividing a township, and what are those which are not to be surveyed? 9

20. In what cases is the area of the bed of a river to be deducted from the area of a quarter section crossed by it? 6

21. When are both banks of a river to be traversed? 4

22. What is to be done when the edge of a marsh varies ten chains or more according to the height of water? 8

23. How are the following posts to be marked?
    (*a*) At the corner between sections 19, 20, 29 and 30, township 59, range 19, east of the principal meridian.
    (*b*) At the southerly corner between sections 4 and 5, township 67, range 22, west of the 3rd meridian.
    (*c*) At the southerly corner between sections 15 and 16, township 31, range 14, west of the 2nd meridian. (On the north side of the road allowance between two different systems of survey.)
    (*d*) At the southerly corner of township 103, between ranges 13 and 14, west of the 4th meridian.
    (*e*) At the witness mound placed 9 chains north of the S.E. corner of section 12, township 47, range 9, west of the 5th meridian. 20

24. Define a resurvey, a retracement, a restoration survey, an obliterated corner, and a lost corner. 8

25. Give the rules governing resurveys, retracements and restoration surveys. 8

26. Under what circumstances is a subdivider justified in resurveying or retracing a township outline without instructions from the head office? 5

SESSIONAL PAPER No. 25b

EXAMINATION FOR CERTIFICATE AS DOMINION TOPOGRAPHICAL SURVEYOR.

February 11 to 13, 1908.

XI.

ALGEBRA.

(Time, 3 hours.)

Marks.

1. Show that $\underline{/1}\ \underline{/3}\ \underline{/5}\ \ldots\ldots\ \underline{/2n-1>}\ (\underline{/n})^r$ 6

2. Find the number of ways in which (1) a selection, (2) an arrangement of four letters can be made from the letters of the word 'proportion.' 6

3. Find the sum of the products, two at a time, of the co-efficients in the expression of $(1+x)^n$, when n is a positive integer. 6

4. Prove that $1+\frac{3}{5}+\frac{3\cdot5}{8\cdot10}+\frac{3\cdot5\cdot7}{8\cdot10\cdot12}+\ldots\ldots\ldots a=2$ 6

5. Express $\frac{1}{2}(e^{ix}+e^{-ix})$ in ascending powers of x when $i=\sqrt{-1}$. 5

6. The integral part of $\frac{1}{\sqrt{3}}(\sqrt{3}+\sqrt{5})^{2n+1}$ and the integer next greater than $(\sqrt{3}+\sqrt{5})^{2n}$ are each divisible by 2^{n+1} 6

7. A certain stake is to be won by the first person who throws an ace with an octahedral die. If there are 4 persons, what is the chance of the last? 5

8. Find the sum of the fifth powers of the roots of the equation:
$x^4-7x^2+4x-3=0$ 5

9. Calculate the value of the determinant:

$$\begin{vmatrix} 3 & 2 & 1 & 4 \\ 15 & 29 & 2 & 14 \\ 16 & 19 & 3 & 17 \\ 33 & 39 & 8 & 38 \end{vmatrix}$$ 5

PLANE AND SPHERICAL TRIGONOMETRY.

(Time, 3 hours.)

Marks.

1. Sum to n terms the series:
Sin 3 θ sin θ + sin 6 θ sin 2 θ + sin 12 θ sin 4 θ +..... 9

2. If x be the circular measure of a positive angle less than a right angle, sin x is greater than $x-\frac{x^3}{6}$ 9

3. Compute the ratio $(=\pi)$ of the circumference of a circle to its diameter. 8

4. Solve the equations (1) sin 9 x + sin 5 x + 2 sin $^2x=1$
(2) $\frac{\cos^3 a}{\cos x}+\frac{\sin^3 a}{\sin x}=1$ 9

5. (*a*) Explain the principle and derivation of addition and subtraction logarithms.
(*b*) Give illustrations of applicability. 8

Marks.

6. Given the equation $\tan z = \frac{m \sin a}{1 + m \cos a}$ to express z in a series of multiples of a. 8

7. (*a*) Give the three fundamental equations for the general spherical triangle.
(*b*) Give the solution of oblique spherical triangles by means of a perpendicular, applying same to Case I. given b, c, and A; Case II, given A, C, and b. 8

8. Adapt the expression $a \cos A + b \cos B + c \cos C$ to logarithmic computation, the letters denoting the sides and the angles of a triangle. 8

9. If k is the area of a spherical triangle, show that

$$\tan \tfrac{1}{4} k = \sqrt{\left[\tan \tfrac{1}{2} s \tan \tfrac{1}{2} (s-a) \tan \tfrac{1}{2} (s-b) \tan \tfrac{1}{2} (s-c) \right]}$$ 8

ANALYTICAL GEOMETRY—TWO DIMENSIONS.

Marks.

(Time, 3 hours.)

1. Find the equation of a straight line in terms of its intercepts on the axes of coördinates. 8

2. Define 'anharmonic ratio,' illustrating by a diagram. 8

3. Deduce the equation to the tangent to the circle $x^2 + y^2 = a^2$ at the point x, y. 8

4. Define 'radical axis,' and prove analytically that the radical axes of three circles meet in a point. 8

5. Write down the equation to the ellipse referred to its centre and axes. Prove that the sum of the two focal distances of a point on the curve is equal to the major axis and that the perpendicular to the directrix is in a constant ratio to the focal distance. 8

6. Find the equation to the normal to the ellipse at a given point on the curve. How many normals may be drawn to the ellipse from a point not on the curve? 10

Three Dimensions.

7. Write down the equation to a straight line given the coördinates of two points upon it, and find the angles which it makes with the axes of coördinates. 10

8. Give formulæ for the transformation of coördinates, without changing the origin, in terms of the direction cosines of the new axes as referred to the old. 12

9. Find the condition that the plane $lx + my + nz + p = o$ may touch the conicoid $ax^2 + by^2 + cz^2 + d = o$. 12

10. Prove that the sections of an ellipsoid by parallel planes are similar ellipses. Hence deduce the relation between the radii of curvature of the sections of an ellipsoid made by different planes containing the normal at a given point. 16

DESCRIPTIVE GEOMETRY AND PROJECTIONS.

(Time, 3 hours.)

Marks.

1. Two interseeting straight lines being given by their projections, find the angle of the lines. 8

2. Two straight lines which do not intersect being given their projections, find the shortest line joining them. 9

3. Given the declination and hour angle of a star and the latitude of the place, find the azimuth of the star. 9

4. Give the definition of the picture plane, principal point, horizon line, distance points and vanishing points in a perspective.
   Given the altitude of a point above the ground plane and its horizontal projection, find its perspective. 9

5. It is desired to construct a map of Canada comprised between latitudes 42° and 60° north and longitudes 56° and 141° W. of Greenwich. Comparing the polyconic and the secant conical projections, what are the maximum errors of representation in each case? 15

6. In a perspective projection, explain how you find where the point of vision must be placed in order that the total misrepresentation over a given area be a minimum. 15

7. Define the conical Orthomorphic projection (Gauss' or Lambert's second). What are its properties and for what kind of maps is it best adapted? 10

DIFFERENTIAL AND INTEGRAL CALCULUS.

(Time, 3 hours.)

Marks.

1. Differentiate with respect to x

$$\log \left\{ 2x - 1 + 2\sqrt{x^2 - x - 1} \right\}$$

$$e^x \tan^{-1} x$$

$$\cos^{-1} \left\{ \frac{3 + 5\cos x}{5 + 3\cos x} \right\}$$ 10

2. If A be the chord of any circular arc, B that of half the arc, prove that the length of the arc is equal to

$$2B + \tfrac{1}{3}(2B - A).$$

   with an error which, for an arc equal to the radius, is less than 1 in 7680. 10

3. From Taylor's series derive John Bernouilli's series. 10

4. If u is a homogeneous function of x and y of the n^{th} degree, prove that

$$x\frac{du}{dx} + y\frac{du}{dy} = nu$$ 10

5. Find the maximum value of $x^{\frac{1}{x}}$, also its limiting value when $x = o$ or ∞. 10

Marks.

6. Find the radius of curvature of an ellipse at the point where the normal makes an angle of ϕ with the major axis. 10

7. Sum the series

$$p_1 + \tfrac{1}{2}\ p_2 + \tfrac{1}{3}\ p_3 + \ldots\ldots\ldots\ldots\ldots\ldots \frac{1}{n}\ p_n$$

where $\dfrac{1}{p_r} = \dfrac{n}{r} + \dfrac{r}{n}$

when n is indefinitely increased. 10

8. Obtain a formula of reduction for the integral

$$\int e^{ax} \cos^n x\ dx$$ 10

9. State Simpson's Rule and apply it to determining the area of an ellipse included between two ordinates to the major axis. 10

10. Find the volume and moment of inertia about its axis of a section of a paraboloid formed by revolving the parabola $y^2 = 20x$ about the axis of x, the section being bounded by the planes $x = o$ and $x = 10$. 10

PROBABILITY AND LEAST SQUARES.

Marks.

(Time, 3 hours.)

1. Two independent witnesses, A and B, whose probabilities of speaking the truth are p and q, respectively, agree in a statement of which the *a priori* probability of truth is P. What is the probability that the statement is true? 15

2. A phenomenon of which the causes are unknown has been observed to recur at regular intervals. If it has thus happened n times, what is the probability that it will occur m times more? 15

3. Write down the equation to the curve of probability of error of observation. Indicate its form in a general way, and show the relation to the curve of the mean square error, the probable error and the average error. 20

4. Two sets of measurements are made with results a and b, with probable errors r and r_1 respectively. Find the most probable value got by combining them, and its probable error, when (*a*) a and b are measured lengths of the same rod.
   (*b*) When a is a zenith distance, and b is a declination from which the latitude is required ($b \pm a$)
   (*c*) When a and b are latitudes determined by moon culminations observed on the east and west limbs of the moon respectively. 25

5. In indirect measurements, when n observations have been made and there are m unknown quantities, describe briefly the process of finding the most probable value of each quantity and its probable error. 25

6. In direct measurements of quantities which are not independent of one another, show how the most probable values are found. Explain the method of elimination, also that of correlates. 25

7. Indicate how the method of least squares is used in finding values for the constants of formulæ, also in the formation of empirical formulæ. 25

REPORTS OF SURVEYORS

GENERAL REPORTS OF SURVEYORS

1907-1908

APPENDIX No. 13.

REPORT OF C. F. AYLSWORTH, JR., D.L.S.

RESURVEYS IN EASTERN MANITOBA.

MADOC, February 26, 1908.

E. DEVILLE, ESQ., LL.D.,
Surveyor General,
Ottawa.

SIR,—

I have the honour to inform you that in accordance with your instructions dated April 9, 1907, to make a resurvey of townships 16 and 17, range 8, and the incomplete portions of townships 14, 15 and 16, range 7, and township 15, range 8, I left Madoc on April 22 and arrived in Winnipeg on the 24th.

I proceeded at once to organize a party and complete the necessary camp and transport equipment, as well as to secure provisions.

On May 2 I arrived at Beausejour with my party, and on the 4th sent for the horses and wagons, which were ten miles from this place. The horses had been well taken care of but hay was getting rather scarce as the winter had been an unusually long and severe one. Though great quantities of hay were harvested there last fall, the price per ton rose from three to ten dollars and farmers were compelled to turn their stock out grazing early in the spring.

Vegetation was very backward, till warm weather and rain began on June 10. The rain flooded the sloughs, limiting the grazing area for the cattle to the uplands, so that grazing conditions did not improve as the season advanced, and the stock went into winter quarters in poor condition.

The flooding of the hay-sloughs rendered it difficult for the farmers to secure hay for their stock for the following winter, as they were compelled to cut their hay in water up to their knees and haul it to the uplands to dry. This condition of affairs existed more particularly in township 15, range 7. It is asserted by the settlers in this township that with a strong west wind the waters of lake Winnipeg are forced up over these flats.

On May 9 we moved from Beausejour to section 21, township 14, range 7. The bush roads were very difficult to travel as the snow was still about a foot deep, and as the ground was frozen it made mounding very difficult. In order to perform this work satisfactorily, I decided to postpone it until the frost had entirely disappeared.

In township 16, range 8, very few traces of the original survey could be found, the corners along the west of the township boundary, and along the east boundaries of sections 31, 30, 19, 18, 7 and 6 being entirely obliterated.

Except in the west half of township 16, range 8, and the west side of township 15, range 7, settlement was very scattered on account of the unproductive quality of the soil. Large areas of it are rolling jackpine, sand and gravel ridges, tamarack,

muskeg and large tracts of stony ground. Some of the settlers obtained sufficient stone to assist very materially in building fences.

The crops developed rapidly after favourable weather set in on June 10, and there were fine prospects of a good harvest, but after threshing the yield was only twenty-five bushels per acre, or half of what was expected, while the quality was inferior.

In township 15, range 8, there is a ditch along the south boundary, another running easterly along the north side of sections 7, 8, 9, 10, 11 and 12, another running along the north boundary of sections 19, 20, 21, 22, 23 and 24, and one partially across the north boundary of section 30. The west boundary of the township is also ditched. The remaining road allowances running east and west and the road allowance along the east boundary have been cleared out, measured and levelled, but no ditches are yet constructed along these roads. The excavations of the pits which mark the road allowances along which the ditches were constructed immediately filled with water, and as the whole township was practically covered with water it would be impossible for us to move our outfit into the township except when the ground was frozen.

Game was very scarce in this township owing no doubt to the land being so badly flooded.

I have the honour to be, sir,
Your obedient servant,

C. F. AYLSWORTH, *D.L.S.*

APPENDIX No. 14.

REPORT OF DAVID BEATTY, D.L.S.

MISCELLANEOUS SURVEYS IN SOUTHERN ALBERTA.

PARRY SOUND, April 4, 1908.

E. DEVILLE, ESQ., LL.D.,
Surveyor General,
Ottawa.

SIR,—

I have the honour to submit the following report of my surveys of 1907.

Under your instructions to make restoration survey of several townships in the vicinity of Lloydminster I went to Prince Albert where I had wintered my horses and stored my outfit in 1906, and after collecting and repairing my outfit, I shipped it to Lloydminster. Here I found further instructions to investigate the necessity of making a restoration survey of township 50, range 27, west of the third meridian. I also found a telegram directing me to go south to township 28, range 6, west of the fourth meridian, and survey seven townships in that vicinity. While waiting for definite instructons and sketches, I investigated the necessity of a resurvey of township 50, range 27, by driving over the township and interviewing nearly all the settlers in it. The only missing monuments were the quarter-section corners on the east and west sides of section 34. These I established, as they had not been built in the original survey.

I then returned to Lloydminster and waited a few days for final instructions for the survey south of Sounding lake. After receiving these I moved south over a fairly good graded road along the fourth meridian for about thirty-two miles, crossing Battle river about thirty miles south of Lloydminster, then by trail to the east side of

Sounding lake, where there is a small detachment of mounted police, thence to township 32, range 6, where I traversed a lake. I then moved into township 31, range 6, which I subdivided, or rather retraced, finding only a few monuments missing. I resurveyed townships 30, 29 ,28 and 27, range 6 and townships 27 and 28, range 7. In townships 27 and 28, ranges 6 and 7, the greater number of the monuments were not built, although the iron posts were nearly all planted and marked and many of the quarter-section corners were marked with a wooden stake about two inches square. The description of one of these townships practically covers them all as to suitability for agricultural purposes. The soil is mostly clay, without any black soil on top, and the face of the country is rolling prairie, except township 27, range 6, which is more hilly with gravel and stones on the hills. There is a scarcity of good water in all that part of the country. In township 30, range 6, the only water in the dry season is Sounding creek, which crosses the township from west to east. In township 29, I found one small slough which served for watering the horses, but I had to draw water from Sounding creek for camp use. In township 28, range 6, I drew water from Sounding creek for both the horses and camp use, although there was some water in holes in a large slough or lake, but the horses could not reach it without miring. In township 27, range 6, I found a spring in the northwest corner of section 2, which was the only water fit for use in the township. In township 27, range 7, I found a spring on the east side of section 9. I found no water in township 28, range 7. There is no wood for fuel in any of the townships surveyed.

I have the honour to be, Sir,
Your obedient servant,

DAVID BEATTY, *D.L.S.*

APPENDIX No. 15.

REPORT OF P. R. A. BELANGER, D.L.S.

INSPECTION OF CONTRACTS, AND MISCELLANEOUS SURVEYS IN NORTHERN ALBERTA.

OTTAWA, March 16, 1908.

E. DEVILLE, ESQ., LL.D.,
Surveyor General,
Ottawa.

SIR,—

I have the honour to submit the following general report on my operations during the past season in connection with the verification and rectification of some survey marks in the Yorkton district and the inspection of contract surveys in that part of the Edmonton district west of the fifth meridian.

I received your instructions on April 15, and at once made the necessary preparations for an eight months' expedition, securing also from the office all the necessary plans and sketches in reference to my work, but it was April 21 before I could leave for the West.

On my arrival at Prince Albert, I organized my party and sent part of it via Birch hills to Domremy to secure my transport outfit, which I had left the year before in care of C. B. Duval, and to drive down to Humboldt, while myself and two other members of the party met them at the latter place on May 2, by rail from Prince Albert via Warman.

On the 4th my assistant, Mr. A.L. Cumming, joined the party at Humboldt, and after making my final preparations at that place I proceeded to Englefeld, in township 37, range 19, west of the second meridian, for my initial work which consisted of the traverse of Luse lake, which had been omitted in the original survey.

This work occupied me only one day, after which I started for 'Round Plains.' From Humboldt to Englefeld I followed the road along the Canadian Northern railway and from the latter village I travelled south to Prairie Rose. All along the way I passed through colonies of German Catholic settlers, who, though newly arrived in the country, are all very prosperous and highly satisfied with the location. Villages with stores, hotels and churches are erected at every railway station, attesting the progress of these enterprising settlers.

From Prairie Rose I travelled across the prairie on the west side of Quill lake till I reached the old Touchwood trail, which I followed to 'Round Plains,' which locality I reached on May 13.

Here, my work consisted of the retracement of the east boundary of township 29, range 15, together with the resurvey of the north boundary of the adjoining sections in ranges 14 and 15. This resurvey was accomplished without any difficulty, the land being vacant, and the original marks for quarter sections on section chords entirely obliterated.

As already mentioned in previous reports there are not many settlers at 'Round Plains'; the land is the best that can be desired, but as it is owned by a private firm who hold it at a high price, it may be some time before it becomes thickly settled.

From 'Round Plains' I proceeded to township 23, range 11, via Touchwood Hills mission, and Lipton, a thriving little town on the Pheasant Hills branch of the Canadian Pacific railway, where I stopped for a few hours to buy supplies before going on to my destination.

In this township my work consisted of the correction of an error of ten chains which had been made in the original subdivision along the west boundary of the Indian reserve. I also resurveyed the section chords affected by the error. This correction was made without trouble, the northeast corner of the defective homesteaded section being entirely obliterated, and the settlers having been made aware of the error when I discovered it in 1904, had made their improvements so as not to encroach on the adjoining land.

My next work consisted in removing and replacing to proper places witness mounds in townships 25, ranges 9 and 10, which had been placed on the road allowance, after which I proceeded to investigate the discrepancies shown in the description of survey monuments restored by me in 1902 in numerous townships in the Yorkton district, as compared with their description in the notes of the original surveys.

The rectification of all these discrepancies extending over twenty townships kept me busy till June 28, without interruption, and though I limited my work to the location and rectification of the erroneously described marks, avoiding as much as possible making any changes which might cause disturbance among the settlers, though I detected numerous large errors which I would have corrected had the land been vacant.

The large tract of land just referred to which only a few years ago was mostly vacant is now thickly settled; it is crossed by the Pheasant Hills branch of the Canadian Pacific railway, along which thriving towns have been started at every station.

On June 29 I started for Kamsack, where I arrived on July 2. A few miles south of this town I passed through a Doukhobor village where I saw the finest fields of wheat in the whole country I had travelled over, but I was greatly shocked to see a large herd of cattle grazing in it, and as near by several women were gardening or digging snake roots, I tried to make them understand that it was a crime to allow the cattle to destroy their crop, and offered them help to chase the herd from their field, but they only laughed at me and shook their heads in sign of refusal, convincing

me that they were premeditating another pilgrimage in the fall in search of the Messiah, who would provide for them. These people are to be pitied for their monomaniac affliction; they are a very moral and industrious people and would make a desirable class of settlers if they could do away with their foolish practices.

On July 3, I shipped my outfit by rail to Edmonton, and boarded the train with my party on the next day for the same place. On my arrival there, I reorganized the party and completed my outfit for the inspection of contract surveys west, north and northwest of lake St. Ann. This work for the most part lasted for the remainder of the season, and involved much loss of time in travelling from one contract to another, owing to the character of the country, which is mostly timbered and much broken by tamarack swamps, principally in Mr. Baker's contract west of lake St. Ann. Here the country is low and was flooded by the heavy rainfall of last season which rendered the roads almost impassable for vehicles. To enter the country north and northwest of lake St. Ann from this place, I had to make a circuit via Riviere-qui-barre and Belvedere crossing on Pembina river. From here the Chalmers road leads towards the north to a ferry at Arthabaska river, crossing in township 61, range 5, west of the fifth meridian, in R. H. Knight's contract, while the 'Peavine prairie' road branches westerly across the renowned valleys of Pembina and Paddle rivers, and runs across the contracts of R. H. Cautley, Thos. Drummond, H. McGrandle and M. Kimpe. This road can be followed with wagons to within six miles of the mouth of McLeod river, where the country becomes so rough and hilly that a pack train has to be used to reach the river, where there is a small Hudson's Bay Company's post.

Separate detailed reports on the eight contracts I examined have already been supplied giving my appreciation of the work inspected in every contract, and I do not think it necessary to enter into further details as to the merit of the work, which in general was found satisfactory.

The country covered by Mr. Knight's contract comprises township 60, range 2, and townships 61, ranges 1 to 5, west of the fifth meridian and is reached from Edmonton via Riviere-qui-barre, Belvedere and Chalmers road which runs across township 61, range 5, and by roads branching from the Chalmers road and running along Pembina and Paddle rivers. It has been greatly overrun by fires in the past, and now the dry land is overgrown with shrub and vetches, affording considerable good land ready for homesteading. The low land is covered with spruce and tamarack, good for all building purposes.

A few squatters were found in township 61, range 3, and in the valley of Athabaska river in range 5 at a short distance from the ferry.

From Belvedere the 'Peavine prairie' road leads to township 59, range 5, in Mr. R. H. Cautley's contract, which covers townships 58 to 60 inclusive of the same range. Several settlers were found in townships 58 and 59, where large tracts of scrubby brulé are found, but township 60 is heavily timbered with large spruce which I believe is included in a timber berth that will prove very valuable some day, if it is not destroyed by fires.

Mr. Thos. Drummond's contract covers townships 57 to 60, range 6, and as far as could be judged by the three townships inspected, the soil is good but it is mostly timbered, though patches of brulé are found here and there, but they are overgrown by a heavy second growth. Township 60 is entirely covered by large spruce alternating with tamarack swamps. A few large hay-meadows are found along creeks and lakelets in townships 58 and 59 and settlers were already searching for them.

From range 6 we inspected Mr. H. McGrandle's contract, covering townships 57 to 59, range 7, where the country becomes much more open, and the soil improves to first class. The land is covered with light scrub and a fine growth of vetches which affords very good pasturage for horses and cattle. This brulé appears to extend over township 58 and the southeast part of township 59, while the northwest part of the latter is heavily timbered with large spruce, which appears to be the continuation

of that belt of heavy timber referred to in ranges 5 and 6, and appears to extend northerly to Athabaska river.

The wagon road enters on section 1 of township 59, and turns south and southwesterly across township 58, leaving it on section 18 to enter 'Peavine prairie' country in range 8, which forms part of the contract of Mr. M. Kimpe, which extends westerly to the mouth of McLeod river. This little prairie is 'the promised land' of settlers looking for a homestead, it is nothing but a burnt tract of country, covered with a high growth of vetches, climbing in short scrub, which at a distance gives it the appearance from which it derives its name.

In range 9 the country is also much opened, and squatters are scattered here and there along Paddle river, and all speak highly of the country of their adoption.

The large tract of land just above described, extending from range 5 to range 9, is well watered by Pembina river, Paddle river and numerous small streams and lakes in which fish abound. The soil is rich and very suitable for farming purposes. Numerous settlers with their families were met on the way back, going into that country to make a home.

Returning from township 58, range 9, to lake St. Ann I followed a wagon road which has been lately opened by different surveyors and settlers. This road, though very bad in summer time, was found fairly good in the fall, and as it is the most direct and shortest route to the 'Peavine prairie' and Paddle river valley, the local government of Alberta, which has at heart the development of that country, has already expended large sums of money during last season on the part east of lake St. Ann and northwest via 'the narrows' to about two miles west of that point, where I met the first gang of workers.

These improvements consist in cutting a road one chain wide through the bush and grading all soft places, or making corduroys over tamarack swamps.

This road will prove a blessing to the settlers, one of whom was so discouraged by his hardships over this road last summer that he left his homestead never to return. It will greatly help to develop the 'Peavine prairie' country as well as Pembina and Paddle river valleys, and will most probably in the future be extended into Peace river valley via the mouth of McLeod river and Sturgeon lake by following the pack trail already existing.

The thing now most needed is a good ferry at 'the narrows' at lake St. Ann, where there is only a small raft manned by the Indian chief of the reserve at that place, who charges what he likes for the poor accommodation he furnishes.

The contracts I inspected west of lake St. Ann comprise townships 54, 55 and 56, range 5, surveyed by the late A. Michaud under contract No. 19 of 1906, townships 54 and 55, range 7 in contract No. 21 of 1906, by R. H. Knight, and contract No. 2 of 1907, comprising township 54, range 9, and townships 53 and 54, range 10, together with part of contract No. 24, extending westerly from contract No. 2, both made by J. C. Baker.

Two roads lead to contract No. 19, one the Government road from 'the narrows' runs across township 55, while the other follows the old Jasper House trail as far as Sandy McDonald's place on section 24, township 54, range 5, from which place A. Michaud cut a road northwesterly across townships 54 and 55 meeting the Government road in the latter township.

I did not meet with any settlers in contract No. 19, but the land is good and I have no doubt it will be taken up soon. For the present it is mostly heavily timbered with spruce which is very suitable for lumbering as well as building purposes.

Contract No. 21 is reached by following the Jasper House trail as far as Pierre Gray's place in township 53, range 6, and then by branching from there northwesterly over Yak's trail which is followed to a point two miles past the crossing of Pembina river where Mr. R. H. Knight cut a road northerly across township 54 as far as the centre of township 55, in range 7.

No actual settlers were found in these townships, but the land being first class I have no doubt the northern part of township 54, and the southern row of sections in township 55, will soon be taken as they are partly open, but the remainder of this contract is rather heavily timbered with poplar, and consequently not ready for homesteading.

About nine miles west of Pierre Gray's place, by following the Jasper House trail, we crossed Pembina river, and about five or six miles farther the road runs by the houses of two settlers, Asselin, and Lambert, and from the latter's it is opened for wagons as far as the east end of Chip lake, still commonly named Lobstick lake.

At Lambert's I left my vehicles and part of my camp equipage, and proceeded from there to Mr. J. C. Baker's contract with a pack-train. At the start I crossed Lobstick river, a tributary of Pembina river, and the outlet of Chip lake, and a short distance farther passed by the two last settlers to be met with on this trail before entering Mr. Baker's survey, which is only a few miles farther west.

The whole of this contract extends over a low country badly broken by tamarack swamps. Fires have destroyed the first growth of timber, and there are many scrubby openings to be found but the land does not appear very favourable for farming, the grass is extremely scarce, and can be found only near creeks; however, I remarked a couple of places at the east end of Chip lake where there is a good quantity of hay which would permit the establishing of small ranches by letting the cattle run through the brulés.

The timber, in general, is good for building purposes, and in ranges 11 and 12 spruce may be found suitable for lumbering.

Blueberries are found in such large quantities all over the country extending westerly from lake St. Ann to McLeod river, that I believe a canning industry placed somewhere in the vicinity of Chip lake for the packing of that fruit, would prove a paying enterprise.

The country above described, though poor in appearance for farming purposes, is bound to be developed some day and bring its share of revenue from its mineral resources, and its proximity to the Grand Trunk Pacific railway, whose location runs through it, will afford transportation for fire-wood as well as coal, which is found in abundance in that district along this railway, construction of which is now under contract and will be in full swing by next summer.

An American company had a party last summer locating the extent of a coal mine which they claim is the best discovered up to the present time, and propose to work it on a large scale as soon as the railway will be built. It is situated on the east side of Pembina river, somewhere near the crossing of the Jasper House trail, and to judge by the samples of drifted large lumps I have seen in the river I do not hesitate to say that it is the best coal I have yet seen in the Edmonton district.

I do not know of any other mineral in this vicinity, but the lumbering industry can be carried on to a large extent in the places above referred to, principally in townships 60, ranges 5, 6 and 7, where lumbering will prove a very remunerative business.

In the road allowance, on the north boundary of section 9, of township 54, range 9, I came across a spring of good clear water situated on a small knoll, which spring was surrounded by a border of petrified moss two or three inches thick, which excited my curiosity, and I have brought back a sample which appears to indicate the presence of sulphur or lime, though hardly appreciable in the water, and I believe if the latter were analyzed it might perhaps prove of value.

While on the subject of curiosities, I might mention that I found in the bed of Athabaska river a curiously shaped stone resembling in colour and shape a petrified human heart, which if not really such is wonderful as a specimen of the action of water on pebbles.

During the season I saw only two deer, and I believe that they as well as all fur bearing animals have to remove farther north across Athabaska river to flee before the settler intruding on their breeding ground.

Small game, such as geese, duck and partridge is very scarce, even hares could hardly be found last season, but I believe the scarcity of the latter is only due to the periodical disease which kills them off, although they become even more numerous after a while.

From November 16, to 19, I made some retracement surveys in township 53, range 3, west of the fifth meridian, as required by your instructions dated September 3, 1907, after which I intended to continue the inspection of the additional part of contract No. 24, but the contractor not having yet finished his survey and being unable to secure anybody to freight oats for my horses, I was advised not to undertake the journey to McLeod river at such a late season of the year when no feed could be obtained for horses in that bush country. I therefore decided to postpone the inspection till next spring, and after storing my outfit with Mr. Angus McDonell, of Ray, I returned to Edmonton where I discharged my party and took the train for Ottawa, where I arrived on December 8.

I have the honour to be, sir,
Your obedient servant,

P. R. A. BELANGER, *D.L.S.*

APPENDIX 16.

REPORT OF LEWIS BOLTON, D.L.S.

MISCELLANEOUS SURVEYS IN THE VICINITY OF THE PAS, SASKATCHEWAN.

LISTOWEL, November 15, 1907.

E. DEVILLE, ESQ., LL.D.
Surveyor General,
Ottawa.

SIR,—I have the honour to report that in accordance with your instructions dated June 10, 1907, I left Listowel on July 1, for The Pas, to make certain surveys in that vicinity. I arrived in Winnipeg on July 4, purchased my supplies, had my transit overhauled and engaged one man to accompany me on the work. I left Winnipeg on July 10 for Winnipegosis, where I arrived on Thursday, July 11. I found the steamer *Lottie S.*, owned by the Northwest Fish company, was the only boat moving on the lake, and that she would not connect with the steamer *Cumberland* on Cedar lake for The Pas until Wednesday, July 24. I arrived at The Pas on the evening of the 24th. Next day I took a look over the survey made by Mr. Richard, D.L.S., between blocks 'A' and 'B,' Indian reserves, for Louison Marcellais, Isaiah Buck and others. I was told by these parties that they had sold this land to Mr. Finger, for a site for a sawmill. Mr. Finger's agent told me that Mr. Finger had gone to Ottawa for the purpose of having the title transferred to him and would be back in about two weeks. I concluded to leave this survey until he returned.

I engaged four Indians to assist in the surveys, three of them at $1.50 per day, and the other at $2.00 per day, the latter to act as interpreter besides performing other duties. These wages included board, and was the current rate for such work in that district. Friday and Saturday being wet, we were not able to commence work until Monday, when we moved camp to Big Eddy and commenced the survey of that settlement, including the hay-lands along the south side of the Saskatchewan river. Most of the parties interested in this survey were away from home at the time, but

the Indian agent, and Dr. LaRose, had consulted with them about the matter and advised me to proceed with the work. I surveyed the hay-lands, according to their wishes, into lots to correspond with the lots in the settlement survey.

I may say that there is no more land in the rear of the Indian reserve fit for lots, other than those surveyed. The soil is not fit for gardens even on the lots surveyed. there being little or no mould on the surface, which is pure gravel and sand. Part of the hay-lands in a dry season might be cultivated for gardens, the soil being sandy loam.

Mr. Henry Cook, who acted as spokesman for the Indians in this settlement, told me that they (the Indians) would like a timber reserve up Saskatchewan river. The timber on these lots is not large enough for building houses with. I told him that they would require to submit an application to the Department giving the location and extent of the reserve they wished.

The hay-lands in connection with this settlement are very suitable for growing hay, and are close to their lots.

I returned to The Pas and revised the survey of lots, now known as the Finger property, between blocks 'A' and 'B,' Indian reserves. Mr. Finger stated that he had purchased the rights of the Indians, and asked me what my instructions were as to the survey of the lots. I read them over to him, and he seemed quite satisfied with them. I asked him where he would like the road allowance laid out, and he told me to lay it out eight chains back from the bank of the river, across the lots and parallel with the river, and a road along each side from this road to the river. Mr. Finger stated that the Minister of the Interior had told him that he intended to have these lots of the Indians extend back a mile from the river, but he never asked me to lay out the lots to that depth. I inquired of the Indians how far they expected their lots to go back from the river, and they said to the back line run by Mr. Richard. I asked them how they were satisfied as to the depth and they signified that they were well satisfied. I therefore resurveyed the lots in accordance with your instructions, and those of Mr. Finger as to the position of the road.

I then surveyed a piece of ground on Pas river west of The Pas Indian reserve, for J. H. Gordon, merchant at The Pas. This land is low and flat, and subject to overflow from Pas river. The soil is sandy loam, and in a dry season would raise considerable grain and vegetables. This year being very wet scarcely anything matured.

I received a letter from Dr. Cash, M. P., the member for that district, asking me to make a survey up on Cormorant lake at 'the narrows', about fifty miles north of The Pas, for George Cowan and others. After finishing the survey of the Finger property, I went up to Cormorant lake and made three surveys, one for Mr. Cowan, one for the Hudson's Bay company and one for Mr. Presonias. These parties had made considerable improvements and had occupied this land for about eight years. The land had the best soil (a clay loam) but was underlaid with stones and gravel. The finest crop of potatoes and other garden produce that I saw during the summer grew there. The timber was chiefly spruce and poplar, some quite large, from twelve to eighteen inches in diameter, and fit for lumbering purposes.

I then returned to The Pas and made a survey on the north side of Saskatchewan river, adjoining The Pas Indian reserve, of a group of lots claimed by Zaccheus Umfreville and five others. Mr. Umfreville has been occupying his lot since June last. The others had not occupied the land, but had cut down some underbrush, &c. The Umfreville settlement lots cover all the land there fit for building upon. The land down stream is very low and wet, and in the rear, very swampy. The soil is shallow and stony. What the Indians seem to desire is a spot along the river to build a house and enough land to grow a few vegetables. They make no inquiries about roads to their lands. They consider that where they can launch their bark canoes on the water of the great Saskatchewan at their door, that they can travel wherever they please. I then made a survey on the south side of Saskatchewan river

adjoining block 'B,' down stream. This is a group of lots claimed by Matthew Buck and five others. They had not occupied the land, but had lately cut down some underbrush. The lot is mostly swamp; a narrow fringe along the river is high enough to build dwellings on, but a short distance back it is wet, having about two feet of moss, with nothing but gravel beneath. Here and there, there may be little knolls of higher land, but of small extent. The timber is small, not fit for anything but firewood. There is very little more land on this side of the river fit for building upon.

I next made a survey of 'Birch Point' settlement, a group lot adjoining The Pas Indian reserve on the west, which had been occupied by Isaiah Young and four others, each of whom has a dwelling house erected thereon, and some clearing done. The land is somewhat higher and more rolling, with more clay and loam on the surface, but only in small areas, the main portion being stony and gravel subsoil. This high land runs some distance farther southwesterly along the Canadian Northern railway, and there is room for other settlements. The strip of high land is narrow between the railway and the marshy lake.

I also made a survey adjoining 'Birch Point' settlement for a group lot intended to be applied for by Louison Marcellais and others who had sold their land along the Saskatchewan to Mr. Finger.

I also made a survey of a piece of land adjoining The Pas townsite lying along Pas river for Louis Bacon, who had built a house and resided thereon for some time. It is mostly marsh, there being a narrow strip along the bank of Pas river, fit for cultivation, but scarcely high enough to build upon with safety from floods.

Game was plentiful, such as moose and other kinds of deer, bear, wolves and smaller animals. Fish in abundance is found in all the lakes and rivers and is of the best quality, such as whitefish, lake trout, sturgeon, jackfish and smaller varieties.

In the Pas district, game such as deer, bear, &c., are very scarce, but ducks, geese and all kinds of waterfowl are numerous. The season, from the time I arrived at The Pas, was very wet, with frequent heavy thunderstorms. The lakes, rivers and swamps were flooded, making the work in the low lands very disagreeable and somewhat dangerous. The first frost of the season occurred about the end of August, but was so slight that it did not affect the potatoes. During the first half of September there were occasional frosts, but not heavy; quite a number of gardens had not been affected very seriously, considering the wet season. The temperature was much milder than you would expect in that latitude.

As the season had been very wet and cold and showed prospects of an early winter, I concluded to leave for home at the first opportunity, having no other work in view. On the morning of Monday, September 16, the steamer *Marjorie* sailed for 'high portage' and my man and I took passage on her, arriving at Winnipeg on Monday, September 22, and at home on September 30.,

I have the honour to be,sir,
Your obedient servant,

LEWIS BOLTON, *D.L.S.*

APPENDIX 17.

REPORT OF C. E. BOURGAULT, D.L.S.

RESURVEYS IN THE PROVINCE OF MANITOBA.

St. Jean Port Joli, March 6, 1908.

E. Deville, Esq., LL.D.,
Surveyor General,
Ottawa.

Sir,—I have the honour to submit the following report on resurveys made during the past season in the province of Manitoba.

In accordance with your instructions of January 10, 1907, to survey a fringe of marsh on the shores of lake Manitoba, I left home on January 17, arriving in Portage la Prairie on the 24th, having been delayed two days at Fort William by a snowstorm. The greatest difficulty was organizing a party and procuring the transport outfit, as the horses were at Gladstone and the sleighs at Oak Point, one hundred and fifty miles apart. I bought supplies and shipped them to Poplar point, where I hired two teams to take them to St. Marks in township 15, range 5.

The soil in this township may be ranked as third class, being composed of sand and gravel, but hay is plentiful and of first class quality. The settlers depend for their living on fishing in lake Manitoba in winter and on stock raising. As they earn good wages I had some difficulty in getting good men to work on the survey for the wages paid by the Department. The season was not suitable for this kind of work as there was too much snow and cold weather. I was in the field from January 17 to November 11, during which we experienced weather ranging from 45° below zero to 75° above. We suffered from cold during the winter as we were surveying in open country. During the summer we worked nearly all season in water from six inches to three feet deep, so that it is not to be wondered at if I was compelled to be continually hiring men. I have never seen such a severe winter and late spring; the ice was solid on lake Manitoba till June 10, and the summer was so wet that the men could not stand work more than a month.

These marshes are covered with long reeds from eight to twelve feet high. These had to be cut with scythes which made the work slow and tedious. After opening and chaining the lines I was compelled to haul on sledges posts about eight feet long and six inches square to mark the section corners in accordance with your instructions, often having to cut through four feet of ice before reaching the ground.

Settlers cut timber along parts of the sandy beach of lake Manitoba. This seemingly renders the shores lower at these parts, allowing the water to inundate good land on sections south of the lake.

About the end of March water covered the ice so that it was impossible to survey township 15, range 4. I accordingly moved my camp to township 18, range 4.

The township is suitable for stock raising. There is a creamery here and cream is shipped twice a week to Winnipeg where it commands a high price. Most of the settlers are Icelanders, who appear to neglect farming except raising vegetables and potatoes.

On May 17, I left this township for Sewell where I retraced the north boundary or Spruce Woods forest reserve. The surface of this reserve is composed of sandy hills and muskeg and is unfit for farm land. The timber has been completely cut or swept by fire.

From Sewell I returned to Deer Horn on June 6, to make a retracement and restoration survey of township 21, range 5, and finding an error of five chains on the west side of section 6, I made a new survey of the whole township. Poplar and scattered spruce were found on every section. During a dry season hay is plentiful and of good quality, but irrigation is necessary to ensure a good crop. There is no cultivated land in the township. The soil is black loam with sand and gravel subsoil. The township is about one-third hay marsh, the remaining two-thirds being covered with poplar, spruce and willow.

From here I moved camp to township 22, range 6, and completed the retracement of this township on September 4. The settlers here are almost all of Swiss origin. The west part of the township is covered with thick bush consisting of poplar, eight to eighteen inches in diameter and scattered spruce twenty inches in diameter, while the east part is coverd with young poplar, hay marsh, muskeg and lakes. There are no streams and the surface is so level that in wet seasons settlers are compelled to cut hay in the water. The soil is a black loam with sand and gravel subsoil.

I made retracements of townships 22, ranges 4 and 5, which were almost covered with water, and then retraced the Colonization road northwest to Teulon, which occupied us till October 31.

On November 1, I returned to Teulon, stored the outfit with Mr. W. McKinnell, paid off my party and started for home, arriving there on November 11.

I have the honour to be, sir,
Your obedient servant,

C. E. BOURGAULT, *D.L.S.*

APPENDIX 18.

REPORT OF P. A. CARSON, D.L.S.

TRIANGULATION SURVEYS IN THE RAILWAY BELT OF BRITISH COLUMBIA.

OTTAWA, March 1, 1908.

E. DEVILLE, ESQ., LL.D.,
Surveyor General,
Ottawa.

SIR,—I have the honour to submit for your consideration the following report of my field operations for the triangulation survey in British Columbia, in connection with the Trigonometrical Section of the Topographical Survey of Canada, for the season of 1907. This report is accompanied by a topographical map, on a scale of six miles to an inch, showing the whole triangulation in the Rocky and Selkirk mountains as it stands at present. The map shows also the topography of that part of the railway belt, British Columbia, which lies north of the Canadian Pacific railway, and west of Blaeberry river, that is, the districts drained by Blackwater creek, Bush river, Gold creek and Sixmile creek. The topography and the positions of the important features have been determined by means of triangulation, track surveys, photographs, and miscellaneous information, and names have been given to the principal mountains and streams.

I left Ottawa on June 7, for Golden, British Columbia, where my outfit had been stored at the close of the previous season. My horses I found in excellent condition after a very severe winter in the Columbia valley, twenty-nine miles south of Golden. The horses had managed to forage very well in the sloughs along Columbia river, until the approach of spring, when the heavy crust on the snow prevented them from reaching the grass, and it was therefore necessary to give them chopped feed for several weeks. Considering the severity of the winter, which seems to have prevailed throughout Canada, and from some of the reports of the death of horses and cattle on the ranges in other districts, I was well satisfied with this vicinity as a winter range. I purchased two more horses in the Columbia valley at fifty-five dollars each, bringing the number of my horses up to eight.

It was found impossible to obtain skilled packers at the standard wage of two dollars *per diem,* so I was obliged to pay seventy-five dollars per month in order to secure a good man. The remainder of my party was engaged in Golden, only two of last year's quota being available.

BASE LINE.

I first visited the base line which was established during the season of 1906 in the Columbia valley, twenty-one miles south of Golden. The whole extent of the line was this year cleared out and prepared for final measurement, and the ends of the base were marked in a permanent manner, as described in your instructions.

At 'A,' the southerly end of the base line, which is situated in the northeast quarter of section 16, township 24, range 19, west of the fifth meridian, the end was marked as follows: The true end of the base line is an underground mark, being the intersection of a pair of fine lines in the upper end of a brass bolt, such as is used for marking the triangulation stations. This brass bolt is six inches long and three-quarters of an inch in diameter. It has a flat head one and one-half inches square and one-half inch thick. The bolt was firmly set in concrete, three feet below the surface of the ground (i. e. below the frost line). The head of the bolt was also marked with the letter 'A', and the words 'End of Base, Canada.' The underground mark was covered with loose earth level with the original surface of the ground.

A set of four witnesses was securely placed in concrete, being iron reference bolts, each sixteen inches long, and three-quarters of an inch in diameter. A cross was marked on the head of each bolt, the centre of the cross in each case being three feet distant horizontally from the geodetic end of the base. These reference bolts bear respectively north, south, east and west from the geodetic point.

At 'B,' the northerly end of the base line, which is situated in the northeast quarter of section 35, township 24, range 20, west of the fifth meridian, the end was marked as at 'A,' except that the head of the bolt bears the letter 'B.' A set of four witnesses were also placed in a similar manner to that at 'A.'

It was deemed undesirable to place a permanent surface mark or monument over the ends of the base, as is generally done in geodetic surveys; but a temporary signal for observing upon was erected at each end of the base, being a triangular wooden pyramid three feet wide at the base, and three feet six inches high. The signals were covered with white cotton to assist in clearness of vision.

Each end of the base was accurately tied to the neighbouring survey posts of the Dominion system of survey, and a plot of ground, one chain square, is to be reserved at each end of the base for the purposes of the triangulation.

PROJECTION OF BASE LINE.

In order to project the base line of five and one-quarter miles extent, to the main triangulation, in which the sides of the triangles are from fifteen to twenty miles long, a set of three secondary stations was established, viz.: station 'C,' on Beaver-

foot range, opposite the base line, station 'D,' on a wooded ridge on the west side of Columbia valley, opposite the base line and station 'E,' on the summit of Kapristo Mt. near the northerly end of Beaverfoot range. By means of these three stations the base line is connected with station '17' (Mt. King), station '20' (Beaverfoot) and station '21' (Spillimacheen) of the primary system.

STATION C.

Station 'C,' for the projection of the base line, is on the summit of the Beaverfoot range, at an altitude of about 8,000 feet. The mountain is easily reached by means of a pony trail running from Columbia valley wagon road, at a point near Biebernitz's ranch. This trail leads up the side of the mountain, and horses lightly packed may be easily taken to timber line. The station is marked with the usual brass bolt securely cemented in a hole drilled in the rock. The top of the bolt is stamped with the letter 'C,' followed by a triangle. The apex of the triangle is at the centre of the bolt, faces north, and is the geodetic point. Three reference bolts were also firmly cemented in the rock, each being six feet horizontally from the geodetic point, and bearing respectively north, south and west from it. Directly over the brass bolt a conical stone cairn was erected, four feet in diameter at the base, and six feet high. The cairn tapers to a point at the top, which is vertically over the geodetic point. White cotton was wound around the cairn to serve as a signal.

STATION D.

Station 'D,' for the projection of the base line was established on a wooded ridge on the west side of the Columbia valley, opposite the base line. The station is just south of the pass leading from Carbonate Landing to Spillimacheen valley. A spot on the ridge was cleared of timber so as to give unobstructed vision towards both ends of the base, and towards stations 'C,' 'E' and '21.' The station was marked by means of the usual brass bolt, cemented in a hole drilled in solid rock, twelve inches below the surface of the ground. The head of the bolt was stamped with the letter 'D,' followed by a triangle. The apex of the triangle which is at the centre of the top of the bolt, faces north and is the geodetic point. Directly over the geodetic point was erected a wooden signal, in the shape of a tetrahedron, five feet high. The signal was covered with white cotton to assist in clearness of vision.

STATION E (KAPRISTO MT.).

Station 'E,' the third station for the projection of the base line to the main triangulation, was established on July 10, on the summit of Kapristo Mt. (altitude 8,900 feet), one of the most northerly and highest peaks of the Beaverfoot range. The station was reached via an old smugglers' trail leading from Carbonate Landing to a high pass over the Beaverfoot mountains. At one time the trail led down into the Beaverfoot valley, but has fallen into disuse since the building of the Canadian Pacific railway and is impracticable for horses. From this pass above timber line the summit of the range was followed northerly until Kapristo Mt. was reached, overlooking the town of Palliser, on the Canadian Pacific railway. Angles were read towards station '17' (Mt. King), station '20' (Beaverfoot), station '21' (Spillimacheen), and stations 'C,' and 'D.' The station was marked in a permanent manner with the usual brass bolt firmly cemented in a hole drilled in the rock. The flat head of the bolt was stamped with the letter 'E,' followed by a triangle, with its apex at the centre of the top of the bolt. The apex of the triangle faces north and is the

geodetic point. Directly over the geodetic point a conical stone cairn was erected five feet in diameter at the base, one foot at the top and six feet high. The top of the cairn is vertically above the geodetic point. Four reference bolts were also securely cemented in the rock, each being six feet horizontally from the geodetic point, and bearing respectively north, south, east and west from it. White cotton was wound around the cairn to act as a signal.

While we were on the summit of Kapristo Mt. establishing triangulation station 'E,' an electrical storm came from the northwest and we were soon enveloped in heavy dark clouds. A strange buzzing sound was heard, which seemed to proceed from our alpenstocks which we had placed in an erect position in the rocks. Then our faces commenced to tingle, as though swept by innumerable cobwebs, and our hair rose and fell from our scalps. A most peculiar tingling sensation pervaded our whole bodies and we looked at each other with half fear, half laughter on our faces, not knowing what to make of the situation. However, I decided to go ahead as though nothing strange were occurring and laid my hand on the metal of the theodolite. A sudden shock almost knocked me off my feet, and the smothered exclamation from my lips finished the oozing remnants of bravery which the others were displaying. In less time than it takes to tell it, all three were seeking shelter beneath some overhanging rocks fifty feet below the summit, and each one, I am sure 'searching his soul for sounds to tell how scared he was.' The storm, however, passed as quickly as it came and we resumed work at the station.

STATION 20 (BEAVERFOOT.)

On June 26, I visited station '20' in order to learn whether I could move it a little farther north and still see station '14' (Storm Mt.), and also to locate a suitable position for station 'E.' Even at this late day in June the snow of the past winter lay far below the timber line, while the peaks were so deep in snow that the cairns on Storm Mt. and Mt. King were completely invisible. I destroyed the markings for station '20' and subsequently erected a new station on the mountain immediately north of the old one. The markings for the new station are the same as before, except that only three reference bolts were placed. Each witness is distant six feet horizontally from the geodetic point and they bear north, south and west from it. The cairn is five feet in diameter at the base and eight feet high.

STATION 21 (SPILLIMACHEEN.)

Station '21' was established in 1906 on the peak where Mr. W. S. Drewry, D.L.S, had placed a cairn fifteen years before. It was afterwards discovered that the location was unsuitable for a triangulation station, as the cairn is invisible from any of the peaks in the vicinity of Battle Creek. Consequently in 1907 this station '21' was removed to a higher and more commanding peak a couple of miles westerly, in the same range of mountains. From the new station also a location for station '24' was determined upon, to take the place of the cairn called 'Battle Creek' and the magnificent mass of Mt. Sugarloaf was picked out. The mountain on which station '21' is situated may be reached either from the north or middle forks of Spillimacheen river, although probably the easier ascent may be made from the latter. If however it is desired to visit station '22' (north fork) directly afterwards, a saving of time is made by travelling via the north fork trail.

STATION 19 (MT. LAUSSEDAT).

The station established by Mr. W. S. Drewry, D.L.S. on the westerly side of Blaeberry river was afterwards discovered to be unsuitable for the continuation of the triangulation westward. Consequently in 1907 I destroyed station '19' (Blaeberry) as situated, and placed the station on Mt. Laussedat, altitude 10,000 feet),

about three miles in a northeasterly direction from the old station. Mt. Laussedat is a high and prominent mountain commanding the Blaeberry and Waitabit valleys. The mountain may be reached from either of these although perhaps the more easily from the former. The ascent of Mt. Laussedat is by no means an easy one, for in the upper heights are several reaches of almost sheer rock. Our camp was placed on the left or east side of Blaeberry river, about fifteen miles from Moberly, and several miles above Blaeberry canyon and falls. Here we built a foot-bridge over a narrow part of the river, and with packs on our backs ascended a ridge leading northwest towards Mt. Laussedat. We bivouacked at timber line, and the following morning commenced the ascent of the main mountain. After some difficult rock climbing, and an ascent up an almost precipitous snow couloir occupying five hours from timber line, the summit of Mt. Laussedat was reached.

Station '19' is marked in the usual way with a brass bolt set in cement in a hole drilled in the rock. The top of the bolt is stamped with the Roman numerals XIX, followed by a triangle having its apex at the centre of the head of the bolt and pointing north. The apex of the triangle is the geodetic point. As reference marks there were drilled in the solid rock two holes, one due south of the geodetic point and distant six feet horizontally from it and the other due west of the geodetic point and four feet six inches horizontally from it.

Over a brass bolt a conical stone cairn was built, four feet in diameter at the base, one foot at the top and six feet high. The top of the cairn is vertically above the geodetic point.

While on the summit a snowstorm set in which made it exceedingly disagreeable and cold during the enforced stay at the top. The descent to timber line was made in four hours, being rather hazardous on account of the falling snow. Our trip up the Blaeberry occupied eight days, from July 15 to July 22 and five of these were rainy.

STATION 28 (BLACKWATER.)

Station '28' (Blackwater) is reached from the old town of Donald, on the Canadian Pacific railway by way of the Government pack trail from Donald to the Big Bend of Columbia river, and Tete Jaune Cache, near the Yellowhead pass. The trail crosses Waitabit creek by means of a bridge about a mile north of Donald, then follows a northwesterly course for four and one-half miles to a point on Bluewater creek about three miles from its mouth. A bridge crosses the Bluewater just where Blackwater creek falls into it, and the trail ascends Blackwater valley. The first three miles of trail are on the left or east side of the stream when the trail crosses and follows up the right bank for seven miles to a point opposite Blackwater lake. Here we descended on a branch trail to the level of the lake and camped at its southerly end. The lake is about one mile in length north and south, about three hundred yards wide and empties into Blackwater creek. Its elevation is 3150 feet. It teems with fine rainbow or mountain trout from six to eighteen inches in length. From Blackwater lake an old miners' trail leads northeasterly up Blackwater creek, coming from between the two most southerly mountains of Blackwater range. At timber line an old deserted mine is reached, from where the ascent to Blackwater Mt. is easily made in three hours (altitude 9000 feet.) This mountain is one of the highest peaks of Blackwater range and indeed of the district drained by Waitabit, Bluewater and Blackwater creeks. It commands an unobstructed view easterly towards Mts. Laussedat, Mummery and Freshfield, and northerly, across the Bush valley towards the lofty Lyell, Bryce and Columbia groups. To the south and west lies Columbia river, with the monarchs of the Selkirks beyond.

Station '28' is marked in the usual manner for primary triangulation stations with a brass bolt securely cemented in a hole drilled in the rock at the summit of the mountain. The head of the bolt is stamped with the Roman numerals XXVIII,

followed by a triangle with its apex at the centre of the head. The apex of the triangle faces north, and is the geodetic point.

As witnesses there were set in cement three iron bolts, each six feet horizontally from the geodetic point, and bearing respectively east, south and west from it. A conical stone cairn was built with the centre of its base directly over the geodetic point. Its dimensions are six feet in diameter at the base, one foot at the top and seven feet six inches high. White cotton was wound around and securely wired to the cairn to serve as a signal.

Mosquitoes were very troublesome at Donald and all through Bluewater and Blackwater valleys, although at the lake we had a short respite from their onslaughts on account of the light breeze which generally blows down the lake. There is some excellent timber in Bluewater, Blackwater and Waitabit valleys, most of which is under license; there is also a quantity of low grade galena and copper ores.

STATION 29 (BUSH RIVER.)

From Blackwater lake the main trail continues for two and one-half miles to a low swampy pass (altitude 3,150 feet) and there swings to the easterly side of several small beaver lakes which form the headwaters of Succour creek, flowing northwesterly. For eleven miles the trail follows the right bank of Succour creek, finally striking Bush river crossing about a mile and a half in a straight line from the mouth of that river. This point may also be conveniently reached in canoes by descending Columbia river from Beavermouth.

Bush river empties into the Columbia from the east, about twenty-two miles below Beavermouth railway station. It is a glacial stream some two hundred feet wide near its mouth, flowing at the rate of three and a half miles an hour. During the months of July and August the river carries an immense quantity of water being fed by the large glaciers of Freshfield, Lyell, and Bryce groups. For a distance of three miles from its mouth the river flows in a westerly direction through low flat lands, which are mostly inundated during July and August by the high waters of Columbia and Bush rivers. Higher up, Bush river runs from the northeast with numerous side-channels flowing through shingle flats; the valley is about half a mile wide and the slopes of the mountain on each side are covered with dense spruce and fir timber. Bush river is navigable with canoes and small boats for a distance of thirty miles, although during the upper twenty miles poling must be resorted to, as the current from the mouth of Chatter creek (locally called Callahan creek) to the forks of Bush river is nearly five miles an hour. The whole of Bush river almost to the forks lies within the railway belt.

Owing to the low inundated lands of Columbia valley near the mouth of Bush river, and the numerous hay meadows and lakes up Bush valley, this vicinity is scourged with mosquitoes and black flies during the greater part of the summer. Messrs. Collie and Stutfield, who explored this district during 1900 thus describe it in their book ' Climbs and Explorations in the Canadian Rockies ': ' The weather was now very hot and sultry and that evening swarms of the most voracious mosquitoes we ever encountered drove us nearly crazy. The men said they had occasionally seen them more numerous on the prairie, but that never in their lives had they known them anything so vicious or venomous. They lost no time in buzzing or fooling around, but went straight to business with their beaks until our faces and hands were one mass of bites . . . The night was a night of unending torment for at this lower elevation (about 2,500 feet) the insects do not go to sleep after sundown, as in the higher regions of the eastern Rockies.'

On the north side of Bush river near the crossing are two lakes, each about half a mile long, which I have named Cygnus lakes from the white swans that are generally to be seen upon them. These lakes are also the haunts of wild duck and geese in the autumn and besides teem with magnificent salmon trout, which are easily

caught. In the river itself charr, ling and squaw fish are found. Black bears, are plentiful along Bush river, and goat on the mountains; a few marten, wolverine, coyote, lynx, caribou and white-tailed deer may also be found. There is no mineral of any account in this vicinity. It would be desirable to establish the limit of the railway belt up Bush river, on account of the valuable timber in the valley, and along the tributaries of the river, for at present there is great uncertainty amongst timber cruisers as to the exact position of the belt boundary.

Station '29' (Bush River) was established near the north limit of the railway belt on the summit of a mountain distant about four miles north of Bush river crossing. We placed our camp on the south side of the river at the crossing, where we found an old galvanized iron boat, which had been placed there by the provincial government for the convenience of travellers on trail. Crossing the river we set out with instruments and packs up a hog's back between the two Cygnus lakes. 'At timber line we set a fly-camp, and the next morning (September 24) we finished the ascent to the desired peak. The station was marked in the usual manner with a brass bolt cemented in a hole drilled in the rock. The flat head of the bolt was stamped with the Roman numerals XXIX, followed by a triangle with its apex at the centre of the head of the bolt. The apex of the triangle faces north and is the geodetic point. Four reference bolts were also securely cemented in the rock, each being distant six feet horizontally from the geodetic point, and bearing respectively north, south, east and west from it. Directly over the brass bolt a conical stone cairn was erected six feet in diameter at the base, one foot at the top, and nine feet high. The top of the cairn is vertically above the geodetic point. White cotton was wound around and securely wired to the cairn to assist as a signal. From station '29' a magnificent view is obtained to the north and east of those grand mountains of the main range, Mts. Columbia, Bryce, Alexandra, Lyell, Bush peak, Forbes, Freshfield and Mummery.

STATION 24.

During the season of 1906 a visit was made up Battle creek, a confluent of Incomappleux river, to establish station '24,' near where Mr. W. S. Drewry had set his 'Battle Creek' cairn in 1892; but it was found that no suitable location could be obtained to connect with station '21' (Spillimacheen) and station '22' (North Fork). I decided therefore that any attempt to extend the system of triangles across the summit of the Selkirks by sighting through a gap or gaps between the mountains would be futile and that it would be necessary to fix station '24' on one of the summit peaks of the Selkirk range, Sugarloaf Mt., was accordingly picked out as a desirable location, and a trip was made up the valley of Beaver river in order to ascend that mountain.

The horses and outfit were shipped from Donald to Bear Creek by rail, as there is no trail between these points, the railway here crossing many streams and rivers by some of the highest arches along the line. Bear Creek railway station is a flag station at an elevation of 3,670 feet, clinging to the side of the Hermit mountains along which the railway winds as it approaches Rogers pass. Some pickings of grass may be foraged along the railway track, but it is a dangerous spot for horses, it being necessary to herd the animals carefully in the daytime and tie them up at night to prevent accidents from passing trains. Consequently an immediate start was made from Bear Creek station (August 2) down the pack trail which leads to Beaver river, 800 feet below. About a mile and a half from the railway the trail crosses Beaver river by a bridge, then follows up the right (or east) bank of the river for a couple of miles, where it makes a turn up the north side of Grizzly creek. Here the trail branches, one fork ascending Grizzly creek to connect with the north fork of the Spillimacheen river, while the right hand trail crosses Grizzly creek by means of a bridge and ascends Beaver valley. The trail runs in a southeasterly direction along the east side of the river for about twenty-three miles to the head of the river,

and crosses a low pass (altitude 4,700 feet) into the valley of the Duncan. Beaver trail is now in bad condition, being littered with windfall, necessitating the constant use of axes in order to make it passable for the pack horses. About six miles from the Grizzly bridge the first swamp or meadow is reached, where feed may be obtained for horses, then during the remainder of the distance there are many swamps and meadows, which however at high water make the trail very disagreeable for travelling, and it is an open question which is the worst, the swamps or the windfall.

As progress is made along the Beaver valley, openings in the dense forest allow occasional glimpses of the black and white precipitous mountains which line the west ern side of the valley. These rise to a height of over 10,000 feet, and their sheer dark masses form the easterly confines of the extensive Illecillewat and Deville *névés ;* and I may add that this view of Mt. Sir Donald and the other majestic peaks of the Selkirks is much grander than that seen from the Canadian Pacific railway on the western slope. On the left or easterly side of Beaver valley Bald mountain lifts its long undulating height scarcely above timber line.

Beaver river, which rages and races through canyons and rapids in its lower reaches, soon becomes much smaller as its many glacial feeders are passed, until at the summit between Mt. Beaver and Mt. Duncan, the river commences its flow from the broad Beaver glacier, which extends its tongue into the very valley. Here, too, from the Duncan glacier only a short distance beyond, Duncan river takes its rise, flowing southward. About three miles from the pass or about twenty-three miles from Bear Creek railway station, one of the largest confluents of Beaver river, enters from the west, being a stream about fifteen feet wide, and only a mile long coming from the enormous Grand glaciers, which lie in the cold bosoms of Sugarloaf and Grand mountains.

Although Sugarloaf mountain seems to lie quite close to the pass, it is more easily reached via Grand glacier. Consequently we pitched our main camp on the bank of Beaver river, and taking instruments and packs ascended the south branch of Grand glacier to an altitude of 6,800 feet, where we bivouacked on a small timbered slope beside the glacier. The following morning we ascended the glacier to an altitude of 9,000 feet, making only slow progress over its rough icy surface and around its many wide crevasses. After climbing steadily for several hours the morning turned cloudy and fine rain and sleet commenced to fall. We soon realized that further advance would be but a waste of time so returned disheartened to our fly-camp. Then followed five days of steady rain, during which time the whole vicinity was shrouded with dense clouds, and we were never able to discern objects more than a hundred yards away. On August 19, it began to clear so the following morning before daybreak we once more attempted Sugarloaf. This time, however, instead of ascending the glacier we stuck to the rocky cliffs leading directly to the desired peak. After a steady but by no means difficult climb of six hours, almost entirely over ice and snow, we reached the summit (altitude 10,700 feet). A temporary cairn was erected for station '24,' but we could not set the permanent brass bolt on account of the depth of the snow. The descent to our fly-camp was made in four hours with many exciting glissades down almost precipitous snow fields. The next day we returned to our main camp in the Beaver valley.

Although the geographical position of Sugarloaf mountain is a good one for a triangulation station, it is not a perfect location by any means. Owing to the heavy precipitation in this locality, and the consequent enormous areas of ice and snow, glaciers and *névés,* it is only on rare occasions that a perfectly clear day can be obtained for observing and reading the angles necessary for triangulation work; while signals set on peaks in this district are also but rarely visible from adjacent stations.

From our camp near Grand glacier we returned to Bear Creek station in two days, although the trip in had taken over four days. The whole trip occupied twenty-two days, of which eighteen were rainy.

There is some very fine timber up the Beaver and Duncan valleys, fir, spruce, cedar and hemlock. Large deposits of iron pyrites exist in the mountains on the west side; also some copper and traces of gold on the eastern side towards the head of Beaver valley. Game is somewhat plentiful, consisting of caribou, deer, marten, wolverine, and bear, while goats are numerous on the mountains to the west.

STATION 30.

That portion of the railway belt which lies north of Beavermouth and west of Columbia river had never up to this time been explored or mapped, so a visit was made into this district to establish triangulation stations and at the same time to prepare a topographical map of the country by means of triangulation, photography and track surveys.

Start was made from the Sixmile Creek railway siding, where the united north and south branches of Sixmile creek enter Beaver river from the west, about four miles from the mouth of the latter. Both valleys of Sixmile creek flow rapidly through narrow valleys between the mountains, and a route up either stream is impracticable for horses. Several years ago a prospector made a trail up the north branch for several miles, in order to tap some rich mica deposits which he had located and staked there, but nearly all traces of the trail have been obliterated by slides and fallen timber.

Between Columbia river and the north branch of Sixmile creek, a long ridge extends from the northwest, its southerly hog's back reaching in a point to the siding at Sixmile creek (altitude, 2,600 feet.) This ridge was swept by fire several years ago, and it now stands grey and black with the burnt remnants of once valuable timber. Up this long hog's back we cut our way through débris and *brulé*, the horses with light packs following slowly up the steep incline. After advancing in a northerly direction for about three miles an elevation of 6,000 feet was attained, and here the going was comparatively easy through the sparse timber and undergrowth of this altitude. Camp was pitched on a pleasant spot where the first water was found, the horses finding plenty of grass in these high lands. We continued our advance in a northeasterly direction through narrow passes at timber line, then along the level ridge termed 'The Esplanade,' on the westerly slope of the Esplanade range, lying between Sixmile creek and Columbia river. On our left the north branch of Sixmile creek lay several thousand feet below, while beyond rose some of the highest peaks of the Selkirks, 'Iconoclast,' 'Sorcerer,' 'Seraph,' 'Cherub,' 'Ventego' and 'Pearee.'

A secondary station No. '30A' was established on a peak of the Esplanade range, Cupola mountain, so called on account of the shape of its rocky summit. Angles were read, photographs were taken, and other information derived for topographical purposes. Advance was continued along the easterly slope of the north branch of Sixmile creek, and a gradual descent made to the head waters of that stream where we crossed a narrow snow pass, and reached the head of Spinster creek flowing northerly into Gold creek. From the pass we advanced for about a mile, dropping down several hundred feet, and pitched camp beside a small alpine lake, (Sunbeam lake).

Secondary station '30 B' was established on Sentry mountain (altitude, 7,500 feet), which is the most northerly mountain of the Esplanade range, and overlooks the mouth of Gold creek and Bush river valley.

From station '28' (Blackwater) and subsequently from Sentry and Cupola mountains, a high mountain since named Mt. Sandford, has been picked out as an excellent position for primary station '30.' This mountain lies near the north limit of the railway belt, in township 31, range 28, west of the fifth meridian, and is situated between Gold creek and Novelist creek. To reach this mountain, we therefore took packs on our backs (horses being of no further use), and crossed over a range

of mountains to the west of our camp. We then descended some 4,000 feet into the valley of Bachelor brook or south branch of Gold creek, a rapid mountain stream about thirty feet wide. This creek flows through a narrow valley from the southwest and obtains its water from snow and ice in the very heart of the Selkirks, and empties into the main brauch of Gold creek, about fifteen miles from the mouth of the latter. We made a difficult crossing over the swiftly flowing Bachelor brook, by means of an improvised foot bridge, and finding that progess was extremely slow through the dense timber along the banks of the creek, we ascended to timber line of Sonata mountain, the mountain lying between Bachelor brook and Gold creek. From Sonata mountain we soon discovered that we were still a long way from Mt. Sandford, and that that mountain, alas, was covered with fresh snow. We established a secondary station, '30 C,' on Sonata mountain (9,000 feet) then returned to our main camp, after an absence of five days, during three of which it had rained. A heavy snow storm now set in, which covered the whole district with nearly a foot of snow, so we returned to the railway at Sixmile Creek siding. A topographical map of that part of the railway belt in the vicinity of Gold creek and Sixmile creek has been prepared, with names for the important mountains and streams.

Gold creek enters Columbia river from the west, near the mouth of Bush river and is a rapid glacial stream, which during the months of July, August and September, carries an immense volume of water. Although a reconnaissance was made up Gold creek at the time of the preliminary surveys for the Canadian Pacific railway, no trail exists up the valley, which is at present impracicable for horses. There is much valuable timber up Gold creek, and its many confluents which has not yet been taken up. There is very little mineral of value in the vicinity despite the suggestive name of the stream. Rich deposits of amber and white mica exist all through the Selkirks from Sixmile creek to the 'big bend,' and although some claims have been staked and recorded, the mines have not been developed.

NOTES ON THE WEATHER.

The winter of 1906-7 which was such a severe one all over Canada was none the less so in the Rocky and Selkirk mountains, and the sonwfall was especially heavy. The spring too was late and eveu in the last week of June, the snow still lingered below timber line. It was not until after the first week in July that the higher peaks became at all free from their many feet of snow, so that the cairns and signals of the triangulation survey were visible. After such a winter it was of course expected by all that the summer would make amends but in this we were greatly disappointed. Some very warm weather was experienced it is true, but on the whole the summer was the wettest for many years, the only compensation being the lack of forest fires which are generally such a curse, especially during the month of August. The mosquito pest was worse than usual, and we were troubled with that scourge from June until the end of September. Of course it must be realized that weather conditions are often judged from different view points, and that many days which are termed 'cloudy' by a mountain surveyor, are called 'fair' by residents of the valleys, for the clouds which obscure the mountain peaks and the surveyor's signals serve to make the days more pleasant to the sojourners in the valley.

During the latter half of June in Columbia valley there were nine fair days (all of which were very warm and sultry,) one cloudy day, and five days of rain. In the month of July, in Columbia, Blaeberry and Blackwater valleys we had fifteen fair, two cloudy and fourteen rainy days. In August in Beaver valley it rained on twenty-one days (with snow on the peaks) and of the remaining days six were fair and four cloudy. During September in the valley of Gold creek, and the vicinity of Bush river, thirteen days were fair, three cloudy and fourteen rainy, with some heavy snowfalls even at the low altitude of 5000 feet. The month of October was exceptionally

fine in Columbia valley, being free from severe storms, and very little snowfall on the mountains. Although the reports on the weather give only four rainy and five cloudy days, the conditions were not suited to triangulation work. A heavy mist obscured the whole valley and the neighboring mountains every morning and it was unaffected by the rays of the sun until nearly eleven o'clock at which hour the banks of fog lifted only to cling tenaciously to the cold mountains. Then at four in the afternoon as the sun settled below the western hills the mist descended once more in a dense mass.

The water in Columbia river during the summer months was lower than usual, which goes to show that the amount of extreme heat especially in the early summer was less than in other years.

GENERAL NOTES.

The west boundary of Yoho Park reserve has recently been altered by Order-in-Council, and instead of following the meridian between ranges 19 and 20, west of the fifth meridian, from the summit of the Beaverfoot range to the south limit of the railway belt, it now runs southeasterly along the summit of the said range of mountains to the limit of the belt. This change throws open to settlers a goodly portion of fruit and farming lands, and already advantage has been taken of it by homesteaders and purchasers. At present only the bottom-lands in the Columbia valley are at all under cultivation, and but few attempts have been made to thoroughly test the possibilities of this district for producing the hardy and small fruits, although the results of most endeavors have been eminently satisfactory. Besides the bottom-lands, however, there is a large area of excellent bench-lands suitable for fruit farms extending back to the main mountains, but these lands will need considerable clearing, a task, however, which seems to require more energy than the easy going ranchers of the valley have at their disposal. A great portion of the said bench-lands is comprised within timber-berths, which have been stripped of their best timber, except that suitable only for railway ties. Should these lands be desired at any time for farming purpose they could be expropriated from the timber-berths without any serious loss to the lumber companies. However, until the much delayed Kootenay Central branch of the Canadian Pacific railway is constructed there will be very little activity in this district, either in agriculture or mining.

I have the honour to be, Sir,
Your obedient servant,

P. A. CARSON, D.L.S.

APPENDIX NO. 19.

REPORT OF WILLIAM CHRISTIE, D.L.S.

SURVEYS OF BASE LINES IN THE PROVINCE OF MANITOBA.

CHESLEY, ONT., March 27, 1908.

E. DEVILLE, ESQ., LL.D.,
Surveyor General,
Ottawa.

SIR,—I have the honour to submit the following report of my surveys during the season of 1907.

On April 17 I received your instructions dated April 15, to survey the eighth base line across ranges 10, 11, 12, 13 and 14, and the ninth base line across ranges 10, 11, 12, 13, 14, 15, 16, 17, 18 and part of 19 all west of the principal meridian.

I was delayed in starting for the work owing to the fact that the six-inch transit which I had ordered from the Department did not arrive until May 27.

On May 29, I left Chesley and on June 1, arrived in Winnipeg, where I was to organize.

On June 6, I went to Winnipegosis and purchased a sail boat as instructed. I also purchased five pack horses.

On June 8, I returned to Winnipeg and on the 10th went to Teulon, where I disposed of the wagon, buckboard and harness belonging to the outfit used by me last year. The rest of the outfit, together with two additional horses purchased at Teulon, I shipped by rail to Winnipegosis in charge of a member of my party.

Returning to Winnipeg I completed the organization of my party and left on the 13th for Winnipegosis, where we pitched camp on the 14th.

We were delayed here until the 21st waiting for the boat to be rigged and for supplies to arrive from Winnipeg. We would scarcely have been able to start earlier even had we been prepared, as the lake was not clear of ice until about that date. On that date, however, having sent five men across country with the pack horses, we loaded the outfit and supplies on the boat and proceeded across lake Winnipegosis, down Waterhen river to Waterhen lake, and thence continued down Waterhen river to lake Manitoba. We met the pack horses at a ranch on the west shore of lake Manitoba on section 16, township 29, range 15. Here we left the boat and most of the supplies, and moved with pack horses to the northeast corner of township 28, range 15. From this point the line was run easterly across ranges 14, 13 and part of 12 to the western shore of lake Manitoba.

This portion of the line was completed on July 8. As I had no further need of the horses on this line, I sent two men to take them down to The Narrows in anticipation of having them taken by steamer to Gypsumville, which was the most convenient point to the northeast corner of township 32, range 10, at which point the survey of the ninth base line was to be commenced.

On July 9, having had the boat brought around to the line, we crossed the lake and camped on the east shore in township 29, range 10. I found that the portion of this line across range 10 as far as the east shore of the lake had already been surveyed.

On July 10, I went to Gypsumville and arranged with the Manitoba Gypsum company to have the horses taken across the lake to Gypsumville by one of the company's steamers. I began the survey of this portion of the eighth base at the northeast corner of section 33, township 28, range 10. By July 24, the line was completed across ranges 10 and 11 and connection made with the portion of the line on the west side of the lake.

On July 25, I started for Gypsumville with the outfit. Arriving there on the 26th I found that the horses had not yet arrived. They reached there on the 29th and on the 30th we left Gypsumville. On August 2, we camped on section 1, township 33, range 10, and began the survey of the ninth base line at the northeast corner of township 32, range 10.

I used pack horses to move across ranges 10, 11, 12 and 13, as far as Boggy creek, which crosses the line in section 35, township 32, range 13. From here to the end of the line I used the boat exclusively for transporting the outfit and supplies, the country through which the line passes being so swampy as to be almost impassable for horses. At some time it was with difficulty that the horses, without loads of any kind, were kept up with the camp. The horses also suffered greatly from swamp fever and foot-rot; so much so that up to the time of completing this line, five of them died. Considerable time was lost in moving camp, cutting roundabout trails to avoid swamps while moving with horses, and on account of the roundabout route to be taken when moving by boat on the lakes and rivers. When I reached the east shore of lake

Winnipegosis I left the horses in the care of Mr. Adam, rancher and fisherman, until the completion of the line on September 25.

I then crossed the lake and ran the line east from the northeast corner of section 32, township 32, range 19.

On October 8, I completed this line by connecting the two portions across lake Winnipegosis. The error in longitude of closing across the lake was 17.82 chains.

On October 9, I returned to Winnipegosis and received your instructions to survey the tenth base line easterly across lake Winnipegosis to the east boundary of range 15, the principal meridian across townships 26, 27 and 28 and the eighth base line across ranges 1, 2, 3, 4 and 5. I made inquiries regarding the time at which navigation usually closed on the lake, and the nature of the country adjacent to the lake ,through which the tenth base line would pass. From the information received I concluded that it would not be advisable to attempt to make the survey of the tenth base line at that time. I telegraphed you accordingly, and in reply was instructed to proceed with the survey of the principal meridian and the eighth base line.

I accordingly shipped the outfit by rail to Teulon. Here I purchased three wagons, three sets of harness and another horse, with which to move the outfit and supplies out to the starting point, a distance of about seventy miles by the route taken. This route followed the colonization road from Teulon to Icelandic river. The trail crosses Icelandic river in township 23, range 1, east of the principal meridian. From here a trail leads north across townships 23, range 1, east of the principal meridian, and 24 and 25, range 1, west of the principal meridian, to Fisher river, where some settlers have located in township 25, range 1, west of the principal meridian. The roads were in such condition, owing to the unusually wet summer, as to be almost impassable. And I found that the loads were altogether too heavy for the horses I had. Having got as far as township 21, I hired a team of horses and two teams of oxen, thus reducing the loads for each team by one-half. On October 31, we reached the settlement mentioned above and the freighters returned home.

From here we cut a road to the meridian and camped on section 12, township 26, range 1, west of the principal meridian. In cutting this piece of road we had to make a wide detour to avoid swamps. On November 5, I began the survey of the principal meridian at the northeast corner of township 25.

When I reached Fisher river with the survey, the horses were in such a condition that I saw clearly that they would not be able to endure the remainder of the survey, as it was impossible to provide proper food in sufficient quantities along the lines. Two of them had already died since commencing this line. I therefore decided to resort to man packing for the remainder of the survey. I left the horses and as much of the outfit as possible in care of Mr. E. Rogers, who has a ranch on Fisher river, in township 28, range 1, west of the principal meridian. I then began the survey of the eighth base line, which I completed on December 28.

I had previously arranged to have some Indians come in with dog trains to move the outfit back to Fisher river. They arrived at the camp with five dog trains on the 29th and on the 30th we started for Fisher river, where we arrived on the 31st.

As there was now about a foot of snow on the ground, I thought we would be able to travel much faster with sleighs than with wagons. I therefore exchanged one of the wagons for two sets of bobsleighs. I also hired another team to help move the outfit back to Teulon, where we arrived on January 9, 1908.

I stored the outfit with W. C. McKinnell, of Teulon, who also contracted to winter the remaining six horses. On the following day I returned to Winnipeg, discharged my party, and arrived in Chesley on January 14.

Throughout the whole of the region traversed during the season's operations good water was found in abundance, much of the country surveyed being under water at the time of the survey. Practically the whole of the region traversed is too low and wet for farming purposes without considerable draining Big game, parti-

cularly moose, is plentiful throughout the whole of the region traversed. Some jumping deer were also seen on the east shore of lake Manitoba on the eighth base line. No minerals of any kind were noticed along the lines surveyed, but gypsum is mined quite extensively in township 32, range 9, west of the principal meridian.

I have the honour to be, sir,
Your obedient servant,

WM. CHRISTIE, *D.L.S.*

APPENDIX No. 20.

REPORT OF T. A. DAVIES, D.L.S.

SURVEYS IN CENTRAL ALBERTA.

OTTAWA, FEBRUARY, 28, 1908.

E. DEVILLE, Esq., LL.D.
Surveyor General,
Ottawa.

SIR,—I have the honour to submit the following report concerning the survey work done in the Edmonton and Lloydminster districts during the season of 1907 in accordance with instructions issued to me on April 16 and September 17, 1907.

On April 17, I left Ottawa for Edmonton and having arrived there proceeded to organize a party for the season's work. This done we left Edmonton and drove to Wetaskiwin; thence we followed the Wetaskiwin and Hardisty branch of the Canadian Pacific railway to a short distance east of Gwynne, where the trail left the railway going in a southeasterly direction through Rosenroll; thence following Battle river and passing through Heather Brae we arrived in township 44, range 19 west of the fourth meridian on May 5.

At this time snow lay on the ground from one to two feet deep and during the first week owing to snow storms work was considerably delayed. After that the snow began to disappear rapidly and weather conditions became favourable for work. This section of the Edmonton district is well settled and opened up with well travelled trails and surveyed roads. Along many of the section lines grading has been done and small bridges built by the settlers.

In each township schoolhouses have been built and are well attended. On Sundays church services are held in them. There is a weekly postal service, the post offices being conveniently placed throughout the district. In connection with the post office there is in most cases a general store to supply the settlers with their several wants.

The country is broken by Battle river valley averaging three-quarters of a mile in breadth, with slopes from one hundred to one hundred and fifty feet in height. The river itself, generally, is two chains wide, varying from two to ten feet deep during the summer season, with a current of approximately two miles per hour. It flows in a southerly direction through this section of the country.

On each side of the valley the country is a first class farming district having an undulating surface with clumps of poplar and willow bush. The clumps of poplar and those of spruce, tamarack and some birch which are thickest in Battle river valley and in Meeting creek and Willow creek valleys, make a sufficient supply for fuel, fencing and building purposes, but are not of large enough extent for lumbering.

The soil is generally a sandy loam with a clay subsoil, and in some parts a rich black loam.

Coal, which is deposited in pockets along the slopes of Battle river valley is used to a small extent for fuel by the settlers, but it is not in sufficient quantities for mining purposes. Other minerals were not seen. The water is pure and the supply plentiful.

In section 18 of township 41, range 16, west of the fourth meridian there is a small fall of about ten feet on Battle river and this is the only water-power in the district.

Good wild hay is obtainable throughout this country and grows luxuriantly in many parts of Battle river, Meeting creek and Willow creek valleys.

Good crops of wheat, oats and flax are harvested and these are the chief products, although potatoes and all vegetables ordinarily used, are grown successfully.

Cattle ranching, owing to the large number of settlers, is carried on in very few parts and in a small degree.

The settlers are composed largely of men from the United States and eastern Canada with a considerable number of Norwegians and Swedes and a comparatively few Englishmen.

Frost came for the first time during the season about the middle of August, but I understood from the settlers that this was unusually early.

The chief game in the district is duck. There are a few prairie chicken, coyotes and lynx.

Having completed the work in this district on October 1 we drove to Bawlf on the Wetaskiwin branch of the Canadian Pacific railway and from there shipped the outfit to Edmonton and thence by the Canadian Northern railway to Lloydminster. From this place we drove along the mail trail northeasterly to Hewitt Landing post office on the south bank of Saskatchewan river. Here we were ferried across the river and proceeded about five miles down stream to a suitable camping place in township 53, range 26, west of the third meridian, where we were to do retracement and restoration work in accordance with the instructions of September 17.

That part of the country in township 53, range 26, west of the third meridian and north of Saskatchewan river is rough and sandy and broken with small lakes, sloughs, marshes and muskegs. Pipestone creek, which flows southerly along the east boundaries of sections 33 and 28 and here enters Saskatchewan river, divides the north part of the township into two parts by the rough and wooded coulée through which it flows. To the west of this creek large clumps of poplar, spruce and tamarack from two to ten inches in diameter almost cover the country. To the east is rolling with scattered clumps of popular and willow bush. Farther to the east in ranges 25 and 24, the country becomes higher, and is covered with willow bush and poplar from two to twelve inches in diameter.

The soil is a light sandy loam with a clay and sand subsoil. The water in the creeks is good and pure, but in most of the sloughs and lakes alkaline. Good wild hay grows abundantly, especially along the valley slopes.

Settlement had not crossed the Saskatchewan, but settlers were scattered along the southern slope of the valley. They had grown wheat and oats in small quantities, and owned some few head of cattle. As far south as Big Gully creek which crosses the northeast corner of township 50, range 27, and the southwest corner of township 50, range 26, settlement is in an early stage. The settlers had apparently been in the country but a short time, houses and shelter for cattle were being built, pieces of land ploughed and small crops of grain harvested. Most of the settlers are English.

The country is hilly with scattered clumps of second growth poplar and willow brush. The small lakes and sloughs which are numerous are very often alkaline. The soil is a sandy loam with a clay subsoil.

Game consists principally of duck and prairie chicken. There are also some coyotes and muskrats. There was no indication of minerals.

Fuel can be obtained in small quantities from the scattered clumps of poplar. The larger poplar timber lies mostly along the banks of Saskatchewan river.

About November 1 the sloughs and small lakes began to freeze over and by the middle of the month the frost began to settle in the ground, so that by the end of the month the digging of pits became a slow and difficult part of the work. Consequently having received instructions to close the season's operations when these conditions came about, we stopped work on December 2, drove to Lloydminster and shipped the outfit to Edmonton where having made satisfactory arrangements with Mr. Angus McDonell, of Ray, Alberta, for wintering the outfit, I placed the same in his charge and left Edmonton for Ottawa, where I arrived on December 11.

I have the honour to be, sir,
Your obedient servant,

T. A. DAVIES, *D.L.S.*

APPENDIX No. 21.

REPORT OF W. J. DEANS, D.L.S.

SURVEYS IN SOUTHERN SASKATCHEWAN.

BRANDON, February 24, 1908.

E. DEVILLE, Esq., LL.D.,
Surveyor General,
Ottawa.

SIR,—I have the honour to submit the following report on my surveys in Saskatchewan during the season of 1907.

On May 12, I received your instructions directing me to make a retracement and restoration survey of township 21, range 1 west of the second meridian, and township 24, range 30, west of the principal meridian.

I also received instructions on the same date to sell a horse which had been left at Oak Point. I tried to dispose of the horse by corresponding with some parties, with whom I had some acquaintance, but failed. It was, therefore, necessary for me to visit Oak Point. I found the horse in a very poor condition, but after a great deal of effort I succeeded in selling him at what seemed to be a good price.

On my return to Brandon I expected that a letter containing the usual advance would be awaiting me, as the instructions stated that such would be mailed in a few days. It was June 8, when the advance reached the Bank of Montreal.

On June 12, I left Brandon for Saskatoon to take over an outfit which had been left at this place by Mr. W. R. Reilly. I found the light horses, which had been wintered by Mr. J. McNeil, in splendid condition, although the winter had been most severe and hay exceptionally scarce. It was a source of great pleasure to me to meet a man who had carried out his agreement in such a satisfactory manner. A large portion of the outfit which was stored with Mr. J. F. Cairns, Saskatoon, was destroyed by fire. It was consequently necessary for me to replace the parts required before leaving Saskatoon. This unforeseen occurrence delayed me two days.

On June 17, I obtained a car from the Canadian Northern Railway company and shipped the outfit to Canora at which place it arrived on June 21. Owing to the severity of the winter and the great snowfall, the roadbed of this railway was in a bad con-

dition in many places and derailments were quite frequent. I was much relieved when the car arrived containing the outfit and man without any serious mishap.

From Canora I went by road to Yorkton arriving there on June 22. My instructions were to organize the party at this place. I had not been in Yorkton since 1899, and my recollections associated it with a collection of shacks. I was surprised to find it a place of such size and importance and began to realize the possibilities of this western country. Two days were required to organize the party and get supplies so that it was not until June 25, that I got started for township 21, range 1, west of the second meridian, the scene of my first work.

The country between Yorkton and this township is well settled in places and contains many fine cultivated farms, and buildings equipped with all appliances for successfully carrying on farming operations. The houses contain conveniences which one would hardly expect to find in such a new country.

The original survey of township 21, was made in 1880 and many of the corners were marked with wooden posts and bearing trees which in most cases had disappeared and now that the township had become well settled it was necessary to retrace the lines and restore the monuments so that roads could be constructed and fences placed on the correct lines. Most of settlers signed the necessary petition enabling me to do this work and appeared pleased when it was completed.

The Polar Star Ranching company own a number of sections in this township and had quite a large force of men engaged in cleaning the land and placing it in a state fit for cultivation. The old settlers have waited long and patiently for a railroad and are elated over the prospects of their expectations being realized. The Canadian Pacific have surveyed a line which runs from Esterhazy to Bredenbury and passes through the centre of the township. It is thought that this line will be constructed at once. The Grand Trunk Pacific have also constructed their main line about two miles south of this township so that the settlers will have railway facilities which will enable them to market their produce to great advantage.

I completed the survey of township 21 on August 2, and next day started for Saltcoats. While in this vicinity I investigated a claim in reference to a lake located on the northeast quarter of section 11, township 24, range 2, west of the second meridian. I found that the lake was one the area of which should be deducted according to the provisions of the Manual of Survey and accordingly traversed it.

On August 6, I started for township 24, range 30, west of the prineipal meridiau, arriving at the northwest corner the same day. We erected our tents and made preparations to start to work next day. This township was subdivided in 1882 and in 1902 a restoration survey was made, the surveyors reporting serious errors in the original survey. My instructions were to correct these errors if possible, and retrace all lines. I found it impossible to make any corrections owing to the numerous complications, but retraced all the lines and restored the monuments. The plan of this township furnished me showed a lake having an area of about 160 acres, located on sections 25 and 26. I was much surprised to find that no such lake existed, the site being mostly high and dry prairie. There are quite a number of Galicians settled in the northwest corner of this township, where the most serious mistakes occur, but I found that Galicians were much like other nationalities, the desire to have the errors of survey corrected extending only to the man with the small homestead. The work was seriously retarded in this township by the extraordinary wet weather which prevailed throughout August. The want of railway is greatly felt by the settlers in this part.

I intended to go south after finishing my work in township 24 to carry out your instructions contained in a letter dated July 4, but a telegram received on August 29, stated that surveys were required of Doukhobor villages near Buchanan and that I was to communicate at onee with Michael White, Doukhobor interpreter. I telegraphed Mr. White that I would try to be at Buchanan on September 5, but owing to the wet weather and the impassable condition of the roads, I did not reach Buchanan until September 10, at which place I was further delayed two days so that it was

September 12, before I arrived at the Doukhobor village of New Gorilloe, in township 32, range 6, west of the second meridian. My instructions in reference to the survey of the Doukhobor villages stated that I was to be guided by information contained in a letter of the secretary of the Department, dated August 15, and the suggestions of Michael White, Doukhobor interpreter. The villages were to contain twenty acres and where not on sectional road allowances were to be connected by roads from the village site. I first surveyed the village of New Gorilloe, giving it an area of twenty acres including a road. I also surveyed a road one chan wide, starting from the northeast corner of section 5 and running easterly in a straight line to the northeast corner of section 4. Over this road the Doukhobors and public living to the west will be enabled to reach Buchanan by a short and good route.

My next work was to survey the village of Kyrillovo, situated on section 7, township 32, range 6, west of the second meridian. This village has an area of 20 acres, including a road connection.

I next surveyed the village of Moirayovo, situated on the west half of section 21, township 31, range 6, west of the second meridian. The village has an area of 20 acres. This village being near the centre of the section, it was necessary to give them an outlet, and accordingly I surveyed a road a chain wide, starting at the quarter-section post in the east boundary of section 20 and running easterly to Spirit creek, where I made a diversion in order to get the best and most economical site for a bridge. Shortly after crossing the creek the road again assumes its original course and connects with a road which I surveyed through the Doukhobor village of Resbehileovo, thence on to the meridian road allowance east of section 23. This road will allow the Doukhobors living to the west, south and east an outlet to Buchanan which can be travelled at any season of the year, made possible by the construction of a bridge across Spirit creek. The settlers and people of Buchanan greatly appreciate this road.

My next work was to survey the village of Ootishennie, situated on the southwest quarter of section 31, township 30, range 5, west of the second meridian. This village has an area of twenty acres and is situated near Patterson lake. On September 28, I started to survey the village of Kalmakova, situated on the southeast quarter of section 31, township 30, range 5, west of the second meridian. I surveyed a road southerly from this village to the sectional road to the south. The area of this village, including a road running through the centre, is twenty acres. I next surveyed the village of Old Gorilloe, situated on the northeast quarter of section 17, township 30, range 5, west of the second meridian. The area of this village, including roads, is twenty acres. The inhabitants of this place are all independent Doukhobors and are divided into two bitter factions so that Mr. Michael White and myself found it impossible to reconsile the dicordant elements. We accodingly laid out the village and roads in a way by which we considered all parties would be equally benefitted. There is a public school in this village. We surveyed two acres as a site for the school. The Doukhobors do not take advantage of the facilities offered to obtain an education, there being only one Doukhobor present on the two occasions when I visited the school.

On October 9, in company with Mr. Michael White, I left Buchanan for the Doukhobor village of Novoe. It was reported by the Doukhobors that the houses in this village were on the road allowance and on this account they wished a road diversion. I ran the east boundary of section 14 and found that the houses were not on the meridian road allowance, and that to divert the road as the Doukhobors wished would close up the only ford on Whitesand river for a considerable distance and would doubtless inconvenience the public who might have occasion to use this road. We therefore refused to make any diversion.

On Saturday, October 12, I arrived at the Doukhobor village of Pakrofka, situated on the northeast quarter of section 28, township 30, range 1, west of the second meridian. I surveyed this village, giving it an area of twenty acres, including two connecting roads. One of these roads is a chain wide and is taken off the southerly

part of the northeast quarter of section 28, township 30, range 1, west of the second meridian, and runs the whole width of the quarter section and in an easterly direction, connecting the village with the road allowance to the east; the other road is fifty links wide and runs from the road allowance north of section 28 southerly through the village.

While surveying the Doukhobor villages I noticed the supreme authority Peter Veregin had over the community and the use he made of his power. I know little about the religion or creed of the Doukhobors, but it appears to me that they do not observe very strictly that code of morality common to all Christian sects.

My work was greatly retarded by rain in September. I found Mr. White thoroughly conversant in all matters pertaining to the Doukhobors and deeply interested in all that concerned them. It was a great pleasure for me to be assisted by him in this work.

On October 16, I left Pakrofka for Frame lake, having received instructions in September to traverse that portion of the lake which extended into township 34, range 3, west of the second meridian. I arrived at the lake on October 19, and completed the traverse the same day. From Frame lake I started for Invermay by way of Buchanan to investigate the necessity of traversing two lakes situated in township 32, range 8, township 32, range 9, and township 33, range 9, west of the second meridian. I retraced some of the lines in townships 32 and 33, range 9, placing traverse points on the lake shore. I extended the east boundaries of sections 28 and 33 to Saline lake. I decided it would be better to wait until these lakes were frozen before attempting to traverse them, as there was a thick growth of poplar and a peculiar stone wall around the lake in many places.

On October 28, I started for Kamsack to retrace the boundaries of a parcel of land situated in the northeast corner of Coté Indian reserve No. 64, and to make a traverse of Whitesand river from the second meridian to its junction with the Assiniboine river, also to retrace the west boundary of Coté Indian reserve No. 64, and subdivide any unsubdivided land east of the reserve. I arrived at township 30, range 31, west of the principal meridian on November 2, and started to retrace the boundaries of a parcel of land referred to in your instructions as being in the northeast corner of the Coté Indian reserve, No. 64. I found that the subdivision within the reserve did not agree with the work which had been done previously to the east, there being a jog of nearly 10 chain in the roads running east and west. I traversed the easterly boundary of the reserve and found that there was a deflection to the west but not as much as that which appears on the township plan. I found a small piece of land east of the reserve which had not been subdivided. I extended the lines through this to the reserve. In township 29, range 31, west of the principal meridian I retraced the east boundaries of sections 33 and 28 and the north boundaries of sections 21 and 28 re-establishing the corners. I also retraced the south boundary of Coté Indian reserve, No. 64, and connected this with the subdivision to the south.

On November 16, I started to retrace the lines in township 30, range 32, which crossed Whitesand river, placing traverse points in the centre of the river. I completed the traverse of the Whitesand on November 29. On December 2, I with the party, took the train at Kamsack for Ivermay to traverse Saline and Stonewall lakes. I completed the survey of these lakes on December 7, and on the 9th returned to Kamsack where I found your instructions in reference to retracing the south boundary of Coté Indian reserve, No. 64, and connecting it with the subdivision to the south. I completed this last work on December 11, and on the 12th I paid off the party, stored the outfit and made arrangements to winter the horses. I arrived back in Brandon on December 14. Not having any assistant I thought it better for me to do the larger pieces of work as I found moving a large party slow and cumbersome, taking up too much of my time.

The weather in June, July, August and part of September was very wet making travel slow and unpleasant, also seriously interfering with the work.

The wheat crop throughout the part of Saskatchewan in which I was working turned out poor, but oats and barley did very well. I noticed a great deal of new breaking throughout the part in which I was engaged, the crop conditions not affecting adversely the spirits of the settlers.

I have the honour to be, sir,
Your obedient servant,

W. J. DEANS, *D.L.S.*

APPENDIX No. 22.

REPORT OF L. E. FONTAINE, D.L.S.

TRAVERSE OF MILK RIVER IN SOUTHERN ALBERTA.

LEVIS, QUE., March 23, 1908.

E. DEVILLE, Esq., LL.D.,
Surveyor General,
Ottawa.

SIR,—I have the honour to submit the following report of my field operations, during last season, on the course of Milk river, in southern Alberta, performed in accordance with your instructions dated April 10, and those of subsequent date relating to subdivision of part of township 4 range 6 west of the fourth meridian.

On receipt of your instructions, I proceeded to Ottawa, where I remained two days, in order to procure additional information for the carrying out of the survey operations during the summer, I then left for Edmonton, Alberta, where I arrived on April 29.

My object in going to that point was to forward south the outfit stored there during the previous winter, and to secure the services of my men of last year who would be willing to hire for a second season, and also, if possible, engage the full complement of labourers required, as I was well aware from past experience that I would not be able to engage the required number in the district where I was to operate. I was fully sucessful in this, and on May 3, I left for Calgary.

On May 6, the men arrived from Edmonton and on the 8th, they left for Lethbridge by way of the Calgary and Macleod trail, and on the 14th arrived at their destination. I had preceded them by train, and occupied the few days at my disposal completing the organization. On their arrival, everthing being in readiness, we proceeded on our journey to the international boundary by way of Cardston and Taylorville, and on May 27, camped on the southeast quarter of section 3, township 1, range 23, west of the fourth meridian.

For a few days following my arrival at the starting point, on account of the high winds and prevailing rains, I was obliged to postpone operations; eventually, conditions becoming favourable, the work was proceeded with and carried out successfully and uninterruptedly.

In order to act in accordance with your instructions and carry out effectively the two distinct survey operations called for therein, I proceeded to traverse the river, using the stadia method during two successive days, and on the third day, while a squad of men would be moving camp, I gave my attention to the line of levels.

This mode of procedure, in my estimation, was the only way that these two operations could be carried out simultaneously, without any loss of time, and the result achieved is an evident proof in this respect.

The course of the river meandering across ranges 5 to 23, was considered too great a distance in longitude to refer all bearings to the same meridian; therefore, the following division was made:—

1. From station 1 to station 322 all bearings are referred to the central meridian of range 23.

2. From station 322 to station 688, all bearings are referred to the central meridian of range 17.

3. From station 688 to station 919, all bearings are referred to the central meridian of range 11.

4. From station 919 to station 1101, all bearings are referred to the central meridian of range 7.

With reference to the line of levels, it may be noted that from the starting point, following the north branch of the river and proceeding easterly to the forks, a difference of six hundred and twenty feet in elevation was observed over a distance of sixty miles, or an average fall of a fraction over ten feet to the mile.

On the south branch from the forks in a southwesterly direction to the international boundary a difference of two hundred and ninety-six feet in a distance of twenty-five miles was observed, or an average fall of nearly twelve feet to the mile.

From the forks easterly to the international boundary in range 5, a fall of eight hundred and fifty-four feet in a distance of one hundred and fifty-five miles was noted, or a drop of five and a half feet to the mile.

The line of levels was carried on throughout the entire traverse, and at every half mile, when practicable, the elevation of the river bank above the water line was noted.

The elevation used at the starting point is that given for bench mark No. 53, mentioned in the report, 'Irrigation in the Northwest Territories of Canada, 1902,' by J. S. Dennis, Deputy Commissioner of Public Works.

Connection was also made with permanent bench marks Nos. 288 and 290, of the above-mentioned survey.

As requested, section iron posts marked T. H. (traverse hub) on one side, and B. M. (bench mark), with a crow's foot (⅄) on the other, were placed on all township outlines intersected by the survey, and the elevation of each will be found in the note books.

A permanent bench mark with a stone cairn was established on the north bank of the river in range 5, opposite the mouth of Kennedy creek. This was considered a more favourable place for establishing it than at the end of the traverse, as first intended. Owing to its proximity to a well known ford of the river and the location of Kennedy creek being known throughout this section, this bench mark can be easily identified.

The course of Milk river is in a well defined valley, bordered on each side by a range of hills, in which its sinuous course forms intermittent flats of more or less extent.

From the international boundary, in range 23, easterly to the east half of range 15, the elevation of the banks above the mean water level is not of a very great height and during heavy prevailing rains the flats in the section are in many places flooded, and the effects of erosion are everywhere evident. In the east half of range 15 and the west half of 14 the river runs through a series of canyons and small gorges.

From here to range 6 the stream meanders in a valley twice the size of that at the head waters. In range 6 and the greater portion of 5, the river flows through what is commonly known as the 'bad lands.' This, I may say, is not a very inviting spot, as it is an agglomeration of broken hills of various heights which bars access to the stream. In the remaining part of range 5 it resumes its normal course.

The south branch presents very nearly the same general topographical features, except that it carries a greater volume of water and has a swifter current.

Except in ranges 5 to 8, where a few poplar, cottonwood and willow are to be found on some of the benches, the remainder of this valley is absolutely void of timber. On the other hand, any quantity of building stone can be obtain d throughout almost its entire course.

* * * * * * * *

On the completion of the operations on Milk river, I attended, as requested, to the subdivision of part of township 4, range 6, west of the fourth meridian, and when this was carried out, I left for Calgary, where I discharged the party.

I have the honour to be, sir,
Your obedi nt servant,

LOUIS E. FONTAINE, *D.L.S.*

APPENDIX No. 23.

REPORT OF W. T. GREEN, D.L.S.

MISCELLANEOUS SURVEYS IN SOUTHERN ALBERTA.

OTTAWA, March 1, 1908

E. DEVILLE, Esq., LL.D.,
Surveyor General,
Ottawa.

SIR,—I have the honour to submit the following general report on my survey operations in southern Alberta during the season of 1907.

In accordance with your instructions of April 22, I left Ottawa for Calgary on April 29, and arrived there on May 3. All through the west the season was very late, and the settlers were anxiously awaiting the advent of warmer weather. Little or no seeding had been done up to this time and grave fears were being entertained as to the safety of the crop for 1907. I organized my party in Calgary, where I found that men were fairly plentiful. With the exception of cook, the positions on the party were easily filled. It was difficult to secure a good cook for the wages paid by the Department.

On May 9 I left with the party by train for Claresholm, a flourishing town on the Calgary and Edmonton extension of the Canadian Pacific railway. Like so many towns in the west, the growth of this place has been phenomenal. Four or five years ago there was nothing but the station house, a mere dot on the prairie, while to-day it is a thriving centre of industry with a population approaching the thousand mark. The country to the north and east which has so long been the undisputed territory of the ranchers is now being converted into farms. All around could be seen the smoke of the steam ploughs turning over the virgin soil. I understand that hundreds of these outfits have been brought into southern Alberta within the last year and as, under favourable circumstances, they can turn over twenty or thirty acres per day, one can readily see what a factor they are becoming in the development of the country. Fall wheat can be grown quite successfully in southern Alberta, and will, in a few years, I think, be an important asset to this portion of our great West.

On May 10 I hired a livery and with three of my party drove to Lyndon to the home of Mr. Erwin, with whom Mr. Hawkins stored his outfit when he closed operations the fall before. This drive proved to be particularly interesting and instructive.

leading as it did through the Canyon ranch and the 'Forty-four.' The latter with an area of about 17,000 acres is one of the largest ranches in this neighbourhood. On all sides were to be seen the ghastly relics of the most severe winter Alberta has experienced for over twenty years. Dotting the hillsides, in the ravines, lying in the creeks, and sometimes on the trail were seen the carcasses of last winter's victims.

I found the transport outfit in very fair condition, with the exception of the buckboard which would have lasted scarcely a month on our work. Accordingly I sold it to Mr. Erwin and purchased instead a 'democrat' from the agent of Gray's Carriage works, in Claresholm. I spent two days in Claresholm, having the horses shod, wagons and harness repaired and purchasing supplies.

On May 15 we moved to the northeast quarter of section 35, township 13, range 24, west of the fourth meridian. The country between Claresholm and Little Bow river is rapidly becoming settled and but little land available for settlement is vacant. Generally speaking the trails are good. The Blackfoot trail has been fenced up across many of the sections, but the road allowances are rapidly being graded into shape and before long will be as good as any in the west. The surface of this district is open and undulating, becoming more decidedly rolling as one approaches the Little Bow. Close to the river the soil is of a light sandy nature, becoming heavier farther back. Mr. A. C. Nash, for whom the survey was performed, has a comfortable home on the edge of the river. He is engaged entirely in ranching. High cut banks are to be found along the Little Bow with outcropping of rock in several places. No evidence of coal was found though there is a good coal mine within reasonable distance where the settlers obtain their fuel.

I completed the work in this township on May 21, and on the 22nd moved to Claresholm again. The afternoon was spent replenishing supplies and on the morning of the 23rd we left for our next work in township 13, range 1, west of the fifth meridian. There is a surveyed trail from Claresholm to Lyndon postoffice, a distance of about twenty-two miles. This road is good in dry weather, but in a rainy season becomes very heavy. There is a much shorter route across the Canyon ranch, but several steep hills make the road impracticable, except for a saddle horse or a light load. From Lyndon to Lyndon mill, a distance of seven or eight miles, the Lyndon Lumber company have graded a road for the convenience of settlers drawing lumber from their mill in section 11, township 13, range 30, west of the fourth meridian. This road like the one from Claresholm to Lyndon is very heavy in rainy weather, although excellent in a dry season. We reached Lyndon mill at noon on May 25, and as we could get no farther with wagons, we camped on Lyndon creek near the mill.

Lyndon mill has a capacity of 12,000 feet per day and supplies the settlers for miles around. They have been operating now for over two years and have enough timber in sight for two or three years without being compelled to move their mill. Lyndon creek is about eight or ten feet wide and two to three feet deep. Its water was unquestionably the choicest I found all season, clear as crystal and cold as ice.

The district is eminently a ranching country, though the settlers between the mill and Claresholm make some attempts at cultivation. Early frosts coupled with the hilly and broken nature of the country make agriculture to any great extent impossible.

On June 5, having completed the work in township 13, range 1, we started for township 14, range 1, and although our next camping place was distant only about eight miles in a straight line from Lyndon mill, we did not reach our destination until noon of June 6. In that time we travelled nearly twenty miles, making long detours around the higher hills and frequently doubling for miles over the smaller. We camped in section 30, township 14, range 1, on Willow creek, and from there with one or two flying camps I was able to complete the work in this vicinity.

This township can scarcely be equalled as a grazing and ranching country. A luxuriant growth of grass, a plentiful and permanent supply of water in Willow creek

and its numerous tributaries and plenty of open land for cutting hay, all help to make an ideal stockman's home. Much of the land in the northern and eastern portions would be suitable for grain growing if it were not for the danger of early frosts. In this connection a peculiar phenomenon was noted. Willows postoffice, situated in section 12, seems to be the line of demarcation for the ravages of the summer frosts. Below there, along Willow creek, vegetables and grain will mature well; above that point a crop is never sure. Several ranchers have quite large holdings—the McIntoshes, McDiarmid's and Riley and Thompson's being the largest stockholders. There is a fair road from Willows to Nanton, a thriving town on the Calgary and Edmonton extension of the Canadian Pacific railway. This trail crosses over a high hill in the northeast of township 14, range 1, and I believe the provincial government intend surveying a new road to circumvent this hill.

On July 26, we left for the forks of Highwood river in the southwest of township 18, range 1. With the exception of about four miles through Cochrane's ranch we found an excellent trail from the 'C.-C.' ranch in township 14, range 2, to the forks. On the way we passed through a portion of the 'Bar U' ranch, one of the largest in the whole of the west. Travelling north the country changed from the roughly rolling and hilly character of the Willow creek district to the gently rolling and open farming country along the Highwood. Some excellent crops were noticed. The country along the river is very picturesque, on the one side high almost cut banks with a growth of poplar and willow, on the other a gently undulating flat with just a fringe of trees along the edge. A bridge is badly needed here, as the river is a dangerous ford at low water and in high water is particularly dangerous. One of the settlers informed us on our arrival that there was an excellent ford, and trusting to his superior knowledge of the country, we attempted to cross with our loaded wagons. Suffice to say that we were thankful to get our horses and dunnage back safely, and were content to remain on the high side of the river.

After two days survey here, we left for our next work in township 20, range 4, west of the fifth meridian on July 30, going by way of High river and Okotoks, two prosperous towns on the railway. On August 3, we reached section 21, township 20, range 4, finding an excellent trail the entire distance of sixty-five miles. Like Willow creek district, this is a ranching country though there is less open country. Some excellent hay flats are to be found along Ware creek or as it is locally known Sinnot creek. I believe there is good timber in the west of this township, and it is expected that a mill will be operated there in the near future.

After completing the work here, we left for Calgary en route for Banff to perform certain surveys there pursuant to your instructions of July 25. We reached Calgary on August 15, and having secured a car, we loaded our outfit the same night. Owing to the irregularity of the train schedules at this time, we did not reach Banff until the morning of the 17th and we were forced to unload and move out to camp in a regular downpour of rain. This turned to snow during the night, and on the morning of the 20th, I received my first impressions of the mountains. So much has been written of the gorgeous splendour of the scenery here that anything I could say would seem of little value. But the grandeur of the view that met my gaze that morning will not soon be forgotten. Mt. Rundle, Sulphur mountain, Cascade mountain, Mt. Edith, the Vermilion and Sawback ranges and Tunnel mountain glistening in the sun with their new garments of snow, and rearing their lofty peaks until lost to view in the clouds above, made a memorable picture indeed.

The popularity of Banff as a summer resort is so widespread that the numerous hotels, both tourist and commercial, are taxed to their fullest capacity during the summer season. It is the centre from which so many expeditions, of a nature interesting to the mountain climbing enthusiast, can be made and is an ideal spot for such to enjoy their summer vacations. Cascade mountain and Mts. Edith and Rundle challenge

the more daring of the climbers, while Sulphur and Tunnel mountains provide an interesting climb for the less adventurous.

Too much credit cannot be given to the superintendent and officials of the Rocky Mountains park for their excellent work in making possible many of these expeditions.

Pack trails have been cut and blazed, roads which have not their equal in Canada have been graded along the valley of the Bow and everything possible is done to make the transient guest remember his stay in Banff as one of the bright spots in his travels. And yet much more could be done to enhance the natural beauty of the place. With the power right at hand, in the Bow River falls, the part of the valley known as 'The Loop' could be transformed into a veritable fairy land. As the editor of one of the western weeklies remarked, 'it could be made to rival the world-famed Coney Island.' At present there is little or no entertainment provided during the summer evenings for the hundreds of guests and tourists and this lack must be very noticeable to the large percentage of Americans among them.

The game regulations are rigidly enforced and the result is becoming noticeable, The park is a city of refuge for all kinds of game and this fact is doing much to preserve many of the animals peculiar to our Rocky mountains. A great many sheep and goats were seen on the Sawback range and they seemed but little afraid of man.

On September 2, having performed as much of the traverse of Bow river as was convenient from our camp in 'The Loop,' I moved to the 'Brewster Leasehold,' the resurvey of which occupied three weeks.

In the second week of September we had a heavy fall of snow lasting for three days and delaying the work considerably. One of my greatest difficulties while working in the vicinity of Banff was the procuring of hay for the horses. Even at twenty dollars per ton, only hay of the poorest variety imaginable could be secured, one bale at a time. Those who had any for sale were very independent and it needed a deal of persuasion and pleading to get them to part with any. Oats at two dollars per sack were somewhat prohibitive. All the hay is brought by train from Calgary though the park authorities manage to cure a little each year for the use of the buffalo through the winter. It is no uncommon sight to see men wading up to their knees around Vermilion lake, carrying out grass forkful after forkful to some high spot where it could dry.

The present holder of the Brewster lease has a large herd of dairy cows during the tourist season. Through the summer months he has upwards of fifty milch cows with which he supplies the larger hotels. In the fall he ships all but twelve or fifteen to some ranch farther east, wintering them there until the opening of the next season. With those he keeps he can provide for the winter population of Banff.

The survey of the Brewster leasehold proved particularly difficult and arduous. With the exception of the portions of the northwest limit of the old park, the work could have been accomplished much more easily and expeditiously in winter. Forty-mile creek, a rushing mountain stream, had to be forded again and again in the traverse of that portion of the boundary of the lease. One of the party more daring than the rest would manage to make the first crossing and then by means of a rope the rest could be steadied across to safety. It was with many misgivings, I watched the transitman make the trips across with the instrument on his back. One misstep and both might have been washed away. We would probably have managed to save the former but the loss of the latter would have tied up the survey for days.

However the work was completed and the entire boundary resurveyed with no very serious mishaps. The length and bearing of the easterly half of the northwest limit were obtained by traverse saving us at least some of what appeared to be almost impossible chaining.

On September 26, we moved camp to section 4, township 26, range 11, following the carriage road which the park authorities have put in such splendid shape. On our way we passed through the deserted village of Anthracite. Churches, hotels, stores and dwelling houses all bear testimony of the sometime presence of man. Good

coal was obtained here but after the mine was worked out the miners drifted away some to the new Pacific Coal company's holdings at Bankhead and others farther west. There is another mine at Anthracite which will probably be operated in the near future and the town will again become an inhabited centre.

From this camp we traversed Cascade river through township 25, range 11, and the left bank of Bow river as far as the east boundary of section 28. The want of a boat handicapped us very much in the traverse of Bow river. If it had not been for the railway bridges across the river I would have been compelled to purchase a punt or canoe. As it was we had many a long weary walk on account of being unable to cross the river.

On October 2, we moved camp to section 27, township 25, range 11, and from there completed our work in this vicinity. The traverse of both banks of Bow river through this township necessitated more or less cutting throughout the entire distance. The right bank, especially in the western part of the township, was heavily wooded with large spruce and jackpine down to the water's edge.

We completed the work on October 9, and on my return to camp that day I received your telegram instructing me to proceed at once to subdivide a portion of township 27, range 17, west of the fourth meridian. On the morning of the 10th we left by trail for Calgary. Considering the nature of the country through which it passes the road from Banff to Calgary is in splendid condition. If the portion between Canmore and Exshaw were properly fixed, it would equal any carriage road in Canada. From Calgary to the boundary of the Rocky Mountains park the provincial government graded and are still grading their share of the road, and the park authorities are to be credited for the excellent work they have done on their portion from there to Banff. In a few years this should make a very popular driveway whether for horse or motor carriage.

On the evening of the 10th we reached Exshaw, where we remained until the next day to have the horses shod. Exshaw is a new town and its chief industry, the cement works, was not yet in running shape. The immense factory with its gigantic frame of steel, gave promise, however, of a thriving business. It was estimated that employment would be given to fully three hundred and fifty men in the night and day shifts. The town is owned by the cement company, and it was refreshing to see a place where real estate offices did not crowd out everything else.

On the night of the 11th we reached Morley, the Indian agency. Here I tried to secure the services of two Indians for the remainder of the season, but the wages did not seem sufficiently good to tempt the better class.

From Morley we made the remainder of the distance to Calgary in a day and a half, reaching there at noon on Sunday. The entire journey was made in three days of actual travelling, a fact which speaks well for the character of the road. No more enjoyable drive could be taken in the west than that from Calgary to Banff.

I was detained in Calgary from October 13, to 22, awaiting instructions from the Department which, unfortunately, had gone astray in the mails. The most regrettable feature, however, was the loss of the splendid weather at this time.

On the morning of October 23, we left for township 22, range 4, west of the fifth meridian. On our way we passed through the Sarcee Indian reserve, about half of which is composed of some of the finest land around Calgary.

The surveyed trail from Calgary to Priddis is in splendid condition. West of there, the road is only fair and in several places in a wet season would be very bad. In one bog we broke the reach of one of our wagons, delaying us several hours. On the 24th we reached camp in section 35, township 22, range 4.

This township is more wooded than the Willow creek country, but is still well suited for ranching. Most of the valleys are open and while much of the land, upon which hay could be cut, is somewhat swampy, there is plenty sufficiently high and dry to provide winter fodder.

As yet there are only four settlers in the township and their holdings are comparatively small. An attempt has been made at agriculture, although not to any great extent. Last year the crops were entirely ruined by the early snow and frosts, and the oats could only be used as green feed. In time, however, I believe that farming will be carried on all through this district as the land becomes cleared and drained. There is quite a large amount of fair timber in the southern and western portions of the township, and plenty of standing fire-killed jackpine and poplar for fuel.

On November 4, we moved to section 18. The trail across the township is impassable in a wet season and even when we used it, was very soft in several places. The road ends at the northeast corner of section 18, and we made an attempt to open out a road into the next township west. We succeeded in reaching the southeast corner of section 18, but found that beyond that point wagons were useless. Fallen timber combined with the mountainous nature of the country to the west made pack horses the only practicable means of transport. Although we made an effort to do the work in township 22, range 5, I decided, after three days of heart-breaking walks, that this part of the work would have to be abandoned. As the season was so far advanced and as there were no settlers in the township, I did not think it advisable to incur the extra expense of purchasing a pack outfit.

Accordingly on November 11, we moved back to section 17 to complete the work in township 22, range 4, This was accomplished on the 13th, and on the 14th we moved to section 25 of the same township. The return trip across this trail was, if anything, worse than the first. The ice on Fish creek was from one-half to one inch thick, and wherever the trail led across we had to cut a way through. Mr. Cummings, who is homesteading the northwest quarter of section 24, having purchased the southwest quarter of section 25 from the Canadian Pacific railway, asked us to locate his corners for him before leaving the district. Accordingly we spent the 15th running the west half of the north boundary of section 24 and the east boundary of section 26, township 22, range 4. The lines were completely grown up, not a trace of cutting being visible. Evidently when the original survey had been made, there was either open country or small scrub, while now there is poplar up to six or eight inches in diameter. I found the mounds easily enough after cutting out the lines, much to the surprise of Mr. Cummings, who declared that no monuments had ever been erected. I renewed the mounds at the quarter section on the north boundary of 24, also the pits at the northeast of section 26.

On November 16, we left for section 35, township 22, range 2, where I had made arrangements for wintering the horses and storing the outfit. We reached there that evening. On the 18th I sent in to Calgary, a distance of some twelve miles for any mail or telegrams which might have arrived in regard to further work. I received none though I presume that your wire in reference to the traverse of Willow creek must have arrived just after my men had called. I might say, *en passant,* that this telegram reached me in February of 1908.

I decided not to delay the discharge of my party any longer and on the 19th I packed the outfit away and made out the articles of agreement with Mr. Stobo. As the horses and transport outfit were all in good condition for another year I presumed that it was not your intention to sell any part of them. Your letter of instructions which arrived later was in accord with what I had done.

On November 20, I discharged my party although I had to remain a day or two in Calgary making arrangements with the bank for the payment of the cheques. I found the Bank of Montreal very courteous and I had no difficulty in getting the party paid.

On November 22, I left Calgary arriving in Ottawa on the 29th.

I have the honour to be, sir,

Your obedient servant,

W. T. GREEN, *D.L.S.*

APPENDIX No. 24.

REPORT OF ERNEST W. HUBBELL, D.L.S.

RESURVEYS AND INSPECTION OF CONTRACTS IN THE PROVINCE OF SASKATCHEWAN.

OTTAWA, ONT., March 7, 1908.

E. DEVILLE, Esq., LL.D.,
Surveyor General,
Ottawa.

SIR,—I have the honour to submit the following general report of my survey operations in the province of Saskatchewan, during the past season.

In compliance with your letter of instructions dated April 10, 1907, I left for Winnipeg on April 23, arrived there on the 25th and remained over one day in order to inspect five thousand iron section posts, at the Manitoba Iron Works. Accompanied by Mr. Miles, D.L.S., I visited the said works and tested several iron bars, picked at random by driving them into partly frozen ground, the regulation depth. None were broken or defective. I then telegraphed you that the inspection was satisfactory. The next day I left for Moosejaw, my organizing station, and arrived there on the 28th, where I found my camp pitched and several of my men awaiting me, as previously arranged.

The following week we were engaged in overhauling and repairing the survey outfit, bringing in horses from their winter quarters, purchasing supplies, training chainmen and attending to the numerous essentials for the equipment of a survey party.

On May 4, we were ready to start, but owing to inclement weather, and as there was no grass for the horses, we decided to wait for a few days. On the 6th one of my horses was injured and although a veterinary surgeon was called at once and an operation performed, it was of no avail; the poor animal died in great agony. On the 7th we shipped 1,600 pounds of supplies by rail to Caron, distant eighteen miles, and the following morning left Moosejaw, making but ten miles as the trails were soft and muddy, besides a heavy snowstorm about two o'clock compelled us to pitch camp.

The next day we reached the initial point of our survey, section 6, township 17, range 29, west of the second meridian, and pitched camp, during a severe snowstorm. The whole country was covered with snow ten feet deep in the ravines and the weather like what we would expect in November.

We commenced our season's work by running the east boundary of section 6, township 17, range 29, and proceeded northward along the meridian between ranges 29 and 30, renewing obliterated corners and re-establishing lost ones. There being no township monument at the northeast corner of section 36, towship 17, range 30, the fact was reported to you, this monument was destroyed in the construction of the Canadian Pacific railway grade (now abandoned) and is not the only instance to my knowledge, where survey monuments have been destroyed in construction of railway grades.

It appears to me that some provision should be made by the engineer in charge of construction to perpetuate a mark showing the position of these monuments and not heedlessly ride roughshod over government land marks, which are essential to the settlers and others for establishing the boundaries of their homesteads or claims.

In the triangulation of Pelican lake, township 18, range 30, we found an error of 10 chains, this accounts for the excess in the quarter section adjoining the correction line.

After considerable trouble with some of the settlers, owners of these sections, I was able to procure in writing their consent to the rectification of the erroneous monuments, thus adjusting a longstanding dispute and giving to each settler his theoretical area. The excessive width of 1½ chains existing on the correction line between townships 18 and 19, range 29, I am afraid, cannot be adjusted without many complications and much expense, as the settlers all have accepted the original monuments and built their houses and fences accordingly, nor do I anticipate further complaints, all now appearing satisfied with the existing state of affairs. I therefore, recommend that the department take no further action in this matter.

We now proceeded to survey a meridian through townships 19, 20, 21 and 22, in range 29, which had been omitted in the original survey of these townships some twenty years ago.

The survey of this line did not meet with the approval of all the settlers concerned, many being under the impression that the strip of land eight chains wide, was part of the sections they had bought or homesteaded. On May 24, we arrived at Craik. The weather up to this time had been cold and raw with considerable frost in the ground. The country passed over is all prairie, fairly level, soil generally sandy loam, and worth from eight to fifteen dollars per acre. A fair portion is under cultivation and many new arrivals were employed building houses, fences and tilling the soil. Firewood and coal is procured at Caron and Mortlach, two small but thriving towns on the main line of he Canadian Pacific railway. The price of lumber varies from twenty-five to thirty-five dollars per thousand.

The Canadian Pacific railway is extending a branch line from Moosejaw to The Elbow on the south branch of the Saskatchewan river, graders were hard at work on this extension and a townsite was being surveyed in township 20. This railway will be of great advantage to the settlers in this district, who find it a rather long distance to the towns previously mentioned. I understand that this line is now in operation.

We next proceeded to township 25, range 25, and traversed an arm of Last Mountain lake, which passes through sections 25 and 36 and had been omitted in the original survey. My next work consisted of the retracement of section lines and eight miles of traverse of the west shore of Last Mountain lake in township 27, range 24, which was finished on May 31.

The weather continued cold and raw and the ice on this large body of water remained unbroken, something unprecedented. However, the frost was out of the ground and most of the settlers in this vicinity had completed their ploughing and seeding.

I now proceeded to township 35, range 1, west of the third meridian, to make a resurvey of the township, which, upon examination, was found to have been carelessly surveyed. There were no iron posts, and the few wooden ones found were almost rotted away. The positions of the survey monuments, more especially the quarter section corners, were most irregular; however, the greatest error was on the east boundaries of sections 3, 10, 15 and 22. The remainder, after considerable trouble were rectified, apparently to the satisfaction of most of the settlers. My experience in resurveys taught me that it is impossible to satisfy all the occupants or owners of land, someone is bound to raise an objection on principle, notwithstanding the fact that in some cases they gain considerable acreage and have their boundaries made straight. The Canadian Pacific railway has a line across this township, and the townsite of Elstar is surveyed and comprises portions of sections 3 and 10. I traversed a lake of about eighty acres in section 23, which had been omitted in the original survey. A detailed report of the resurvey of this township was sent you on June 17. The country in this vicinity and for miles around is prairie, surface level to rolling, soil generally

sandy loam, suitable for the production of wheat, oats, barley, flax and vegetables, in fact some of the finest crops in Saskatchewan are raised here, and land is worth from twenty or thirty dollars per acre. Plenty of good water of a permanent nature is obtained from the many large lakes. A limited amount of firewood is procured from around Manitou lake, distant twenty miles, a supply which before very long will be closed to the settlers, as this timbered land is very rapidly homesteaded. It would be of inestimable value to the settler could a tract be reserved as a fuel supply. Grain and other farm produce is taken to Saskatoon, twenty to thirty-six miles distant.

Our next work was in the vicinity of Prince Albert (St. Louis settlement), distant by trail one hundred and thirty miles, where we arrived on July 3. During this trip we passed over a beautiful stretch of agricultural country, in fact the most productive of that great wheat-growing province of Saskatchewan.

It is superfluous to dwell on the resources of this well known portion of our great West, suffice it to say, that there are few, if any, vacant homesteads. Land varies from eight to twenty-five dollars per acre. The wooded country commences about township 42, extending northwards. On July 4, we commenced the resurvey of township 46, range 25, west of the second meridian and finished the same on the 12th. This fractional township comprised of river lots is all settled with considerable land under cultivation.

The surface is fairly level and mostly covered with small poplar and willow, the soil generally being sandy loam. Very few of the original posts were found and great confusion existed among the settlers as to the boundaries of their claims. A surveyed trail runs through this township which was tied to our work when practicable. A lake of about seventy acres not shown on the original plan, in lots 14, 13, 12 and 11 was traversed upon request of several of the settlers. Whilst at work in this township and vicinity, we were troubled very much with flies, commonly known as 'bulldogs.' They are most vicious in their attacks upon animals, but fortunately disperse when the sun goes down and are not 'in evidence' during wet or damp weather.

My next work was the resurvey of township 44, range 22, where we arrived on July 17. A great portion of the township is muskeg or swamp, and with the exception of a few open spaces, all covered with timber, principally poplar and willow, the former averaging six inches in diameter. There are few settlers in this township ,it being too wet for cultivation. Not many of the original wooden posts were found, and these were far from their correct positions

A surveyed trail across this township was connected with the new monuments of survey. Owing to the immense areas of impassable muskegs and swamps, it was impossible to survey all the section lines, although several attempts were made, the remainder if necessary will have to be done late in the fall or winter when everything is frozen over.

Whilst engaged in the survey of this township the mosquitoes were almost unbearable. Only once before have I experienced such a siege. Most of the time the weather was dull, cloudy and very hot, this combined with the wet surface of the country produced an unequalled climate for the propagation of mosquitoes. It was only by perpetual smudges that temporary relief was obtained for man and beast. For the information of the uninitiated and especially those who picture camp life as all sunshine, a few days spent in our camp at this particular time would effectively disabuse their minds as to the many pleasures one has on a survey.

According to your instructions of July 13, we returned to Saskatoon in order to effect, if possible, adjustments of certain disputes, between several settlers in townships 32 and 34 ranges 1 and 2, west of the third meridian and recently resurveyed. After ten days continuous travel we reached our objective point and proceeded at once to investigate the various claims or grievances of the disaffected settlers, in which we were partially successful. A detailed report of proceedings on this occasion was forwarded you August 14.

My next work was the resurvey of township 49, range 26, where we arrived on August 23, after six days of continuous travel, during which we averaged twenty-four miles a day. The country passed over has already been reported on and I can only add that at this season of the year, the crops were at their best and looking remarkably well, but owing to the exceptionally late spring, all crops were two or three weeks later than usual.

Township 49, range 26, is heavily timbered, principally with jackpine, spruce and some clumps of poplar, from which all the mercantile timber has been taken. About ninety per cent of the soil is sand totally unfit for cultivation. Except a few half-breeds, who have shacks along the river, there is but one settler, the owner of a tannery and manager of the ferry at the crossing. The traffic across the river at this point is something wonderful, no matter the hour of the day, teams are always on the ferry, the rate charged is five cents per team.

Considerable sand and firewood is hauled from this township to Prince Albert. Little Red river meanders through this township and averages about one chain in width and from four to eight feet in depth, has a current varying from four to six miles per hour and is spanned by a fine iron bridge in section 14. Great quantities of sawlogs are brought down this stream by the Prince Albert Lumber company.

A timber reserve comprising nine sections in the southwest corner of the township, I understand, is to be abandoned and thrown open for settlement. Owing to want of time all the section lines were not retraced.

On September 7, we moved camp to section 23, township 50, range 25, and from here I re-inspected township 50, ranges 24 and 25, according to your letter of instructions. Owing to unprecedented weather conditions, we had great difficulty in taking a flying camp into township 50, range 24. Practically all this portion of the country, except the sand ridges was under water, even where mounds had been built last year. We had great difficulty in getting part of our outfit across Garden river owing to the unusual depth of water, and the bad muskeg approaches, in so doing, three of our horses were nearly drowned. We next proceeded to Kinistino, about seventy-five miles distant, a prosperous town of three hundred inhabitants, on the Canadian Northern railway, and made some corrections and resurveys in townships 46, ranges 21 and 22. Township 46, range 22 is nearly all covered with small bush. Owing to the fact that there are no survey monuments to be found, a resurvey is being petitioned for by the settlers.

Our next work was the resurvey of township 46, range 23, which was commenced on October 3, and finished on the 26th. This township is partly covered with poplar and willow. The surface is undulating to rolling and the soil generally first class. A surveyed trail to Prince Albert, closed in places, by some of the settlers, runs across this township. It was tied to several of the new monuments. The Canadian Northern railway is constructed across the northern part of the township and the station of Brancepeth is situated in section 20. All the homesteads are taken and considerable land is under cultivation. There are several rather large lakes, one of which we traversed upon request of the occupant of section 10.

Great quantities of grain and vegetables are grown in this township and vicinity. In accordance with your telegraphic instructions, dated October 8 I proceeded to Saskatoon on the 19th.

On November 4, I started on my tour of inspection of survey contracts. From Prince Albert we travelled to Carlton where we crossed Saskatchewan river on a ferry, thence along a well beaten trail to township 47, range 11, west of the third meridian. We now commenced the inspection of certain survey contracts north of Battleford

On November 26, we left Battleford and proceeded to Shellbrook, inspecting a contract in that vicinity. From here we went to Prince Albert where we arrived December 15, in the midst of our first real heavy snowstorm.

My next and last work of the season was the inspection of a contract north of Prince Albert in the vicinity of Egg lake.

The survey work of contractors now required by the Department is of such precision that contract surveys of to-day must be unusually well done and the rigid inspection upon completion of a contract has a strong influence upon the work, it being the exception now for a contract or portion to be condemned.

During the period of field operations, in which I was engaged last season, extending from May 4, to January 8, we made ninety-two camps and travelled by trail alone eighteen hundred miles (as far as Moosejaw is from Ottawa.) This does not include the everyday use of horses on the usual survey work, nor the freighting of supplies and firewood from various points, which frequently involved on one trip alone a journey of seventy to one hundred miles.

This proves conclusively the necessity of having good horses on a survey outfit having unusually long journeys, and in order to keep them in condition for these long trips plenty of oats must be at hand.

In the performance of my allotments of work extending over a large area of northern Saskatchewan I had ample opportunity to gather knowledge of the resources of this country.

Settlement is progressing even more rapidly than was anticipated. In every direction the land is being cultivated and the ever increasing magnificent fields of grain are sufficient guarantee and advertisement of the prosperity of this fast growing country, which as yet is in its infancy.

Last season was exceptionally backward; it was not until June 10, that the buds began to sprout, and the ice was in the larger bodies of water until June 1. The summer was wet, cold and raw; in fact, in places a slight frost was apparent every month, consequently the crops were from two to three weeks later in maturing; however, as compensation, the months of October and November were all that could be desired and the weather perfect. On November 11, most of the smaller lakes were sufficiently frozen to walk on.

Railways are gradually extending through this vast country, greatly facilitating transportation, and many iron railway and traffic bridges have been constructed over the larger rivers. Good trails extend in every direction, even in the partially settled districts, and it is an easy matter now for the settler or land seeker to travel in any desired direction.

Game of the feathered variety is to be had in great quantities, in fact in certain localities the supply appears inexhaustible. Rabbits are very scarce; it would appear as if every few years they disappear almost entirely.

Wolves were numerous and bold, so much so that they would in daylight enter a corral to kill and carry away sheep. North of Prince Albert moose and other deer were quite plentiful, and we came across many of their yards. It might be well to record here that we found some recently constructed mounds trampled flat by these animals.

The price of a team of good horses varies from three hundred dollars to three hundred and fifty dollars, oxen about one hundred dollars per yoke, and cows from forty dollars to fifty dollars each.

Farm produce commands a high price, potatoes when procurable one dollar per bag, new potatoes seventy-five cents to eighty cents per bushel, butter thirty cents to forty cents per pound, milk seven to ten cents per quart, eggs twenty cents to thirty-five cents per dozen. Of course, these prices vary during different periods of the year. Great progress is perceptible in all towns and villages. There are many handsome buildings and industries, as well as a number of splendid schools throughout the province.

The country in which new surveys are being projected north of Saskatchewan river is covered for the greater part by bush, principally poplar, spruce and jackpine, suitable for building purposes and fencing, but not in sufficient or paying quantities for lumbering.

The soil is generally sandy loam suitable for the production of wheat, oats, flax and vegetables.

Numerous streams and lakes afford a permanent supply of excellent water.

We did not perceive any indication of minerals of economic value, stone quarries, coal or lignite veins, although it is the prevailing opinion that there exist vast quantities of coal, as yet undiscovered. In the province of Saskatchewan north of Saskatchewan river the only town of any importance or having railway connection is North Battleford, which has a population of three hundred, and numerous fine buildings, with good hotel accommodation. The Dominion Government has a combined land and immigration office here.

North and east of Battleford there are numbers of vacant homesteads, which offer to the new settler unequalled advantages, and it may be worthy of note that the climate in this northern latitude is unsurpassed, in my opinion superior in every way to that of two hundred miles farther south. Large quantities of whitefish and other varieties are obtained from many of the larger lakes.

Good trails extend in every direction except north of Prince Albert, where it is still unsettled. However, as the Canadian Northern are extending their railway into this country and are now at work constructing an iron railway and traffic bridge across the Saskatchewan at Prince Albert it is only a matter of a short time before this portion of our great country will be the objective point for the new settler. In conclusion, I wish to record my appreciation of the services rendered by my assistant, Mr. Earle M. Dennis.

I have the honour to be, sir,
Your obedient servant,

E. W. HUBBELL, D.L.S.

APPENDIX No. 25.

REPORT OF A. W. JOHNSON, D.L.S.

SURVEYS IN THE WESTERN PORTION OF THE RAILWAY BELT.

KAMLOOPS, B. C., February 8, 1908.

E. DEVILLE, ESQ. LL.D.,
Surveyor General,
Ottawa.

SIR,—I began the season's work at Agassiz on February 15, by resurveying lots 536 and 39, group 1, and the adjacent land.

As usual many of the original posts were missing, and I had to reconstruct these lots from what data was to be found on the ground.

There is good hill land in section 6, township 4, range 28, west of the sixth meridian and in the section immediately south of that, which, though on a hill, is very easily cleared, there being only a comparatively recent growth of alder and birch. We were so much hampered by three feet of compact snow that I ordered snowshoes for the party. There is no prettier place on the Canadian Pacific railway than the Agassiz valley, with its soft, moist climate. Fruit, hay and hops grow very well and the last named is being cultivated to a large extent. To a northwest farmer, who wants a softer climate and a beautiful home this land should appeal.

I had received instructions to survey some dyking lands on Pitt meadows as soon as possible, and judging that the snow would have gone I moved to Sturgeon slough

on March 5, in township 40, east of the coast meridian. The whole of the undyked part of Pitt meadows is a swamp, cut up by many sloughs. I got rubber boots for the men, otherwise it would have been killing work breaking through ice and wading in cold water up to your middle for weeks. This swamp was evidently at one time part of Pitt lake, and the sloughs which cut it up are affected by the tide as is the lake itself. We had more luck finding old posts than I expected, and I have no doubt that the survey we made very nearly coincides with the original. In some cases we put long cedar posts as well as iron ones to mark corners, for the latter were sometimes below the water at high-tide. There is undoubtedly splendid land on these meadows.

The main difficulty in dyking here is, I should judge, to keep the water from seeping under the dyke. As to whether it is feasible from a business point of view I am not expert enough to give an opinion. There is someone intending to do this particular piece of work and he is probably not doing it for fun. The lake is so shallow at the south end that if dyking turns out a success I believe it can be extended in to the lake itself. As you paddle up, even in the middle, you can touch bottom with your paddle for two miles.

We were troubled a great deal by wet weather at the end of March and the beginning of April. For two weeks it hardly ever stopped raining and we were thankful not to be in the bush.

In the middle of April I went on with the traverse of Pitt lake itself. The west shore is very precipitous, the rock dropping into the water in perpendicular bluffs in many places and giving us endless trouble with the chaining and especially when planting posts at section corners or witness posts. It was not an uncommon thing to spend three hours getting a correct measurement to a point where a post could stand without the men being in imminent danger of falling off. When men are thinking more of their foothold and the rocks a hundred feet below, than of the stones they are painfully picking out of the cliff for a mound the work is not done quickly. And the fact that the chief is wondering whether the transit, already much battered, will slip over that particular edge or not, does not help matters out.

While this traverse and others on the meadows were being cut I ran a triangulation up to the head of the lake from a base on the long tangent on the Canadian Pacific railway, immediately east of Pitt river bridge. This was done with considerable accuracy, though I was bothered by funny trippers from Vancouver throwing away the large red and white signals that were conspicuous on rocks close to the water. At any rate I have no doubt that the section corners laid out around the lake and the belt limit are much more accurately placed than would have been the case had the work been carried up from the south end of Pitt meadows by traverse.

There is one way on the west side at the mouth of the small valley that offers a splendid landing for picnic parties and there is good timber up that valley.

In township 6, on the west shore are some benches with good timber which are being worked and on the east shore in the same township are similar benches, also being worked. The east shore is generally not so rough as the west, though there are two or three inaccessible cliffs that I had to climb around or work across by triangulation.

Other work was pressing so I did not traverse much more than half the lake, but went on to the north end, laid out my second base, and ran a mile or two of the actual belt limit on both sides of the water, so that timber cruisers would have no difficulty in finding it.

The mountains around the lake are not particularly high as mountains go in British Columbia, not more than five or six thousand feet, but they are very precipitous, one bare precipice piled on another as far as you can see. But at every creek mouth and on benches at other places there is good timber and a large number of logs have already been taken out to New Westminster.

On my way to Keefers in the upper country I did two days' work at the quarry on Pitt river about which there is some dispute, and on May 27, began work at Keefers. Here I laid out as accurate a base as I could with the appliances I had, on the Canadian Pacific railway track and connected this with the nearest section corner. While I was doing this my picketman was putting up signals on both sides of the Fraser, for it was impracticable to get out of the canyon without crossing the river. Then as soon as I began to read angles I sent this man with a small party up the Nahatlatch river to plant signals on convenient peaks and to put his last two as nearly twenty miles back from the railway as he could.

It is all to his credit, and saved me much time that the actual railway belt passed about midway between his last stations which I made my second base. A surveyor will appreciate a feat of this sort. He had to canoe and pack on his back through forest without the vestige of a trail and pick out his peaks as he could catch glimpses of them through the trees or from the water and it is no exaggeration to say that had he been a couple of miles out it would have meant four or five days' extra work.

The weather went to pieces in June just as I began reading angles and on 'Two Squares' mountain I was held for ten days without a tent and with very little food, waiting on timber line for the clouds to lift. Every day we climbed the two hundred feet between camp and the signal and shivered around a poor fire in a gale of wind as the snow fell. After this however I luckily got all my other angles without difficulty, and was glad to make a close tie on my second base. Nahatlatch valley has very little if any agricultural land, but there is timber in small quantities, east of the lake and on the lake itself. West of the lake the valley is wider, up to nearly a mile, but though there is timber there, it is not in large quantities nor of good quality. From the lake to the Fraser the river is just a roaring rapid, large enough at the lowest water to develop tremendous power, for the drop is several hundred feet. The lake is not one sheet of water, but three, joined together by strips of quiet river and very beautiful. I expect that some day there will be a flourishing summer hotel on its shores and some enterprising man will build pack trails up to the basin on mount Whiskepig where one of the finest falls I have ever seen takes its rise.

These valleys on the edge of the timber must be seen to be fully appreciated and in spite of the punishment they get climbing through dense huckleberry or young balsam and windfall, there are few men, however unromantic, who do not forget their troubles when camp is pitched in the park country under the ice.

After tying on to my second base I ran the belt down to Mt. Douglas near Harrison lake where I had planted a post in 1903. This was not more than fifteen miles in a straight line from the Nahatlatch, but it was not advisable to spend weeks making a horse-trail and we carried everything on our backs. To those who have packed steadily for a month over high mountains any description is superfluous and to those who have not, no words of mine could make them realize what it is like. I believe some of the men had a change of socks, but there was little other changing done, in most cases none at all, and one man left because I would not let him carry as many blankets as he wanted. The line zigzagged over mount Whiskepig and finally ran straight for six miles to Mt. Douglas crossing three deep canyons on the way. As soon as we had packed with great tribulation up one three thousand foot precipice we found a three thousand foot hole beckoning us insistently. But at last in a thunderstorm under the ice of Mt. Douglas glaciers, a thunderstorm so strenuous that we fled into the snow and threw away anything that had iron on it, we tied on.

There is good timber on Silver creek which rises near Mt. Whiskepig, and keeps a distance of from one to three miles east of the belt along its entire course to Harrison lake; and though this creek is very rough and has two or three big falls, the timber will no doubt be taken out before long. It is all in the belt.

I did not post every section corner of this last six miles. Putting lines up those precipices is very slow work even when it is possible and it was not by any means al-

ways so in this case Putting posts in on a very steep slope of rock is slower work still. So I put witness iron posts and also large wooden ones on the ridges and by the sides of streams in the canyons. As it is not likely that anybody but timber cruisers and prospectors, except surveyors furnished with the necessary data, will want to find the belt here, the above method will be sufficient, for prospectors will travel on the ridges, and cruisers in the valleys.

There is the usual wilderness of peaks with glaciers here here and there. Mt. Whiskepig is about seven thousand feet high, but the Snowy Group to the west and southwest is higher.

On my way back I ran the belt across the Nahatlatch valley. At the western end of this valley adjoining the belt, the land is very low and swampy. There are three hay swamps which are solid enough to carry a horse and were the saving of our train, but they would not grow crops because both in the summer when the snowwater comes, and more particularly in a winter rainstorm, they are flooded.

When I had posted the belt in the Nahatlatch valley I put most of my men to work making a pack trail up Bear creek, which is just outside the belt, while with three men I went north to Mt. Kythe to see what could be done about getting horses through. I found an unbroken range of high mountains, the lowest pass filled with glaciers, and I determined that should it be found impracticable to take horses over this ice that I would send them around by a hunting trail above Lytton, that I had used the previous winter on a trip partly for hunting and partly to find out the best way to get horses into the belt in that part of the country. I took care to impress on the men with me exactly which of the distant mountains were approximately on the belt and then came back to camp after a rough trip indeed. I gave instructions to push the trail to the foot of the ice and to try to get the horses over; but this proved hopeless so they built a cache and left a lot of food and other things there.

Meanwhile I had taken a few men down to Chilliwak and did some work in township 2, range 29, west of the sixth meridian. This finished, I met the mountain party at Keefers and paid everybody off. This was on August 24. Next morning I started seven men off with the train and told them to go up the trail mentioned above and cut a pack trail clear through Mt. Kythe on the north side of the range. This was done sucessfully and I now have a trail ready along the whole length of the unsurveyed belt from the Nahatlatch to the Fraser. The party came in for the winter on October 15.

I have the honour to be, sir,
Your obedient servant,

ALFRED W. JOHNSON, *D.L.S.*

APPENDIX No. 26.

REPORT OF G. J. LONERGAN, D.L.S.

INSPECTOR OF CONTRACTS AND MISCELLANEOUS SURVEYS IN CENTRAL ALBERTA.

BUCKINGHAM, QUE., Mar. 16, 1908.

E. DEVILLE, ESQ., LL.D.,
Surveyor General,
Ottawa.

SIR,—I beg to submit the following report of my surveying operations for the season of 1907. I left Buckingham on April 15, and on my arrival at Edmonton, where I had my outfit of the previous season to meet me, I engaged a few men,

bought a small quantity of supplies and started for township 51, range 21, where I had to complete the subdivision of the township. It consisted of a few miles of section line and a traverse of part of Cooking and Sisba lakes. The soil in this vicinity is a few inches of black loam with a clay subsoil and is more suitable for ranching, as great quantities of hay can be cut along the lakes and marshes. Cooking lake is very largely patronized by the Edmonton people, as a summer resort, and they have a number of tasty cottages on the south side of the lake. The wild rice in the bays is the natural feeding ground for ducks, geese and swans, and the lake is well stocked with fish. Having completed this work I returned to Edmonton and made preparations for a trip to Lac la Biche to inspect Mr. Rinfret's contract. At Fort Saskatchewan a heavy fall of snow prevented us from moving for a few days. After the storm we continued our journey by way of Star, Wostok, Andrew, crossing Saskatchewan river at Desjarlais, then to Sacred Heart and Saddle Lake. From Bruderheim to Desjarlais is settled almost entirely by Galicians. They appear prosperous as they each have a few cattle, a team of horses, and the necessary farming implements. However, I regret to say that I was told on reliable authority that a number of them had mortgaged their farms and invested the proceeds in town lots. From Saddle Lake north the trail winds around ponds and sloughs and undoubtedly was laid out by Indians. The country is very rolling and is covered with poplar and willow scrub and a few scattered spruce. The soil generally is a few inches of black loam with a clay subsoil. All along Lac la Biche and Beaver lake are located the Indian and half-breed settlers of the district. At Lac la Biche mission, which is one of the oldest in the west, is the Hudson's Bay company's trading post.

Having inspected the part completed of Mr. Rinfret's contract I moved southeasterly to Mr. M. W. Hopkins' work, examining townships 63, ranges 11 and 12 and on my arrival at Saddle Lake I received your instructions to make a few correction surveys both north and south of the Indian reservation. This I did and then moved to townships 59 and 60, ranges 1, 2, 3, 4, 5 and 6. I found the contractor at work and five townships surveyed; these I inspected and returned to Edmonton. While at Moose lake I saw a number of settlers and was told there were about thirty squatted on unsurveyed land and a few of them on the Indian hay reserve. This information I communicated to you and noticed that on my second trip you had given instructions to have it surveyed. From Moose lake to Coal lake and for about twenty miles south of Coal lake I consider the best unsettled part of Alberta. I might state that I have worked six years in the northern part of the province and never more than six weeks in the same place and therefore there is very little left of the district that I have not been over. The soil is from six to twenty inches of black loam with a clay subsoil with good water and enough prairie that a settler can get a start on, and an abundance of hay to be cut on either the highlands or sloughs. On my arrival at Edmonton I received orders to repost two other townships (51, ranges 25 and 26). When about half through this work I received your instructions for the inspection of several other contracts. It being then August 6, I made a timetable and after due allowance for bad weather to drive 1,260 miles, inspect seventy-one townships and to make two other traverse surveys, I found that in order to do the work this season it was necessary to start at once. This I did and am pleased to state that I arrived at Edmonton four days late of schedule time on four and a half months' work.

I found I could get from Edmonton to Mr. Magrath's contract, townships 7 and 8, ranges 12 and 13, with horses quicker than by train, consequently I drove. It was difficult to realize the changes in my old territory, southern Alberta, that I had left six years ago. What used to be a post office and country store on the corner of a crossroad had developed into a town of, in many places, a few thousand people, with well graded streets and good substantial buildings, and the older towns have spread themselves out on the prairie to such an extent that it was almost impossible to conceive that it was the same place that I left a few years ago. Often our old camping

ground that was from a quarter to half a mile from town is now the residential part of the city. But it is the 'West' where people move and move quickly.

The irrigated crops are wonderful, firstly their productiveness and secondly the perfect control that farmers have over them. The principal reasons why the grains were frozen in the northern part of the province was that in the wet season the grain kept growing and did not ripen, while in the irrigated districts they have no rain and if a farmer wants his crops to ripen all he has to do is to close his head-gate or cut off his water supply and ripening commences, and at cutting time the ground is dry and the working of machinery is much easier. Having inspected Mr. Magrath's contract I moved northwesterly, passing through Taber, a new coal mining town. I did not have time to visit the mine but the geological features of the country are the same as at Lethbridge and undoubtedly it is the same seam they are working as the Lethbridge people. I crossed Belly river a few miles north of the town and then struck across the prairie about sixty miles, I came to the home ranch of the Circle outfit, and from there we had a trail to the Blackfoot Indian crossing of Bow river and to Gleichen, thence to McBeth's crossing on Red Deer river in township 27, range 17, west of the fourth meridian. This is about the centre of the south end of Messrs. Edwards', Fairchild's and Cautley's contracts. The country is very rolling except that part around the south end of Sullivan lake. Cattle ranchers say it is too rough a country for farming but on closer inspection I do not hesitate to say that at least sixty per cent is suitable for farming. The hills are long and gradual and not too abrupt to successfully and conveniently work farming machinery, except however, the centre of the west part of Mr. Cautley's work, which is extremely rolling. It consists of small round hills fifteen to forty feet high and from one hundred to two hundred yards apart. I never saw such a rolling country, in fact I did not attempt to drive across but went about fifteen miles around it. Having completed the inspection of these three contracts I moved straight north to Vegreville, passing about fifty miles east of the Calgary and Edmonton railway. All the land along this route is taken up but it has been homesteaded within the last few years and therefore farming is not advanced to any great extent. A young man wanting to pick up a homestead in a promising district would do well to go there and work out with other farmers and watch for abandoned claims. Often men make entry on land intending to farm and for various reasons, such as not having sufficient capital or getting homesick, they leave their quarter section and never return to it. Their entry can be cancelled and a new entry made. From Vegreville I moved northeasterly crossing Saskatchewan river at Brousseau thence to St. Paul de Metis, and from there to Mr. Hopkins' contract. I found the contractor still at work. I inspected the surveyed part and then moved to Mr. Rinfret's work at Lac la Biche, which I found had been completed during the summer. My next inspection was at Athabaska Landing where I had two contracts. From Lac la Biche to the Landing is forty-eight miles by straight line or a little over three hundred to go by way of Saddle lake and Fort Saskatchewan. Upon inquiry I found that the Indians have a wagon trail on the short route and on further inquiry was told that only one wagon had been over it. I therefore engaged an Indian guide and started, arriving at Mr. Cote's contract on the third day, seventeen miles east of the Landing. There is no doubt that it is the worst trail in Alberta and during warm weather it would be utterly impossible to make use of it. After inspecting Mr. Cote's contract I went to Mr. McGrandle's work which was about twenty miles west of the Landing.

The country south of Athabaska river and in the vicinity of the Landing is suitable for mixed farming. It is very level and covered in most places with light scrub. A man with a little capital to start farming here can in five years be independent. Oats are worth seventy-five cents per bushel and hay twelve dollars per ton. Everything elseis about in that proportion and the prices will remain high until a railroad is constructed. It is the principal headquarters for all freighting to the north. A farmer keeping a stopping place along the road from Edmonton said he had kept a

record of teams freighting and estimated that there were about 70,000 tons of freight carted per year to the north country. This would average about seventy teams per day. Having completed the inspection of all contracts, I returned to Edmonton where I discharged my men and went to the hospital to recover from a bad cold. On December 16, I received your telegram to complete the survey of township 52, range 21. I engaged a few men and did this work. On its completion I returned to Ottawa, arriving there on December 24.

I have the honour to be, sir,
Your obedient servant,

G. J. LONERGAN, D.L.S.

APPENDIX No. 27.

REPORT OF A. L. MACLENNAN, D.L.S.

SURVEYS IN SOUTHERN ALBERTA.

SASKATOON, SASK., May 21, 1907.

E. DEVILLE, Esq., L.L.D.,
Surveyor General,
Ottawa.

Sir,—I have the honour to submit the following report on the surveys made by me last season in southern Alberta, in accordance with your instructions dated Sept. 11, 1906:

The district surveyed, along Livingstone river, was mountainous except a narrow strip of plateau abutting the banks of the river. The soil in certain parts of this area is suitable for the growth of cereals, but the early frosts would prohibit the maturing of the same. The water is of the very best. In nearly all the streams flowing into Livingstone river there are the choicest salmon and bull-trout.

Deposits of coal are to be seen under the conglomerate peaks of the mountains on both sides of the river.

There is considerable black pine, Banksian pine and poplar.

The short *coulées* of the mountain slopes afford excellent grazing for cattle and horses.

The entrance to Livingstone valley is through the gap made by Oldman river in Livingstone mountain, and except at high water, entrance through this gap is easily made up the bed of the stream.

I have the honour to be, sir,
Your obedient servant,

A. L. MACLENNAN, D.L.S.

APPENDIX No. 28.

REPORT OF GEO. McMILLAN, D.L.S.

INSPECTION OF SURVEYS IN THE PROVINCE OF MANITOBA.

OTTAWA, March 23, 1908.

E. DEVILLE, Esq., LL.D.,
Surveyor General,
Ottawa.

Sir,—I have the honour to submit the following report on my past season's work in the province of Manitoba.

I left Ottawa on April 26 and arrived in Winnipeg on April 29. After making some preparations in Winnipeg I left for Piney to get the outfit and transport used the previous season by Mr. Grover. The horses were so thin that they could not stand hard feed and on reaching Winnipeg I was obliged to secure the services of a veterinary. I was delayed over a week there till the horses got better.

I completed my outfit on May 14 and on the next day reached Lac du Bonnet via Canadian Pacific railway. The ice had not then left Winnipeg river and I was delayed till May 24, when the ferry made the first trip across the river, and proceeded to inspect contract number two of 1906, where I arrived on the same day.

This contract includes township 14, range 12, east of the principal meridian and is traversed by Pinawa channel. This contract is densely timbered with large poplar and small spruce, the larger spruce having been cut off. In section 32 of this township there is erected a large electric power-house, the property of the Winnipeg Electric Street railway. The company has constructed a good corduroy road from Lac du Bonnet crossing as far as section 2. The soil is largely swamp except the strip bordering on Pinawa channel, which is of excellent quality. There are no people living in this township except the employees of the Winnipeg Electric Street railway. Moose and deer are abundant.

From this work I proceeded by boat up Winnipeg river to contract number three of 1907. This contract includes townships 15 and 16, ranges 14 and 15 east of the principal meridian. There are five portages including Pointe du Bois rapids on all of which fine water-power is available. Pointe du Bois appeared to me to have the best location for the development of power on Winnipeg river and it is the rapids selected by the city of Winnipeg for the erection of a power plant, and a railway is being built from Lac du Bonnet to connect therewith. The soil in these townships is, with the exception of the strip bordering on the river, swamp or rock and timbered with scrub jackpine and spruce. There is also much floating muskeg. Moose and deer are plentiful and the river swarms with fish especially sturgeon. I completed the examination of this contract and on June 29 reached the corduroy road on my return. From there I travelled to Lac du Bonnet and then by Canadian Pacific railway and Canadian Northern railway to Dauphin to examine contract number nine of 1906. The townships of this contract were so wet that I had to abandon the work after examining township 26, range 14, west of the principal meridian. I next proceeded to Gimli arriving there on July 18 and completed the addition to the townsite in eight days. Gimli is an attractive spot and at present is the terminus of the branch of the Canadian Pacific railway. There are many fishermen resident there and the abundance of whitefish in lake Winnipeg affords them ample employment.

I next proceeded to make a resurvey of township 18, range 10, east of the principal meridian. I shipped by the Canadian Pacific railway to Selkirk and thence by boat to Fort Alexander arriving there on July 30.

This township is densely timbered except the parts improved by the farmers, and it is traversed by Winnipeg river. On both sides of the river there is a strip of excellent land, while farther back it is swampy and in some instances floating muskeg. It is not at all settled except on the lots fronting on the river. Farming is the chief industry but lumbering is carried on considerably and there are two saw-mills in the vicinity. There are several water-powers, although none have yet been developed. In section 1 is the famous Silver falls rivalling the Pointe du Bois rapids. There is an abundance of wild fruit including plums, cranberries, blueberries and other wild fruit. Moose and deer are abundant.

I completed the survey of this township on October 7, and proceeded to Manitoba House settlement.

This settlement borders on lake Manitoba and is in township 22, range 11, west of the principal meridian. It extends for about one mile in an easterly and westerly direction and six miles in a northerly and southerly direction. The lots are not uniform in size. Along the lake it is open and marshy and more remote from the lake it is densely timbered with poplar and willow scrub.

The chief industries are stock raising and fishing and much hay can be procured. The provincial government has expended considerable money on the trail through the settlement recently. I made a traverse of this trail and next proceeded to township 21, range 10 west of the principal meridian.

I made a resurvey of the sections affected by the lake lots in this township. The same conditions prevail as in township 22, range 11, except that it is more thinly settled. I completed this work on December 16, 1907.

I next proceeded to the examination of contract number nine of 1906. This contract comprises township 25, range 11, and townships 26, ranges 11, 12, 13 and 14, all west of the principal meridian. They are largely made up of swamps and sloughs separated by poplar ridges. The soil is largely of third quality and quite inaccessible in the summer season. Game consists of moose, deer, elk, wolves and coyotes. There are but six families resident in these townships. They are engaged in stock raising and live along lake Manitoba. I completed this examination on January 7 and proceeded to contract number twenty-seven of 1906.

This contract comprises townships 16 and 17 ranges 9 and 10 east of the principal meridian. The soil is of third quality being composed of large muskegs separated occasionally by sand ridges. It is densely timbered and contains some patches of valuable spruce and tamarack. It is quite inaccessible in summer. I completed the examination of this contract on January 25, 1908 and proceeded to Mr. Watt's contract. I examined five townships of this contract, townships 13, 14, 15, 16, range 13 and township 14 range 14, all east of the principal meridian. These townships are densely timbered, there are some valuable spruce in all of them. The soil is of third quality and consists entirely of muskegs, swamps and rocks. Township 15, range 13 is traversed by a railway being constructed from Lac du Bonnet to Pointe du Bois. Winnipeg river traverses townships 14, ranges 13 and 14, and at some meridian crossings is very wide. Game consists of moose, deer, foxes and coyotes. As this completed my work for the season, I stored the outfit at Lac du Bonnet on February 18, 1908 and returned to Ottawa.

I wish to express my entire satisfaction with the service rendered by my assistant Mr. W. L. MacIlquham.

I have the honour to be, sir,
Your obedient servant,

GEO. McMILLAN, D.L.S.

APPENDIX No. 29.

REPORT OF C. F. MILES, D.L.S.

INSPECTION OF CONTRACTS AND MISCELLANEOUS SURVEYS IN SOUTHERN SASKATCHEWAN.

Toronto, March 17, 1908.

E. Deville, Esq., LL.D.,
Surveyor General,
Ottawa.

Sir,—I have the honour to submit the following general report on my field operations during the past season in the province of Saskatchewan, comprising inspection of subdivision contracts, surveying of townsites, resurvey of townships, and investigating and correcting some differences between settlers under instructions, bearing date respectively April 5, April 24, July 17, August 21, September 6, September 18, October 1 and November 6.

Owing to my outfit being wintered about thirty miles southwest of Calgary, I engaged a man to go to Calgary. He left Toronto on April 16, arriving at Calgary on the 20th. Here he hired another man to assist him in bringing in my outfit to be shipped to Moosejaw. They loaded it on a car on the 23rd and arrived in Moosejaw on the 28th, the same day I arrived there from Toronto. We got under canvas the following day, had the horses (which were in very poor condition after one of the most severe winters that had been experienced for some years), shod, fed up, and repairs made to my wagons, harness, &c., &c.

In the meantime, I sent out some men to bring in the horses and outfit used by Mr. Warren, D.L.S., last season from Mr. Nicolle's, Buffalo lake. They returned on the following day, accompanied by Mr. Nicolle, who had the wintering of the outfit, but one mare was missing. According to your instructions, I turned the horses and outfit over to Mr. C. C. Smith, D.L.S., together with three pack saddles of mine, that he could make use of in his mountain work. On account of the mare being missing I did not pay Mr. Nicolle's charges for wintering. I informed him that I would have to submit the matter to the Department, more particularly, as it appeared to me his charges were excessive. I had several communications from him since but as he could neither produce the missing mare, nor prove her death, I did not feel justified in satisfying his demands.

The trails, all the time, were in very bad condition for travelling, the prairie being flooded for miles in the lower places. However, we broke up camp at Moosejaw on May 8, and made a start for Chaplin to lay out a townsite ,having ascertained that the trails to the south were almost impassable. Snowstorms were of daily occurrence on the trail to Chaplin, where we arrived on May 10, going through numerous drifts of snow, necessitating our taking to the hills most of the way. Up to Parkbeg from Moosejaw, about forty miles by trail, the country is pretty well settled, beyond this point it becomes very sandy with but few settlers' houses visible from the trail, which runs parallel to the Canadian Pacific railway.

Chaplin is a small railway settlement with probably little more than fifty inhabitants, most of whom are connected with or dependent on the railway. There is a tank here, the water of which is brought by gravitation from springs in the hills, about one mile to the north. This is also a coaling station; the old sheds were being replaced in the fall by coal chutes. To the south, lake Chaplin approaches within half a mile

of the village and between the village and the lake there are no settlers. To the north for about sixteen miles it is rather sparsely settled beyond that the soil is much improved, and settlers are plentiful, a number of new ones coming in while we were camped there. While making a preliminary survey of the outlines of section 29, township 17, range 5, west of the third meridian I ascertained that the pipe carrying the water from the springs to the tank at the station was not on the water-right of the Canadian Pacific railway in the westerly half of parts of sections 29 and 32, but on the easterly half, whereupon I communicated with the Department on the subject and also about crossings which had not been located by the Canadian Pacific railway. Receiving a reply from the Department not to delay on that account, I broke up camp at Chaplin on June 4, and took the trail for Moosejaw, arriving there on the following Monday. Here we laid in a fresh lot of supplies, oats, fuel, and lath for pickets, and left for the south on June 5.

There is a fairly good trail to the south leading to Wood mountain, Northwest Mounted Police post. About sixteen miles out a trail branches off leading to Willowbunch, this being the regular mail trail, the mail being carried twice a month from Moosejaw to Willowbunch, and thence to Wood Mountain outpost. A government telegraph line runs parallel to the trail as far as the outposts, thence to Willowbunch, its terminus. We arrived at section 11, township 10, in range 30, west of the second meridian on the following day, where we camped beside a snowbank in a ravine, water being rather scarce in that immediate vicinity. We examined the work in several townships of contract No. 25, of 1906, and found that this contract was unfinished, many of the monuments not having been completed. From here I also ascertained that the pits had not been dug in contract No. 13, in range 1. From here we moved south and examined the townships in contract No. 10, of 1906, lying west of 'Lake of the Rivers.' There are extensive alkali flats to the south of this lake, traversed by a small creek, without any current at that time. The lake lies between banks from seventy-five to one hundred feet high, and this depression continues beyond the lake for many miles, in a southerly and easterly direction, the bottom being more or less alkaline, averaging over half a mile in width. I have followed this valley myself for nearly sixty miles to township 3 in range 23, and am told that it continues beyond. I had to take my outfit around by the southerly tier of sections in township 7 to avoid this flat, and the ravines running into it. Although the land in these townships was opened for settlement only a few months ago the majority of the homesteads are entered for. After examining the remaining townships east of 'Lake of the Rivers' in this contract, and ascertaining that in township 9, range 28, the monuments had not been completed, I started north on the Willowbunch and Moosejaw trail on June 22. This trail traverses a very hilly country up to within about ten miles of Moosejaw. My outfit arrived in Moosejaw on the 24th and the following afternoon, after laying in some new supplies and having repairs made, we left on the trail running north to Tuxford, the present terminus of the northwestern extension of the Canadian Pacific railway from Moosejaw. Tuxford, of very recent origin, is quite a thriving village, with several elevators, stores, &c. Another village called Brownlee is situated about the northwest corner of township 19, range 29, west of the second meridian. It started only the past year, and has already a number of stores, hotel, and other buildings. The homesteads along here are all taken up, and also most of the company lands are occupied.

I completed the resurvey of township 21, range 1, west of the third meridian, and on July 9, moved camp from section 16, township 21, range 1, to section 9, township 23, range 3. Here I reran the lines south of Sana lake and the Qu'Appelle which is a very small stream in this township. Between the lake, the river, and the adjacent banks this township is pretty well cut up. The soil is light and only the southerly tier of sections settled upon. Finding more than one monument at many of the corners, I abandoned this work for the present, until I could communicate with the

Department, and on July 15 moved camp to section 9, township 24, range 1, west of the third meridian. This township is fairly well settled, most of the homesteads being occupied. From this township there is a good graded road that leads into Craik, a village of probably five hundred inhabitants, on the Canadian Northern railway, about seventy-two miles northwest of Regina. There are several elevators, stores, hotels, and a bank here, and settlers come from quite a distance to trade. I finished the resurvey of township 24, range 1, on July 24, and moved camp the following morning to section 21, township 24, range 2. I worked but a few days in this township when your telegram was received instructing me to proceed at once to contract No. 13, of 1906. We started on July 29, and arrived at Swift Current on August 2, but owing to heavy rains, only reached township 11, in range 12, west of the third meridian on the 5th. Between Swift Current and this place we passed through a well settled country, there being quite a large settlement of Mennonites, who occupy about half a dozen villages (some not more than a couple of miles apart) in that district. Most of them came from Manitoba, and being frugal and industrious, they appear to prosper wherever they settle.

In the westerly portion of this contract No. 13, of 1906, I examined the remaining four townships, viz., 11 and 12 in range 12, and 10 and 11 in range 13; the surface is high, rolling and well adapted for ranching; a fine creek runs through the northerly part of township 11, range 12 fed by springs in the adjoining township to the west. There are but two or three settlers in these four townships; one of them in township 11, range 12, is a rancher; he has both horses and cattle. This section of the country appears well adapted for this business. The other settler was a more recent arrival and had but a small outfit; but all appear sanguine of success. Having lost a horse while in township 24, range 2, I purchased one from Mr. Alfred Russell, the rancher above mentioned. We broke up camp again on August 10 and started for the easterly portion of contract No. 13. We crossed Mosquito creek during the morning, and some time in the afternoon made the 'Turkey Track,' 'Brand Bull' and 'Hay Camp,' the 'Home ranch' being about twelve miles to the north. It was this ranch which met such very heavy losses during the past severe winter. They were supposed to have by book-account, some 18,000 cattle, but, I am informed, they rounded up last spring not more than one-third of that number. The losses by the ranches in this district all through were very heavy. After crossing Notukeu creek at the 'Hay Camp' we struck the old Fort Walsh to Regina trail, pretty well obliterated, and followed this for a couple of days, which brought us to the French Canadian settlement on Wood river. The country we passed through is mostly rolling prairie, and south from the creek appears very dry. There were no settlers met with until we neared Wood river. On account of the water being scarce, and not knowing whether we would meet with any more, we camped here, and the following afternoon reached section 2, township 10, range 1. I succeeded in taking an observation the same evening. While camped here near the Wood mountain trail we were often visited by homestead seekers, who were anxious for information on many different subjects, as to trails, homesteads, soil, water, fuel, etc., etc. Townships 7, 8, 9, 10 and 11, in range 1, in this contract are more or less rolling prairie, township 10 being somewhat hilly, interpersed with ponds. The nearest wood for fuel may be obtained about forty miles to the south, and the nearest coal in township 7, range 27, west of the second meridian, probably a distance of fifty miles by trail, it being situated at the east of 'Lake of the Rivers.' From here I sent a team to Moosejaw for supplies, including also some wood for fuel. I finished the examination of this contract (No. 13) on August 23, and on the following day moved camp to section 7, in township 6, range 29, to contract No. 17 of 1907. The outer edge of Wood mountain extends to this place and the surface is comparatively rough and hilly, ravines are frequently encountered containing timber, mostly poplar of not very large size, but settlers from a considerable distance come here for their fuel, and also for fence poles. The soil is principally a sandy loam. There are a few settlers in the

valley, most of whom are French half-breeds, who possess small herds of cattle and a number of horses, not much land being cultivated. I completed the examination of this portion of contract No. 17, on September 6, and moved camp to Willowbunch village on the following day. Here we got additional supplies, oats, etc., etc., and left again for the east on the 8th. At Holliss' on the 'Big Muddy' about sixteen miles southeast of Willowbunch, I split up my party and sent my assistant with six men down the trail along the Big Muddy to the international boundary, thence to townships 1 and 2 in ranges 17 and 18 west of the second meridian, where they arrived on the 10th. On the creek near where it crosses the boundary there is an outpost of the Royal Northwest Mounted police; their camp is close to a seam of coal from where they draw their supply of fuel. All this country is well adapted for ranching, water and feed being in abundance. These four townships are more or less hilly and stony, the soil consisting principally of a sandy loam. Leaving Holliss' on September 8, we travelled east along the big valley before mentioned for about fifteen miles to a house on the south side of the valley. As we had come across no monuments we visited it and found it occupied by a family from one of the provinces in eastern France. They had been there less than a year, and not having any near neighbours had not acquired the English language. They have a comfortable house shingled and painted, a good stable, and a large quantity of hay. They own five or six horses, and quite a number of cattle. The next morning one of the men took us to some pits which were on the south boundary of section 3, township 4, range 24. A good deal of hay has been cut along the edges of the valley, but out towards the centre it is mostly hardpan, with but little vegetation. I examined townships 4 ranges 23 and 24. The surface is rolling prairie and the soil black loam with, in many instances, a gravelly clay subsoil. A number of horses were seen here at large, grazing in the marshes, but, as there are no settlers in these townships, they may be owned by some ranchers to the southwest. We moved camp on September 12, to Willowbunch about twenty-five miles westerly. It was a cold day and showery, varied by hail, and a slight flurry of snow, the first of the season.

On the 18th, when my assistant and party joined me we left Willowbunch for townships 9, ranges 26, 27 and 28. About seventeen miles distant the Moosejaw trail crosses that alkaline valley before alluded to. It runs from 'Lake of the Rivers' to Willowbunch lake, and I was gratified to see a gang of men employed fixing up the trail across the flat. It used to be a bad place, so many teams getting mired in it. When I first crossed it in June, a wagon was still standing there, where out of a team of four horses, two had been drowned. Now there is a bridge and the approaches are considerably raised. As there is a good deal of freighting on this trail it will be a boon to freighters and travellers. We camped at a place called 'Bickner's,' a deserted house, where a man by that name had homesteaded on a wrong (an odd) section. Here we split up again, my assistant, with cook and five men, going to townships 9 ranges 25 and 26, while I followed up the Moosejaw trail, as far as townships 9 ranges 27 and 28. It passes through pretty good country, there being a few settlers between it and 'Lake of the Rivers.' In ranges 25 and 26 there are some alkali lakes, the soil in the sections surrounding them generally being sandy and gravelly. In township 9, range 27, also part of contract No. 17, the surface is rolling and the soil a black loam with a clay subsoil. Township 9, range 28, is a part of contract No. 25 of 1906. The land is similar to that in range 27. On September 22 I was joined by my assistant and party at 'Bickner's' and then we camped at a spring on section 35, township 7, range 28. This spring is situated on the north side of the alkali flat before alluded to, and is somewhat strongly alkaline. I sent a man along the flat south of 'Lake of the Rivers' and he reported that with teams it would not be possible to pass around the lake. So, on the following morning we went back to the Moosejaw trail, and struck south along the new road constructed across the flat. It was a long detour, but we managed to make camp the same evening on the southeastern quarter of section 5, township 10, range 29, this being in contract No. 25 of 1906. On the

way we passed quite a number of empty shacks, holding claims of homesteads some of which had been blown down, and completely demolished. We also passed a settler who had come there only in the spring; in the meantime he had built a house and stables, put up a large quantity of hay and had harvested a good crop of oats, besides breaking up a good many acres. This is on section 18, township 8, range 30. After examining of this contract (No. 25 of 1906) we moved west on the 25th to examine the extension of the same contract on Wood river, where there were four townships to inspect. Here there is quite a large colony of French Canadians. There is a priest domiciled amongst them, but they were still worshipping in a large tent on the east side of the river, which is now spanned by a bridge on the third correction line. Much of the material for the church, which is to be erected on the west side of the river, was already on the spot, and the building by now is probably in course of erection. There is also a post office established under the name 'Gravelburg' not far from the church site. A number of comfortable houses had been put up and large piles of wood for fuel which had drifted down the stream from the hills were observed beside the dwelling houses. Considerable areas of breaking also had been done, and was in progress of being done. After examining this contract we continued the inspection of the extension of Mr. Parson's contract (No. 17). There were ten townships lying on both sides of Notukeu creek. They are good townships and well adapted for settlement. They are mostly undulating prairie, the soil being black and sandy loam, with a clay subsoil. We moved camp on October 1 to section 18, township 12, range 6. My assistant, with part of the party moved across to the north side of Notukeu creek, while I moved west. We completed our examination here as far as the subdivision had progressed, and on October 5 we all set out together for Mortlach, on the main line of the Canadian Pacific railway, where we arrived on the 7th. After crossing Notukeu creek at the French settlement, on a bridge recently constructed, there is a good trail; we followed north along Wood river for some distance and then turned north on a trail leading through the hills. Here we passed several settlers who are interested in cattle raising. There is good pasture and also good springs, and it is therefore well adapted for cattle raising, hay also being plentiful. When we reached the northerly edge of the hills a very fine view presented itself, a flat extending up to Mortlach dotted with homesteads and stubble fields, over which thousands of wild geese were hovering. Descending into the valley, and passing the stubble fields, flocks of geese arose, alighting again in some more distant fields. At Mortlach I had the horses shod, and then moved on to Chaplin, where I changed the Canadian Pacific railway water-right from the westerly half of the north half of section 29 to the easterly half, and also made a change in the survey of legal subdivision 11 of section 29. Having finished the work at Chaplin on the 14th we proceeded to Ernfold to lay out a townsite of that part of section 21, township 17, range 7, west of the third meridian, lying south of the Canadian Pacific railway right-of-way. From here, on the 16th, my assistant with cook and four men returned south to range 2, to examine townships 7, 8, 9, 10, 11 and 12, being an extension of Mr. Parson's contract (No. 17), which work was not ready for inspection when we left that vicinity on October 5. Completing the survey of Ernfold townsite, we started again for the south on the 21st, passing through another flourishing Mennonite settlement, and camping on their premises one night. Heavy fire had passed through here a few days before consuming nearly all the pasture. At this point, however, this settler had saved the pastures on two sections by very hard work. The next night we reached a ranch where there was any quantity of hay at our disposal. There were probably between four and five hundred tons, much of it the former season's hay. The following morning after crossing a bleak and black range of hills we reached the home ranch of the 'Turkey Track Brand,' where we were also entertained, and got accommodation for the horses. That evening we reached their hay camp, about twelve miles south. From here I inspected the four townships 11 and 12, in ranges 9 and 10. They are mostly undulating prairie

with sandy and clay loam soil. We completed our inspection here on the 26th, and left again for the 'Home ranch.'

From here we went north across hill and dale and burnt prairie direct for the nearest point on the Canadian Pacific railway. We arrived at Herbert on the 28th, and thence followed the trail along the railway to Morse, a comparatively new town, with stores, hotel, livery stables, etc., etc. The whole party on the 30th went north again from Chaplin, for township 24, range 1, west of the third meridian. I took the train for Regina, thence to Craik, where two of my teams were to meet me. These arrived there on November 2. With three men I left Craik for Mr. Dennis' place on section 20, township 23, range 25, west of the second meridian. We passed through a small town, Aylsworth, on the Canadian Northern railroad, where there are two elevators, and there were probably over fifty teams waiting to turn their wheat into these. I have already reported to you on my work on the east boundary of township 23, range 26. We finished this work and returned to Craik on November 7, reaching the main camp on section 9, township 24, range 2, on the following day. From here we completed the resurvey of this township and of the adjoining one, township 23, range 2. The former township is well settled, except those homestead sections bordering on the west boundary of the townships where the land is very sandy and bushy. On November 15 being in Craik, I received your instructions to inspect D.L.S. Waldron's contract (No. 25) of 1907, and on the 19th started four men with part of the outfit for Gull Lake, where I with my assistant, would overtake them by rail. We, in the meantime, completed resurvey of township as indicated above. We overtook the outfit at Gull Lake on the Canadian Pacific railway on the 26th but owing to the non-arrival of our camp outfit, we could not leave for our destination until the following afternoon. There are a number of settlers along the trail south to township 8. On section 36, township 8, range 20, west of the third meridian, there is located one French family recently arrived from France. There were seven in the family, and none of them could speak a word of English.

South of these no settlers were met with. We camped that night on a lake at the southeast corner of section 2, township 8, range 20, the only water then in sight from this camp. We inspected townships 8, ranges 19 and 20 and the following day moved camp east to section 14 township 8, range 18 on a fine little creek, where a patch of probably one hundred acres had escaped the fire. From here I examined several sections in townships 8, ranges 17 and 18. There being no feed for the horses I did not proceed any farther east, but moved west to Stearn's ranch on the southwest quarter of section 20, township 8, range 20. The westerly half of this township is somewhat rough, broken by creeks from the hills as is also township 8, range 21. There are a number of settlers ranching on a small scale, along the eastern slope of Cypress hills it being well adapted for cattle or horse raising. There is abundance of good water, good pasture, both at the base and on the top of the hills, and shelter in the ravines which are more or less timbered. The easterly halves of township 8, range 19, and township 8, range 20, are undulating, rolling prairie, and are well adapted for mixed farming, the soil being sandy loam and black loam, in many places eighteen inches deep. Townships 8, ranges 17 and 18 are hilly and fairly well watered, the soil consisting of both black and sandy loam. We completed the inspection of this contract (No. 25 of 1907) on December 4 and the next morning started on our return to Gull Lake. The trail was good both going and coming; but at the crossing of Swiftcurrent creek there are bound to be difficulties at that time of the year. The stream there is not more than about two rods wide. It was frozen over and the ice in midstream was covered with a foot of water. The troublesome part was getting the horses, whose shoes had worn smooth, across the ice. After that we could manipulate the wagons with ropes and long chains. We arrived at Gull Lake the same evening. I may mention here that although the station on the main line of the Canadian Pacific railway is named Gull Lake, the lake itself is a few miles to the

south. I may here also mention that while on our way to the railway on December 5 we saw two men on mowers cutting hay. It was a very fine day so that it did not appear so much out of season. From here I took train for Swiftcurrent station where I was obliged to remain for the night, and thence to Chaplin, where I awaited the arrival of my outfit which got there on December 8.

Some of my men were paid off, and on the following day with only a small party I started by train for Weyburn, where we arrived late on the evening of the 10th. Here I hired a conveyance, and we drove out to the southwest quarter of section 34, township 6, range 14 west of the second meridian, where we camped in a vacant house. Here I retraced the east boundaries of sections 28 and 33, and in measuring north from the northeast corner of section 21, I found the error in the first mile.

We returned to Moosejaw and Chaplin on the 13th, where I found your telegram instructing me to return south to re-examine contract No. 10 of 1906. Up to the present the weather had been fine, and what little snow had fallen had disappeared again, so I had no hesitation in going south with wagons. My outfit left Chaplin on the 14th, and after having the horses sharp-shod at Moosejaw, I left there on December 17 by the Willowbunch trail, with three teams and five men. Proceeding south, the snow became deeper, and travelling heavier. At the head of 'Lake of the Rivers' we took to the ice and travelled along the lake for about twelve or fourteen miles, reaching Bickner's on the northeast quarter of section 1, in township 8, range 28. There I re-examined four townships. We then drove west along the alkali flat south of 'Lake of the Rivers,' which was impassable during the summer, to section 24, township 8, range 30, there being about a foot of snow, and no feed for the horses, I stabled them at Mr. Lee's on section 18, township 8, range 29, as he had a good supply of hay. From here we moved to township 7, range 30, where we arrived on Christmas day. There we completed the re-examination of this contract. Although there are not many settlers in these townships just now, yet most of the sections available for homesteads are entered for and many small shacks were erected during the summer, which probably will be occupied by next spring. Another reason why an impetus will be given to the early and rapid settlement of these townships is the fact of the proposed railway between Weyburn and Lethbridge having been located all along township 8, nearly as far as the eastern slope of Cypress hills, where the line diverges to the south. I would have gladly re-examined part of contract No. 13, but for the difficulties of moving about with wagons in the snow and the scarcity of fuel.

I have examined five contracts, comprising seventy-two townships and have reported on sixty-nine of the same, besides which I made a restoration survey of three townships, surveyed two townsites on the main line of the Canadian Pacific railway and made some minor correction surveys. In order to reach these various places, the distance travelled by my outfit was about 2,200 miles, which does not include the mileage from the various camps to work and return, day by day. I finally returned to Moosejaw on December 30, stored part of my outfit there, and sent the horses with the remaining part to Chaplin, thence taking the horses to a homestead in township 21, range 5, west of the third meridian, where one of my men had made preparations to receive and winter them. After paying off the last of my men I arrived home in Toronto, on January 10.

I have the honour to be, sir,
Your obedient servant,

C. F. MILES, D.L.S.

APPENDIX No. 30.

REPORT OF W. F. O'HARA, D.L.S.

SURVEYS IN SOUTHERN ALBERTA.

OTTAWA, ONT., January 1, 1908.

E. DEVILLE, ESQ., LL.D.,
Surveyor General,
Ottawa.

SIR,—I have the honour to submit the following general report upon my work for the season of 1907 :—

I left Ottawa in April for Pincher creek, Alberta, where I organized a party. My work generally was greatly retarded by incessant storms and heavy rains. The roads were almost impassable from the town to the foothills of the Rocky mountains where my work was. It was necessary to resort to the use of pulley, block and tackle, using great mechanical power, to move my outfit in many places.

The work consisted of the production of the second base line across ranges one and two, west of the fifth meridian, and the subdivision of the adjoining townships.

The country generally in this region is very rough and mountainous, there being very little land suitable for agriculture. The chief industries consist of lumbering, mining and drilling for both gas and oil. There is evidence of an oil field on the east slope of the Rockies containing an area of about 1,800 square miles.

Already several companies, which have been operating there, have met with much encouragement, but it may require several years to properly develop the industry. Their progress will be watched with great interest, because I understand from tests which have been made that the petroleum found is of the highest grade. It will be necessary to drill at least 3,000 feet, before large supplies can be obtained. If the early operators meet with anything approaching the success they have reason to expect, there will be a rush of speculators into that part which will greatly boom southwestern Alberta and the production of high grade petroleum may become one of the chief industries of the province.

Coal also exists in large quantities but the fields have not yet been developed to any extent in that part of the country, although small quantities are being mined for local use.

Townships 4, ranges 2, 3 and 4, west of the fifth meridian consist almost entirely of lofty and rugged mountains, and great difficulty will be experienced in subdividing them. The townships are included in the petroleum field. Oil-rock outcroppings were observed on Southfork river, Gladson and Mill creeks, and no doubt this evidence will be followed later on by sinking wells in likely places on these streams, in the above mentioned townships, which are now in unsurveyed territory. It will be scarcely possible to follow the provisions of the 'Manual of Survey' here. In the first place, road allowances surveyed in the regular way, are useless. This applies to large parts of townships 5, ranges 2 and 3, where a system of reserving about two and one-half per cent of the land for roads would be much more suitable for the locality. The best method of surveying the townships above mentioned, would be to lay out roads in the valleys following the best natural grades. The lines should be well opened out, carefully traversed and measured, planting hubs or posts

at every deflection. These then could be used as base lines, in conjunction with a system of triangulation for the purpose of determining distances throughout the townships. Owing to the broken and mountainous character of the country, it will be found a physical impossibility to chain the lines of the sub-division work, although they can all be transited. The work generally would be within the sphere of a topographical survey rather than treated and surveyed under the third system of survey. The work of surveying roads where they can be travelled seems to be left to the local government,and in the meantime there is no end of trouble among the settlers, who close up wagon trails which pass through their respective farms, and which have been broken in best places and travelled for some years. The public, therefore, under these arrangements are obliged to turn into some swamp or ravine, where they find great difficulty in travelling. Whereas if a settler or homesteader obtained a title to only 97½ per cent of the area within his quarter section limits the rest being reserved for a highway, he would have no voice in the matter if his land happened to be situated in a valley through which the public had established a highway.

Hay, oats and hardy vegetables can be successfully grown in the valleys where the soil consists of a rich black loam and clay, but at present the crops are rather risky. After a large area is opened and broken, the climate is likely to become more moderate and wheat can then be more successfully grown. But at present summer frosts injure all tender crops.

Agriculturists will therefore do better by confining their attention to the more hardy crops for a few years, before going extensively into wheat growing.

The hog and dairy industries are greatly neglected in southern Alberta. Both pork and butter are selling too high every year. Vegetables are also in great demand, large quantities of which are shipped there in cans, and no person seems to supply the demand.

Prices of potatoes, carrots, onions, cauliflower, cabbage, turnips, parsnips and celery are three or four times higher than those in Ontario, and all these vegetables will do well in southern Alberta. Nearly every settler who takes up land grows hay and oats, and raises a few cattle or horses, never thinking of how well a crop of celery or cauliflower would sell; whereas if farmers properly farmed or gardened a smaller area as they do in Ontario, there would be much more prosperity in the country, in the event of a crop failure, than at present when everyone is depending upon the success of one crop.

The season was unusually wet during the summer which greatly retarded our progress. The bad weather culminated with the most severe storm of snow I ever experienced. We were camping in township 5, range 2, at an altitude of 6,000 feet during the storm, which began on the morning of the 10th of September, and lasted until the evening of the 13th. During the night of the 10th the greatest precipitation occurred, there being about two and one-half feet of snow in the morning of the 11th. After the storm subsided the depth of snow averaged from three and one-half to five feet. The wind was from northeast and the barometer was unusually high. On the night of the 10th the storm was accompanied by flashes of lightning which occurred at remarkably equal intervals of about fifteen seconds, and judging from the time elasping between the flashes and the thunder, the electrical disturbance must have been about two miles away. I made a great many inquiries and no one in the neighbourhood experienced a flash any closer. Therefore the storm must have been at an altitude of about 16,500 feet, which accounts for the extreme height of the barometer. Were it not that the atmospheric pressure was so great clouds could not have been supported at so great a height. The great depth of the snow falling in so short a time is also evidence that a strata of the atmosphere of very unusual thickness was discharging moisture.

The crops of wheat and oats which were very late and remained uncut were completely buried. Not a head could be seen and it looked at one time like a total loss.

However, after a few days the snow melted and some ingenious men came to the rescue by devising some specially long lifters, attachments placed in front of the knives of the binders and mowers, which lifted the straw, so that the crops could be cut. The final outcome of the agricultural pursuits were on the whole satisfactory, on account of the prevailing high prices, due to crop damage in other parts of the world.

I have the honour to be, sir,
Your obedient servant,

W. F. O'HARA, D.L.S.

APPENDIX No. 31

REPORT OF W. R. REILLY, D.L.S.

RETRACEMENT AND RESTORATION SURVEYS IN NORTHERN SASKATCHEWAN.

REGINA, February 25, 1907.

E. DEVILLE, Esq., L.L.D.,
Surveyor General,
Ottawa.

Sir,—I have the honour to submit the following general report concerning my operations in the field from August 5 to December 9, 1907, pursuant to your instructions of July 15 and subsequent dates:—

Your instructions were to organize at Saskatoon and apply to R. H. Hall, Esq., manager, Hudson's Bay Company, Prince Albert, for surveyor Wallace's horses. I communicated with Mr. Hall at once and received a reply.

I left Regina on August 5 and expected the horses would be in Saskatoon by the time I arrived there. Owing to the fact that a letter to Mr. Campbell who had care of the horses was addressed to the wrong post office the horses were not delivered to me until the 8th. In the meantime I had everything in readiness except the rigs.

I experienced some difficulty in procuring a cook. I was at a disadvantage in procuring this help, as both the Canadian Pacific railway and the Grand Trunk Pacific railway were paying much higher wages for the same work on their construction survey parties than my instructions allowed. On the arrival of the five horses, which turned out to be small ponies not in the best condition, I purchased another pony, the only one available at a reasonable figure, and three democrats. To have purchased lumber wagons would have been a great mistake, as a wagon alone would have been load enough for these small ponies.

When working on contract work I used democrats. I found that I could transport with ease loads that I could not have handled on wagons with the same horses. These ponies had been used to packing and required breaking in to harness. I started them out with light loads and soon had them going all right.

We left Saskatoon on August 9 to mound townships 41 and 42, range 27, west of the second meridian. We crossed the river at Saskatoon and proceeded by trail northeasterly to Aberdeen on the Canadian Northern, along the railway to Vonda and northeasterly from Vonda into township 41, range 27, which was mounded first, then into township 42, range 27. The trail from Saskatoon passes through a good country for grain growing and mixed farming. Some very fine growing wheat and oat crops were seen along the route. The best were within a short radius of Aberdeen and Vonda. Like the majority of crops in the province they were damaged by frost later on. The mounding in township 41, range 27, was completed on the 20th and in township 42, range 27, on August 26. These townships are similar in character. The surface is rolling to hilly with numerous sloughs and small lakes and is more or less dotted or covered with poplar bluffs and willow brush. The soil is mostly a good sand loam. Some homesteads are very much broken by lakes and hills. A large majority of the homesteads are settled on by Galicians. These people are farming so as to produce the most of their living direct from the farm. They started with small means and are gradually making comfortable homes for themselves accord-

ing to their way of living. Scarcely any of the odd sections are settled on and these people are not likely to purchase odd sections for some time.

After completing the work in this district on August 27, we started for township 34, range 6, west of the third meridian, to complete the survey and mounding of that township. The trip as far as Saskatoon was made over the same trail we came up on over two weeks previous. The change in the crops in that short time was remarkable. They bid fair to produce a good yield but were frosted later on. The weather during the growing season was ideal. The damage by frost was not on account of an early autumn, but rather attributable to the very late season. In ordinary seasons grain would have been cut at the time of the most damaging frosts. Wheat sown very late is almost certain to be frosted in any season.

The lines surveyed during the season were nearly all retracements and we ran random lines, being the most practical and expeditious way of carrying on the work. We arrived in township 34, range 6, on August 29. We completed the lines and mounds on the east side of the river, then moved to the west side crossing the river at Saskatoon. On September 12 it snowed to the depth of two inches during the night; this made it disagreeable for a couple of days, after which we had ideal weather.

South Saskatchewan river runs northerly through this township from section 2 to section 33. There is a very wide valley or river flats skirted on the west by a range of hills through the centre of sections 5 to 32, on the east by hills northwesterly from section 1 to 27, and northeasterly through section 35. A large portion of the land in the flats is good farming land, while that on the hills is light sand, fit only for grazing. I completed the survey and mounding of this township on September 18, and started on the following day for township 38, range 13, to make a retracement in that township according to instructions dated July 27.

From township 34 I took the direct trail from Saskatoon to Asquith on the Canadian Pacific railway and northwesterly from there until I struck the old Hudson's Bay company's trail which runs through township 38, range 13.

I finished the retracement on September 24; a sketch and report of the work was sent in later. I started the next day for township 51, range 27. We were in the north part of township 38, range 13, which was pretty rough. I experienced some difficulty in getting west to strike the north trail, the most direct route to Battleford. I passed through Battleford, where I procured some necessary supplies.

After making some inquiry I purposed taking the old Hudson's Bay company's trail to Fort Pitt, the most direct route to the work. At present the trail for a long way out of Battleford is destroyed or fenced in and I had to take a trail leading from one station to another on the Canadian Northern railway until after I had passed Paynton, where I crossed country and got on the Pitt trail which is very little used now. I arrived in township 51, range 27, on September 3.

I went up this trail to the same township in 1884. Apart from settlement the general features of the country have not changed much since that time. Fire has destroyed many bluffs, and while others have grown up they are not so heavy. The most noticeable feature is the change in water areas. In 1884 all sloughs, ponds, lakes and creeks seemed to be at high water mark. These are now much lower and some have entirely disappeared.

In accordance with instructions dated August 8, I made a retracement and restoration survey of the outlines, interior meridians and crosslines of townships 51 and 52, range 27, and of township 53, range 27, with the exception of the west and north outlines, which were retraced by G. J. Lonergan, D.L.S., in 1906.

Township 51 is cut by Big Gully creek. The surface is from rolling to hilly. It has many small sloughs and lakes and numerous bluffs of poplar scattered all over the township. Township 52 is very similar to 51 but not quite so rough. These townships contain a good deal of fair farming land and a number of settlers have taken up

homesteads and are doing fairly well. This district is not a grain district but rather a mixed farming or cattle country.

A large part of township 53 is rough and hilly. It is cut by Saskatchewan river from section 19 to section 1. All south of the river is hilly and north of the river rolling to hilly. Sloughs and lakes are scattered all over the township with scattered bluffs of poplar south of the river, and large stretches of spruce, tamarack and poplar north.

According to instructions dated September 4, a portion of two lakes, one in section 1, the other in sections 12 and 13, township 52, range 1, west of the fourth meridian were traversed and fractional townships 54, ranges 27 and 28 west of the third meridian subdivided. This survey which completed all our work in this district was finished on November 28.

On the following day I started for Lloydminster. On the way in I made arrangements with Mr. Chas. Hayes, section 20, township 51, range 27 for the storing of the transport goods and the wintering of the horses. On arriving at Lloydminster four of the men wished to go to Edmonton; these I paid off. The other six I took to Saskatoon by rail. Two of them were paid off on arrival.

Instructions dated October 26 were to revisit township 38, range 13, west of the third meridian for further retracements.

The intention was to go by rail to Asquith and hire a rig there for a trip to the township. As the Canadian Pacific railway had not started their train service I hired a first-class team at a low rate from Saskatoon, took three men and a cook with me, made the trip, did the work and returned to Saskatoon on December 8. I paid off the men on the following day.

The weather was exceptionally fine during the season's work (from August 5 to December 9), which took me over a district of 175 miles east and west, 125 miles north and south, in the heart of the fertile belt of northern Saskatchewan. A flurry of snow on September 12 was the only snowfall until December 7. Saskatchewan river did not freeze over for safe crossing until November 25.

Looking back over a period of twenty-five years, it is safe to say we never had a season when stock (especially horses and cattle) would not do well on the open run. On the other hand we have had many failures of grain crops. To raise wheat for market seems to be the all absorbing ambition of the majority of farmers. Large tracts of open plains are well adapted for exclusive grain growing, but this class of farming is more or less an uncertainty as either frost, hail, hot winds or drouth have time and again spoiled the promise of a good harvest. On the other hand stock raising and mixed farming is to a large extent free from these damaging elements, and present a surety of success which exclusive grain raising does not warrant.

I have the honour, &c.,

WM. R. REILLY, D.L.S.

APPENDIX No. 32.

REPORT OF GEO. ROSS, D.L.S.

SURVEY OF A PART OF THE FOURTEENTH BASE LINE BETWEEN THE FIFTH AND SIXTH MERIDIANS.

WELLAND, ONT., March 6, 1908.

E. DEVILLE, ESQ., LL.D.,
Surveyor General,
Ottawa.

SIR,—I have the honour to submit my report on the survey of the fourteenth base line westerly from the east boundary of range 13, west of the fifth meridian, to the sixth meridian.

In accordance with the suggestion made by you in a letter dated January 12, 1907, that it would be advisable for me to make a preliminary trip to Edmonton, in order to arrange for the forwarding of supplies to a suitable depot, towards the western end of the line to be run by me, as they could be freighted much easier and cheaper by sleighs in winter, than by packhorses, over soft trails in summer and in order also to purchase packhorses, as these animals would in all probability be hard to procure during the following spring, I left Welland, on January 31, 1907, for Edmonton While there I purchased the greater portion of the supplies required by me during the following season, and arranged to have them forwarded to Big Eddy on McLeod river, and I also arranged for the purchase of twenty packhorses. I returned home to Welland on February 25.

On May 27, I again left for Edmonton, and arrived there on the 31st of that month I organized my party in that city, purchased the balance of my outfit and supplies and took the trail for Lac Ste. Anne on June 10, where we arrived on the evening of the 13th.

From Edmonton to Lac Ste. Anne there is a fair wagon road, and I engaged a freighter to assist us by taking two wagon loads as far as Lac Ste. Anne, from which point we proceeded west with the aid of our packhorses alone, leaving at Lac Ste. Anne, to be forwarded to us, in about ten days, such portion of the outfit and supplies as could not be taken along without overloading the horses.

On the night of June 12 and during the greater portion of June 13 and 14 there was a heavy and steady rain, and the trail was becoming wet and sloppy. About noon on June 15 we left Lac Ste Anne by the Yellowhead Pass trail and arrived at the crossing of Pembina river on the evening of the 18th, and found it to be in flood and not fordable. I had left the folding canvas boat with which I had been supplied behind at Lac Ste. Anne, but fortunately Mr. A. H. Hawkins, D.L.S., who was on his way out to continue the extension of the thirteenth base line, was camped on the other side of the river and he very kindly placed his boat at our disposal. We were thus enabled to get part of our outfit and supplies across the river that evening and succeeded in getting the balance over by nine o'clock next morning. Having the horses all loaded shortly before noon, we again proceeded west and arrived at the ford on Lobstick river that evening during a heavy rain.

The Yellowhead Pass trail is open as a wagon road from Lac Ste. Anne to a point about two miles beyond the crossing of Lobstick river, near the west side of range 8, and the land traversed by this portion of the trail is mainly high and rolling,

covered with poplar woods and intermingling stretches of partially open prairie, on which there is a good growth of grass and some scrub. On these open stretches are to be seen the houses and outbuildings of new settlers, and apparently this country will become the home of a thriving and prosperous community at an early date.

On June 20, after the packs were loaded on the horses, we forded the Lobstick, and proceeding westerly about two miles came to the point where the wagon road dwindles down to a mere pack trail or bridle path, winding through the woods, and marked by an occasional blazed tree. About six miles farther on the trail crosses tamarack swamps and stretches of it are very soft and sloppy. A rainstorm began at 4 p.m. and at 5.30 we camped on an open piece of high ground after crossing a swamp, in which there was good pasture for the horses. The next day we remained in camp owing to the heavy steady rain which continued till evening. The following day proved to be very fine and we continued our journey westerly; the trail passes through the southern part of township 53, range 10, west of the fifth meridian, and was in very good condition in spite of the recent rainy weather; the country traversed was wooded with poplar or mixed poplar and spruce. Several small creeks were crossed where care had to be taken in order to prevent the pack horses from getting mired.

In range 11 the trail was in good condition except about two miles near the west side of the range. In range 12, which we crossed on June 25, the trail winds through woods of spruce and poplar mixed with jackpine and brulé, and about thirty per cent of it is through soft, boggy, swampy lands. In this range also several creeks were crossed, some of which were quite miry.

On June 26 I commenced work by retracing the north boundary of section 31, township 52, range 12, and began the extension of the fourteenth base line across range 13, by turning off the line from the north boundary of section 31. It was cloudy in the evening and I was unable to take an observation for azimuth, and next day continued the production of the line, till a heavy rain set in early in the afternoon. During June 28, 29 and 30 this rain continued with but little interruption and caused abnormally high water in the creeks and streams.

On July 1 we were able to proceed with the production of the base line along the north boundary of township 52, range 13, and on the evening of July 2 I obtained my first observation on Polaris. Next day we corrected the portion of the line previously run and continued it on its true bearing.

Yellowhead Pass trail runs through range 13, about three-quarters of a mile north of the fourteenth base line and we were able to camp along this trail and avoid the necessity of cutting a trail for our own use. Although the country about half a mile north of our own line was fairly light brulé, the line had to be opened through comparatively heavy woods and consequently our progress was rather slow, but we reached Carrot creek near the west side of range 13 on July 9, the camp having been moved along the trail to this creek the previous day. On the evening of the 9th a pack train came in with a load of the supplies we had left behind at Lac Ste. Anne, and also brought up our folding canvas boat, which the packer in charge of the train found to be of the greatest value in crossing Pembina river and some of the larger creeks which were very much swollen by the recent heavy rains and were not fordable.

On July 12 one of my men, while carrying an axe, spade and mattock, slipped off a log and fell on the point of the mattock, which penetrated his back above the hip and rendered him unable to resume work on the line for about six weeks. Being thus short-handed, and the line continuing in heavy timber, I was unable to attend to the work of exploring the country, as required by my instructions.

In ranges 13 and 14 and the east half of range 15, a distance of fifteen miles, we did not run across a swamp of any size, and the first one met with was on July 24, when the line entered a tamarack swamp, occupying the southwest part of section 4 and the southeast part of section 5, township 53, range 15. On the following day

the line crossed the Yellowhead Pass trail, and for the first time entered comparatively open brulé. Intermingled with the brulé were areas of low wooded land with medium sized spruce, together with many spruce and tamarack swamps.

We reached Wolfe creek with our line and moved camp there, on July 25, finding in the valley of that creek, along the trail a fine open hay meadow dotted in places with patches of scrub and groves of poplar. The pasture found in the valley of Wolfe creek, was superior to any we had yet come across, since leaving Lac Ste. Anne, although we had found fairly good feed for the horses at all our camping grounds along the trail. In the comparatively open brulé we found a crop of fine large strawberries.

On August 2 we reached Moose creek, in the eastern part of range 17, with our line, the camp having been moved there on July 30. By the end of July we had completed in all twenty-two miles of the base line, the greater part of which was opened through heavy timber.

During the months of June and July, a great amount of rain had fallen and the trail was almost in an impassable condition, however it was not till the latter part of July that our supplies needed replenishing, when we had no difficulties in bringing in all we required, from our depot at Big Eddy, which proved to be very centrally located.

Between Wolfe creek and Moose creek our line ran through a great many swamps, but the trail kept mainly along the ridges or higher lands, though in passing from one ridge to another, many low swampy and boggy places were crossed by it. The worst of these boggy places on the trail have been corduroyed but the greater portion of the corduroy is now in a bad state of repair.

Our first crossing of McLeod river with the line was made at the northeast corner of section 34, township 52, range 17, west of the fifth meridian on August 3, and camp was moved over on the 5th when the horses loaded with their usual packs were able to ford the river in safety. We reached the second crossing of McLeod river with the line in section 35, township 52, range 18 on August 8, and that day our camp was moved to Big Eddy, where our supplies had been stored the previous winter with Mr. B. Berthoux, the general merchant there. A short distance east of Big Eddy Mr. A. Sinclair, a squatter, had erected a good loghouse and barn in the flats on the north side of McLeod river, and had also a very fine garden.

We continued our line and on August 13 moved camp from Big Eddy about three miles up Sundance creek, still using the Yellowhead Pass trail. On the 15th camp was moved to the crossing at Sundance creek, where there was good pasture for the horses and on the following day we continued our line and also moved camp to Whitemud, where there is a good open hay meadow and a fine stream of pure water.

During the night of August 16 there was a heavy downpour of rain and the following day we were detained in camp by a steady fall of wet snow, sometimes turning to rain, which continued till about ten o'clock in the forenoon of the 18th; however, the snow melted as it fell and after the storm was over the weather turned fine and bright. Previous to this storm the rainfall had been rather excessive but now the weather turned drier.

At Whitemud we were again in the valley of McLeod river, but from this place to Big Eddy the river makes a big loop to the south, away from the base line, while west of Whitemud to The Leavings, a distance of ten or twelve miles, the river runs nearly parallel with and only a short distance south of the base line.

We moved camp to The Leavings on August 30 and on the following day completed the survey of the base line to the west side of range 21, a distance of fifty-four miles in all, our record for August being 32 miles.

At The Leavings there is a fine open hay meadow about forty chains long and thirty chains wide, where we found excellent feed for our horses. At this place the Yellowhead Pass trail leaves the valley of McLeod river and continues westerly to Athabaska river, approaching it at Sandstone creek, while another loop of this trail

turns northwesterly from The Leavings and crosses to the north side of the base line about the centre of range 22 and after continuing northwesterly for some distance turns southwesterly and crosses the base line about the centre of the north boundary of section 34, township 52, range 23, and in our survey of the base line from the east boundary of range 13 we were able to use the old trail and camp alongside of it without the necessity of making any new trails till we crossed it for the last time near the centre of range 23.

On September 2, we moved camp from The Leavings by the northerly loop of the trail to a point on the high ridge or divide between McLeod and Athabaska rivers, which was about half a mile south of the base line. On this divide, feed for the horses is so scarce, that they had to be taken back and pastured at The Leavings.

About 10 o'clock on the night of September 9 a heavy snow storm set in, and continued till the morning of the 11th, when the ground was covered with snow to a depth of five inches. The weather continued cold during the 11th and the snow did not begin to thaw until the afternoon of the 12th. During the 13th there was a drizzling rain the greater part of the day, and on the 14th, 15th and forenoon of the 16th there was a continuous storm of wet snow. After this storm the weather turned milder and in two or three days the snow was all gone and the temperature ranged about sixty degrees Fahrenheit through the day until the middle of October, during which time no rain fell except for one-half day.

We left Yellowhead Pass trail, after crossing it for the last time with the base line about a mile and a quarter east of Athabaska river, and from this point it was necessary for us to make a new trail for our own use, while we continued westerly in the vicinity of the base line until we struck the Smoky river trail in the westerly part of range 26.

On September 23 we moved camp across Athabaska river. Here our folding canvas boat proved to be most useful, as by its aid, we were able to move our outfit and the supplies we had on hand across the river, in a very short time. Before swimming the horses across, I had the packer bring up the balance of the supplies from our depot at Big Eddy, except a small quantity left for our return journey. For the safe keeping of our supplies and outfit, that were not required for immediate use, I had a log hut or storehouse built on the westerly side of the river, and in order to take care of some additional supplies which would be required during the latter part of the season, together with oats for the horses, I had also a small log house or shack built on the easterly side of the river, so that the goods could be placed in this storehouse and left in safety, at any time, by anyone bringing them up. I had previously ordered the supplies likely to be required and oats for the horses, and had given instructions that they should be forwarded from Lac Ste. Anne, as early as possible. Owing to unusual frosts, the oat crop was a partial failure and slow to ripen, thus delaying the threshing season, and it was therefore very late in the fall before a supply of oats could be secured and forwarded. Owing to the late date at which oats could be obtained and shipped, the charges for freighting them up by pack-train, were much higher than they would have been earlier in the season. To avoid the extra charge for packing, I asked that old oats be obtained and forwarded but it was found impossible to secure old oats as they were being saved for seed, because the germinating power of last season's crop had been injured by frost.

In continuing our line westerly from Athabaska river it was necessary to take with us supplies for about ten days or two weeks only, as the packer could readily make a trip back to our storehouse on the westerly side of the river when further supplies were required, and while there he could, with the aid of our canvas boat, easily cross the river to look after any supplies or mail that might have been brought up and left at the cache on the easterly side.

On the westerly side of the river, in the vicinity of the base line, there was, fortunately, a large area on which we found fine feed for the horses. We still had the

original number of horses with which we had set out from Edmonton, nearly all of them being in very fine condition.

On the high ridge or divide between McLeod and Athabaska rivers our line had to be opened out through several miles of heavy spruce and jackpine woods, and also through brulé with dry standing spruce and jackpine trees from six to twenty-two inches in diameter. Through this our progress was rather slow, but after crossing the Athabaska the land was more open, mainly light brulé with second growth poplar and small scattered areas of spruce, through which the line was opened out quite rapidly. After getting over about seven miles of this comparatively open country, we again ran into a stretch of very heavy woodland on the high plateau in range 25, and the western part of range 24, making our progress again rather slow.

On November 11 we completed all work to be done as far as the easterly side of Whitefish lake, which is crossed by the base line in the westerly part of range 26. On the following day we moved camp to the west side of the lake.

The easterly bank of the valley of Whitefish lake rises to the height of about a thousand feet above it, and along this bank is a cliff formed by an outcrop of sandstone, about one hundred and twenty-five feet high. It was necessary for us to make a detour around the south end of this lake in order to reach the Smoky river trail, which runs northwesterly from Prairie creek to Smoky river and passes along the southerly end of the westerly side of Whitefish lake. We struck this trail where it crosses the creek running northerly into the southerly end of this lake, being at a point about two miles south of the lake. We were then able to proceed northerly by the Smoky river trail to the point where it turned northwesterly away from the lake and thence northerly by an old trail running near the westerly side of the lake, to a point a short distance north of the base line, where we found a good camping ground by the lake and close to a good hay meadow in which there was splendid feed for the horses.

When I got around to the west side of the lake, I had the pleasure of meeting Mr. A. Saint Cyr, D.L.S., who was engaged on the survey of the sixth meridian as far south as the fourteenth base. It was his intention to run south from this base line along the east boundary of range 27 instead of producing the sixth meridian farther.

On November 13, we continued our line west from Whitefish lake. The distance across this lake not having been previously measured, the chainmen were now able to measure it on the ice, the lake being covered (except the deep central portion of it south of the line) by a sheet of perfectly smooth and clear ice, somewhat over an inch in thickness. Great numbers of whitefish, jackfish, etc., could be seen swimming around in the water beneath the ice.

West of the lake the country was comparatively open for the distance of about a mile; then our line entered a thick wood of small sized spruce, through which it passed for the further distance of about a mile, and entered a brulé, which with a few scattered areas of spruce and jackpine, extended to the sixth meridian. About two miles east of the sixth meridian we crossed Hay river, a beautiful stream of pure water, about fifty or sixty feet wide and from two to five feet deep, running northeasterly, in a wide and deep valley, in which there are some good hay flats with excellent pasture.

From the westerly side of Whitefish lake we moved camp on November 18, to Hay river, going round by Smoky river trail. At this time the ground was free from snow, none having fallen since September 16, but the morning after camp was moved to Hay river, about three and a half inches of snow fell between 7 and 9 o'clock, and in the forenoon of November 22 there was a further fall of snow.

In McLeod and Athabaska rivers there are great numbers of jackfish, graylings, whitefish and a large species of trout. In Hay river, in range 27, there are great

quantities of bull trout and Carrot creek in range 13 is teeming with speckled trout. Whitefish lake in range 26 abounds with whitefish, jackfish, trout, &c.

In Whitefish lake there are also several families of beaver as can be readily seen by the large amount of poplar freshly cut by them.

Considerable numbers of bear, moose, and black-tailed deer are to be found in the above-named townships, and there are also a few wolves, foxes, mink, weasel, &c.

Ruffed grouse, or partridge are quite plentiful and a few prairie chicken were occasionally seen.

The climate is very similar to that of Edmonton. The rainfall is abundant, and grain growing and gardening can apparently be carried on without injury from summer frosts. High or cold winds rarely prevail, and last season, when the wind attained any considerable velocity it appeared to be a warm chinook.

We completed the survey of the base line to the sixth meridian on November 26, and as it was so late in the season I decided to return home instead of going north to begin the work of extending the fifteenth base line, west from its present terminus in range 20, west of the fifth meridian.

I began my return journey on the morning of November 27, and proceeding by the Smoky river trail I arrived with my party and outfit on the northwesterly side of Athabaska river, opposite Prairie creek, in the evening of the following day, and next day by the aid of a raft left there for my use by Mr. A. Saint Cyr, D.L.S., I crossed my outfit and supplies to the southeasterly side of the river. The river had begun to freeze over, the ice extending out from the sides with an open channel in the centre and a good deal of drift ice running, so that I was unable to get my horses across, either on November 29 or 30. However, on the evening of the 30th the weather turned milder and a considerable amount of rain fell during the night. Next morning I found the ice had loosened from the sides of the river and floated down, while about a mile above Prairie creek there was an ice bridge which held back the drift ice from beyond. Taking advantage of this opportunity, I swam my horses across the river, at Prairie creek in safety on December 1 and the following day with my party took the Yellowhead Pass trail for Lac Ste. Anne.

When at Prairie creek I engaged Isidore Findlay to assist me with twelve pack horses, while returning to Lac Ste. Anne, in order that I might be able to get over the trail more rapidly than I otherwise could and thus avoid the necessity of making double trips. He was to join me at my cache on the Athabaska river at the fourteenth base line when I stopped to secure supplies, oats for the horses, &c., stored there for my return journey. I secured these supplies on December 4, but Mr. Findlay did not overtake me till some days after, and we arrived at Lac Ste. Anne on the evening of December 20.

I started out from Edmonton on June 10 with twenty pack horses, and fortunately, after a season's hard and faithful service, I was able to take them back to Lac Ste. Anne fit for work, strong, and in good condition, and in justice to my packer, Mr. Thomas J. Thompson, I must add that he deserves a large amount of credit for his faithful services and untiring exertions in always looking after the horses, day or night, in seeing that they got the best possible pasture and did not stray away. By his care in loading and packing the animals, they were kept free from the usual trouble of sore backs, and he was able to look after them, and have them on hand when required, without using hobbles, or tethering ropes.

On December 21, I completed arrangements with Mr. Gunn, chief officer of the Hudson's Bay company at Lac Ste. Anne, to store the outfit and winter the horses belonging to my party and in company with Mr. A. Saint Cyr, D.L.S., who was also returning with his party, engaged teams to take both parties to Edmonton, where we arrived on the evening of December 23.

At Edmonton I paid off the men belonging to my party and after closing up all business requiring my attention there, I returned home to Welland, Ont., arriving there on December 31, 1907.

I have the honour to be, sir,

Your obedient servant,

GEO. ROSS, *D.L.S.*

APPENDIX No. 33.

REPORT OF JOS. E. ROSS, D.L.S.

SURVEYS IN THE RAILWAY BELT, KAMLOOPS DISTRICT, BRITISH COLUMBIA.

KAMLOOPS, B.C., February 24, 1908.

E. DEVILLE, LL.D.,
Surveyor General,
Ottawa.

Sir,—In accordance with instructions I beg to submit the following report on my survey operations in the railway belt in British Columbia during the season of 1907:—

Having instructions to make a traverse of Columbia river from a point on the Canadian Pacific railway to the north limit of the railway belt at the most suitable time during the winter, I proceeded to this work on January 17 before completing my returns of the previous season. On arriving at Beavermouth, the starting point, I found that, although there had been extremely cold weather, the river was partly open and the ice weak in places, and that there was considerable slush. The conditions indeed were not nearly so favourable as I had anticipated. There were frequent heavy snowfalls and this, together with the slush, not only made travelling difficult but also prevented us from moving our outfit on sleds or toboggans. We were compelled to resort to the primitive way of packing on our backs. In consequence some of the party quit in disgust. However, I secured more men without much trouble and continued the work. For several weeks our progress was slow, but on February 6 a slight thaw set in, the snow settled, and, on again freezing, a crust formed which made travelling good and allowed us to walk on the weakest ice. From this until March 10, when I finished the work, the conditions could not have been more favourable. Although the main object was to define the limit of the belt line I also planted witness corners at the intersections of all the east and west section lines with the river, which corners, in case of future surveys anywhere along the river, can be used as starting points.

While the Columbia is winding and in places loops and islands have been formed as well as numerous back channels, the general direction is nearly northwest. At the railway the river averages five chains in width, but it gradually widens until at the head of Surprise rapids, near the boundary, it is about a quarter of a mile wide. The channel is navigable, having a depth of from six to ten feet. As the river forms the boundary between the Rockies and the Selkirks it is needless to say that the country is generally mountainous. There are several large flats along the river, one below the mouth of Beaver river and the others at the mouths of Gold and Bush creeks, which flow into the Columbia from opposite sides. So far as seen the middle of the flats is marshy. The timber is mostly spruce of from ten to twenty inches in diameter. On the high land the timber is fir. From the indications I would say that a considerable part of the low land is flooded in the spring and during high water in the river. There is suitable land here for a few settlers, but I do not think there is any prospect of agricultural development until conditions become more favourable in regard to transportation facilities. Possibly as timbering operations proceed and in consequence roads are made and the timber partially cleared off all the available land will be taken up.

On returning to Kamloops I finished all my returns of surveys to date, and on May 10 I commenced the general work of the season. In Salmon river and Spillimacheen valleys, which are the most important centres of the district, small surveys had been accumulating for the last four years so I decided to confine my operations to these parts until the work was entirely completed. This occupied the greater part of the season. The greater portion of the farming land has been surveyed and taken up, but extensions are continually being made on the hills and outlying parts. In Salmon river valley the surveys were small and scattered and were at elevations of from a few hundred to four thousand feet. While the soil is fairly good the declivities and broken surface of the country render much of it unfit for anything in the nature of farming except stock raising. The first land of any extent suitable for settlement I found in township 17, range 10, west of the sixth meridian, situated on a low mountain about five miles long by three miles in width and at an elevation of from five hundred to fifteen hundred feet above the surrounding valley. A part of the westerly side has been taken up by an Indian reserve and provincial lots. The top is thickly wooded with a rolling surface but the sides are mostly open with a steep slope. There is considerable arable land with fairly good soil, but the water is alkaline and scarce. There is a wagon road built by one of the settlers to the main road from the town of Armstrong, situated about four miles to the east on the Shuswap and Okanagan railway.

In township 18, range 9, at an elevation of three hundred to four hundred feet above the main valley there is some land suitable for settlement. It has good water and the timber has been mostly all burnt off. There is at present a thick growth of brush. A good road leads to the town of Enderby three miles distant. Both this township and the one previously mentioned had been partly surveyed and I completed the surveys. There are also a few sections of fairly good land in township 19 of this range. Here the surface is rolling, the soil rather light but the water is good. This land lies about midway between Salmon Arm and Enderby. The main road connecting these places runs through the middle of the survey. I completed the survey of the easterly half of this township.

I next made some surveys along Shuswap river, consisting mainly of river traverse. The sections had been mostly run out on a former survey to establish the belt boundary at Mabel lake. Some four or five squatters have gone in here recently. Besides completing the surveys needed for them I surveyed all the land that would likely be taken up. The only land that appears suitable for settlement is in the quarter sections along the river, as farther back the land is hilly and heavily timbered. There is not sufficient timber on the lands squatted on to warrant it being included in a timber berth. The greatest drawback to settlement has been the want of a good road. We had to cut our way around the worst places. The lumber companies operating on Mabel lake had been hauling in supplies for several months and in consequence the road had been cut up in the worst possible way. The provincial Government has expended about $5,000.00 a year on this road for the last two years. Another season's work at the same rate should put it in good condition.

The rest of the surveys were small and scattered. At 'Grande prairie' I spent several weeks making retracements and connections with provincial lots. As I was on the point of closing for the season I received instructions from you to make a number of connections between my last year's surveys and those of 1886 and 1887. I was engaged on a partial survey of these until the end of the year when I closed field operations.

As to minerals I may say that the country covered by me has been well prospected as is shown by the numerous location posts and prospect holes found nearly everywhere. So far the prospects are not very promising. The only mineral in quantity noticed was a deposit of gypsum in township 18, range 12, west of the sixth meridian.

Surveying the railway belt differs in some respects from the ordinary sub-division work. The country is more mountainous and broken. This is especially the case where the limit of the belt has to be defined. The sectional work is gradually becoming rougher since the main body of the agricultural lands is already surveyed. The lines have to be carried over ridges to the smaller valleys. The surveyor now is usually obliged to begin where the first surveyor considered it advisable to leave off. The starting point is often in some out of the way place at which it is inconvenient to take observations for azimuth or perhaps it is a witness corner put in at the foot of a steep rocky bluff. The extent of country covered is great, usually extending from one hundred to two hundred miles along the railway and involving work in as many as thirty townships. Much time is also taken up in making connections with Indian reserves and provincial lots as well as retracements and closing of Dominion section lines. While making these connections especially when in open country, the chief is by far the hardest worked man on the party.

If complete surveys of the best agricultural townships had been made at the outset it would have proved much more economical and satisfactory but this of course could not be foreseen. This plan could not now be adopted without putting on a large force of surveyors otherwise the work would fall behind and urgent cases could not receive attention. Your present plan of having a township, or part of one, completed when it does not entail much extra labour is a move in the right direction and possibly the best that can be done under the circumstances.

It will be seen from what has already been stated that the railway belt cannot accomodate any large influx of immigrants. The land seeker here, at present, needs to be to some extent a prospector also. If the land lies on a bench he must use his judgment and experience as to what crops can be grown successfully without irrigating; possibly he may have to locate a road, and this also requires experience as quite often a roundabout way has to be taken to obtain a suitable grade; sometimes a switchback or loop has to be put in the road. If the land needs to be irrigated it will be necessary to investigate as to whether water can be obtained from a stream by damming or putting in a reservoir.

As the bulk of the farming lands in this district have been surveyed for some years it was generally expected that the survey list would soon reach the vanishing point. This however does not appear to be the case. On the contrary the list of surveys needed is yearly growing larger. Lands that were once considered unfit for farming are now eagerly sought after and people are gradually settling in the more remote isolated parts. Much depends on irrigation. The provincial government have had this matter under consideration and it is expected that legislation will soon be passed which will have a beneficial effect on all future irrigation works. The climate is perhaps one of the greatest inducements to settlement in this district.

The setback in business which prevailed throughout the country during the latter part of the year was marked by the closing down of the lumber camps and a few of the mines, causing many labourers to be thrown out of work with a consequent fall in wages. It is expected that this will be only temporary and that the usual industrial activity will be resumed in the spring.

A descriptive account of the land in the townships surveyed is attached hereto. My assistant, Mr. Geo. H. McCallum gave complete satisfaction.

I have the honour to be, Sir,
Your obedient servant,

JOS. E. ROSS, D.L.S.

APPENDIX No. 34.

REPORT OF A. SAINT-CYR, D.L.S.

SURVEY OF THE SIXTH MERIDIAN BETWEEN THE THIRTEENTH AND SIXTEENTH BASE LINES.

OTTAWA, February 17, 1908

E. DEVILLE, ESQ. LL.D.,
Surveyor General,
Ottawa.

SIR,—I have the honour to transmit to you the general report on my surveys during the past season.

These consist of the survey of the sixth initial meridian in a continuous line from the sixteenth base line as far south as the northeast corner of township 52, and also in locating its position beyond the Bullrush mountains which rise over 8,000 feet above sea level.

This last work was accomplished by surveying from the fourteenth base line the east outlines of township 52 and 51, range 27, west of the fifth meridian. Then from the temporary post left at the southeast corner of township 51, a traverse survey of eighteen miles was made around the eastern slope of the above mentioned mountains in order to define the position of the sixth meridian. This having been determined by calculations, the south half of the east boundary of section 1, township 49, range 1, west of the sixth meridian was surveyed south to the northeast corner of township 48. Here I planted an iron post and built a mound. This monument falls near the foot of the mountains west of Athabaska river and the pack trail between Jasper House and Big Smoky river crosses the line on which it is erected. As this line was well opened and blazed it will be an easy matter at any time to find this monument should it be required for future surveys.

On receipt of your instructions I immediately set about completing the returns of my previous season's surveys in the Peace river country from which I had just returned, and when it was convenient I attended to the final arrangements of the coming survey such as making inquiries for a few more pack-animals to be delivered to me at Edmonton, ordering a new camp outfit and having more supplies forwarded to Sturgeon lake which was to be my base of supplies for the first part of my work. I had previously been informed in Edmonton that some packers going to 'big eddy' on McLeod river had just returned to Lake St. Anne without reaching their destination, owing to the deep snow and scanty feed along the trail usually followed by the pack-trains, and that no one would undertake to freight in that direction till conditions should have improved. As a matter of fact part of my supplies which had been brought as far west as Lake Ste. Ann in February, were not delivered at 'Jocks house,' on Prairie creek, till the end of August. But in that district the conditions were such during the early summer that I presume such delays in transportation could not have been entirely avoided. On the strength of the information received in Edmonton, I decided to reach the country where my surveys were by way of Lesser Slave lake and East Prairie river settlement, where my pack outfit was stored and where the ponies which I was to use again on my present work had wintered. On March 28, I left Ottawa for Edmonton where I arrived five days later. Some time was spent here in hiring men and in trying to enlist the services of freighters willing to transport my party and outfit to Lesser Slave lake. This proved to be a

difficult task at the time because daily reports were being circulated in town by incoming freighters from the lake, that the ice had already broken over the rapids of Athabaska river. Finally through the untiring efforts of Messrs. Revillon Bros., Mr. Remi Baert and his brother consented to undertake the journey and finally signed the contract, having beforehand provided against loss by possible accident by insuring their horses for the trip.

On April 7 my party and the freighters left for the north with three heavily loaded sleds. In the meantime the ponies ordered had arrived. The pack-saddles etc., needed for these horses were soon ready, and on April 10 I started on my journey overtaking my party at Short's stopping place.

Near St. Emile, where there is a homestead, the freighters found it impossible to travel any farther with sleds and had therefore transferred the loads to wagons, continuing their journey with an extra team of horses and an extra wagon loaded with three sets of sleds which would have to be used again between Athabaska Landing and Stony point, at the head of Lesser Slave lake.

On April 12 we arrived at the Landing. The state of the ice on the Athabaska was far from inviting; so every precaution that experience could suggest was taken and two days later we reached without any serious mishap 'Dumont's place,' at the mouth of Lesser Slave river. Here were camped a party of colonists who were prevented for the present from proceeding any farther, on account of the unsafe condition of the ice on the river. They advised us not to attempt to travel any farther on the ice, greatly weakened by recent rains, so we took again the overland route cut by Mr. Selby's party and mine three years ago. As this road passes through the woods there was still at the time enough snow left on the ground to permit the use of the sleds.

On April 17 we camped at the foot of Lesser Slave lake. One of my freighters who had not been well for some time became very sick, and wished to return home. However, I pursuaded his brother that it would be preferable for all concerned to use all possible diligence to reach the end of the lake where the invalid would have the services of Dr. West of the Royal Northwest Mounted Police and those of the Roman Catholic mission. So we left the next morning and three days later camped at Stony point, Mr. Baert, being removed to the hospital where for several weeks he was very ill with typhoid fever.

At Stony point I found the narrows between Buffalo lake and Lesser Slave lake only partly free of ice and though the water is shallow at this point still the bottom of the lake is such as to make it dangerous if not impossible to cross with heavily loaded wagons. So I decided to go by way of the English mission, a rather long detour, but the only practicable road then.

We left Stony point on April 26, and reached 'Jobin's place' the same night. The next day we had to ford South Heart river which took considerable time as the water was very high. The scow which in previous years had done service as a ferry had been carried away by ice a short time before, so that in order to prevent our baggage or supplies from getting wet or spoiled they had to be placed on the top of the wagon boxes out of the reach of the water. This necessitated many trips across this stream.

The next day we reached Frank Mirault's ranch. Here I was able to hire two more freighters with their teams to carry to Sturgeon lake my supplies, outfit and also grain for my pack ponies.

The difficulties incidental to the trip between Edmonton and the head of Lesser Slave lake recur every spring. To travel this distance with any degree of certainty one must always provide two modes of transportation, *i.e.* he must have in his train both sleds and wagons to be interchanged as occasion requires it. These drawbacks may partly disappear in the future as the country becomes better settled, when casual help may possibly be obtained from the people living on the road. I have noticed

already quite an improvement in some matters along this route, stopping places, such as they are, have been built and more are being erected at convenient intermediate points along the rivers, while in my previous travels over this northern country the top of the loads afforded us the only resting place for the night.

Another source of inconvenience was that three years ago no horse-feed of any description could be had along this route; consequently extra teams had to haul sufficient bales of hay to last also for the return trip, a total distance of 300 miles. Now, hay can be procured at nearly all the stopping places.

In regard to oats, it is still cheaper to carry a supply. If this is not done one may be compelled to buy them at Lesser Slave lake where they cost one dollar per bushel. I have myself often had to give one dollar and fifty cents per bushel for oats and even pay this exorbitant price for large quantities.

The treacherous condition of the ice on Lesser Slave river is a constant and unavoidable source of danger. Besides twenty miles of bad rapids there are spots, such as, at the confluence of Saulteux river and Slave river, where the ice even during the coldest weather is honeycombed by air holes. Every winter valuable teams of horses are drowned and whole loads of supplies which cannot be duplicated are lost to the traders. Such mishaps occur too often and could only be prevented by the opening of an overland route between Athabaska landing and the head of Lesser Slave lake, one hundred and fifty miles apart.

On April 30, Mr. O. D. Hill delivered to me the government horses (16) and the pack outfit which I had left in his care two months before and I started for Sturgeon lake trading post on the winter road which passes by Snipe lake. On May 3 we came to Little Smoky river which had to be crossed on rafts; we continued our journey towards Sturgeon lake where we arrived on May 8. Here the freighters were paid off and preparations begun for our next trip to the starting point of my surveys.

At Sturgeon lake trading post I was surprised to see the lake still frozen over and no signs of spring yet perceptible. None of the bustle always attending at this season the exchange of furs for the commodities required by the native trappers could be noticed at the fort, and I was told that owing to the severest winter ever experienced in this district the natives were unable to return for the trading season and the Hudson's Bay company people were preparing to send them relief. The fall of snow had been so great that all their ponies perished, the little feed which they obtained during the winter months by pawing through the snow down to the grass being insufficient to keep them alive.

One Indian, who had worked for me when I was surveying in that district during the winter 1904-5, had just returned to the post from his winter hunt by following the trail which I intended to take in going to my work. He informed me that Simonette river and Moose river had overflowed their banks and that in the forest the snow was still in many places several feet deep and that feed along the trail was scanty and poor as no new grass had yet started to grow. So I decided to hold my band of horses a little longer at the lake wishing for heavy rains, the only thing that would draw the frost from the ground and start vegetation.

On May 13 we left the post and pitched our camp near a creek one mile and a half south of the eighteenth base line. The next day we started to move camp but we had not travelled very far in the forest before we got into the deep snow and had to return to our last camp. The packers with part of the horses were then sent back to Sturgeon lake with orders to bring camp supplies and some of the men's baggage which could not be carried on our previous trip. During the following days it rained continuously.

When the weather was settled again we resumed our journey and on May 21 camped on the right bank of Simonette river which two days later we had to cross on rafts loaded with our effects, whilst the horses swam across.

At this point there is a ford which I had often used in previous years but which could not be utilized now that the river swollen by the recent heavy rains and the melting snow in the hills had become a raging torrent which would have swept our loaded ponies off their feet.

Beyond the Simonette our progress was often checked by bad roads blocked by fallen timber and in the many days which elapsed before we came to the last crossing of the river at the north boundary of township 61, delays were constantly occurring at the crossings of overflowing creeks which had to be bridged over, and at the passages of extensive swamps which had to be corduroyed. Add to this frequent rains followed by snowstorms and a pretty good idea can be formed of the unfavourable conditions under which we had to travel. The whole country is very hilly and in many places the land is also covered with dead trees lying in every direction and piled up several feet high. There are also large tracts covered with thick willow or scrubby young pine.

On June 13 we arrived at the last crossing of Simonette river, which was forded without difficulty though the current is very swift at this spot, and we camped on a low point at the confluence of the river with one of its southern tributaries.

On June 27 I reached the northeast corner of township 60, range 1, west of the sixth meridian which was the initial point of my surveys. The position of the monument to mark that corner having been established according to your instructions, I proceeded south with my surveys.

GENERAL DESCRIPTION OF THE COUNTRY ADJOINING THE SIXTH MERIDIAN, FROM THE NORTHEAST CORNER OF TOWNSHIP 60, TO THE NORTHEAST CORNER OF TOWNSHIP 52.

Beginning at the northeast corner of township 60, the sixth meridian runs south one mile through spruce and pine woods. In section 25 it enters an extensive tract of brulé, at the present time thickly covered with deadfall. This land is poor and deeply cut up by the valleys of tributaries to Simonette river. By a gradual ascent the line rises in section 13 to 4,450 feet where it crosses the watershed between Simonette river to the north, and Little Smoky river to the south. The divide here consists of several ranges of hills and nearly parallel to the north boundary of township 59. The ramifications of the outer ranges extend far into the township south of this line and in the intervening depressions are many spruce swamps, muskegs and lakes. One of these lakes, over one mile long and one-third mile wide crosses the line at the northeast corner of section 1. Those found on the northern slope of these hills drain towards the Simonette, whilst the streams which rise on the opposite slope empty into Little Smoky river which flows from west to east through the middle of township 59.

These hills whose tops and northern slopes are timbered mostly with jackpine extend far to the west where they appear to connect with the foothills of the Rocky mountains.

From the divide, (altitude 4,450 feet) one gets a comprehensive view of the general direction of the valley of Little Smoky river and of the intricate windings of this stream so that the course of the river can be traced to the foothills. There it bifurcates and seems to emerge from two principal gaps, the widest one coming from a southwesterly direction.

A southern tributary joins also the Little Smoky at half a mile west of the corner of section 13, where the river leaves township 59.

At its crossings (altitude 3,925 feet) on the line, the river is a chain and a half wide and flows at the rate of three or four miles an hour over a stony bottom. At the time of survey (July) this stream was easily forded with horses.

The valley of the Little Smoky is three and one-half miles wide between the edges of the hills which bound it on its north and south sides and is 350 feet deep. Except the narrow belt of merchantable timber above mentioned as contiguous to the

river, the forest which years ago covered the bottom land in this valley and the slopes of the hills on either sides has been overrun by fires and the road which followed at some distance the left bank of the Little Smoky is so obstructed by fallen timber as to be impracticable for travel. Some Indians from Sturgeon lake informed me that this road led to the headwaters of the Little Smoky and that from that point one could cross the divide and reach Big Smoky river in half a day.

A lake surrounded by hay meadows which cover part of sections 26 and 27 drains into Little Smoky river. It lies in a secondary valley parallel to that of the river from which it is separated by low gravel ridges. Between the river and the hills which rise south of it some prairie land with good soil was noticed along the right bank of the river through township 51, range 1.

With this exception the rest of this township is hilly and the soil in the northern half is a clay mixed with gravel and stones; in the southern half, the surface soil is clay mixed with sand and it overlies a subsoil of gravel.

Little Smoky river does not take its rise in the Rocky mountains but judging from the dark brownish color of its water it must head from swamps and lakes in the hills at the divide of Big Smoky river.

Continuing southwards along the east boundary of township 58 we passed through a rolling country where the soil is sand mixed with clay and which supports a second growth of small poplar and jackpine. Gravel ridges separated by large spruce swamps recur constantly.

In the middle of section 13 the line crosses a large creek, the last of several unimportant ones all flowing northeasterly towards Little Smoky river. Along each side of this creek runs an Indian pack trail. Half a mile farther, after crossing a low divide we came to a northern branch of Baptiste river which flows in the next important valley intersected by the sixth meridian.

The aspect of the country remains unchanged in township 57, whose principal feature is Baptiste river, a swift flowing stream which must take its rise in glaciers in the Rocky mountains. Its origin is easily inferred from the greenish appearance of the water so different in colour from that of all the streams met so far.

At the northeast corner of section 12, where it intersects the line, Baptiste river is forty-five yards wide. At about one mile east of that point it receives from the north an important tributary, the same in fact which crosses the line at the northeast corner of section 1, township 58. Small patches of prairie land are found near their confluence. Where the sixth meridian intersects the river its banks are low and wooded. Along the left bank the wooded flat extends half a mile back to a sandstone bluff one hundred feet high. On this flat grow spruce trees six to eighteen inches in diameter. On the opposite side the sandstone ledges, though not more than sixty-five feet high, drop abruptly to the water's edge. Thus through this sandstone bed the river has cut a valley half a mile wide where rocky bluffs and wooded flats alternate along its course. Baptiste river is an important tributary of Athabaska river and has always been recognized by the natives as the territorial division between the northern tribes inhabiting the Sturgeon lake country and those living in the vicinity of Jasper House near the foot of the Rockies.

In the centre of section 36 runs a belt, one-half mile wide, of balsam fir and spruce six to thirty inches in diameter and at different places in this township are patches of green timber of small size. The soil is sand mixed with clay; the subsoil, clay and gravel. South of Baptiste river the soil is a coarse yellow sand so thinly distributed on the top of the sandstone ledges that it made it difficult at certain corners to drive in the iron post to the proper depth. A creek flowing through some prairie land crosses this line a quarter of a mile north of the corner of township 56. It flows northeasterly towards Baptiste river.

From the northeast corner of section 36, township 56, the sixth meridian ascends gradually to the summit (4,400 feet) of wooded hills which cover the southern half of this township and cross the line at the north boundary of section 1. Here also stands

another range resembling a terrace or table-land wooded with jackpine and for six miles, bearing a little east of north. This table-land bounds on the east the valley of a stream which rises in a large muskeg covering the north half of section 12. This creek flows between high cutbanks of sandstone and receives several tributaries which drain the swamp lands west of the line.

In sections 12, 13 and part of sections 14, 23 and 24, grow spruce and jackpine from four to eight inches in diameter. The other sections are covered with burnt timber and deadfall overgrown with a second growth of pine or scrub and willow. The land is also stony in many places. In the swamps, which are numerous, grow small spruce trees up to six inches in diameter. In the southern half of this township the soil is clay mixed with sand and a clay subsoil, which changes to gravel and stones in the other half. A quarter of mile west of the corner of section 36 there is some open prairie land.

In the northern part of township 56, there are many isolated groups of hills which are separated by marshes and have sandy and gravelly slopes supporting a light growth of scrubby poplar and jackpine. From the top (4,625 feet) of one of these hills six chains east of section 24 a good view of the Rocky mountains was obtained and measurements were taken on all the prominent peaks in order to determine their positions and altitudes. In the southern half, which is high rolling, meanders, a large creek which crosses the line in section 13. At one mile east of this point it receives from the north a tributary as large as itself. With a volume of water thus doubled the main stream now takes a northeasterly direction towards Baptiste river into which it empties. One mile north of the junction of these two creeks the width of the valley of the northern tributary is considerably reduced by escarpments of sandstone forty to fifty feet high, which reach down to the water's edge, thus causing a gorge. This spot would be an ideal one for developing water-power should the necessity arise in the future.

In the expansion of the valley above the gorge there is quite a stretch of prairie land and partly open country.

These remarks apply also to the valley of the main stream which flows along the north boundary of section 12.

The only live timber (spruce and pine, six to ten inches in diameter) to be found in this township grows in a narrow belt along the left bank of the last mentioned stream.

The soil is generally a sandy clay overlying a subsoil of clay.

Approaching the mountains the elevation of each successive ridge increases till in township 54 there is a prominent landmark called Jarvis ridge (altitude 5,050 feet). It is a remarkably straight but narrow terrace which extends across the centre of this township from east to west and continues on the same bearing far into range 2, where it terminates in an abrupt descent of several hundred feet to the general level of the country. This table-land is the watershed between the valley of Endurance creek (4,400 feet), which drains the southern half of this township and another large stream which flows along its northern boundary.

Sections 12, 13, 14, 15, 16, 17, 18 and 24, are wooded with spruce and pine, six to twelve inches in diameter. The other sections are covered with deadfall overgrown with willow or a second growth of jackpine. Large tracts of land in this township are swampy and marshy.

The soil, which is of clay mixed with sand, varies in depth from four to eight inches. The subsoil is generally clay.

The surface of this township is very hilly and it has a general downward slope towards the east.

The next stream of any size is a branch of Hay river. It runs diagonally across township 53, entering at its northwest corner and crossing its east boundary in section 1. From that point (altitude 4,600 feet) it flows eastward and three miles far-

ther joins Hay river (altitude 4,050 feet) in section 51, township 53, range 27, west of the fifth meridian.

The foothills of the Rocky mountains, which in this vicinity trend northwesterly, cover one-half of this township. They rise to an altitude of 6,000 feet above sea and at their tops frequently appear escarpments of brown coloured sandstone. In the numerous narrow valleys which divide each range of hills are found strips of open and grassy land with good soil. These low lands, however, are liable to be flooded.

Along the hillsides the soil is generally gravel mixed with clay, and near the top the land is often very stony. Years ago a destructive fire overran this country, which is now covered with deadfall.

The pack trail from Jasper House to Big Smoky river intersects the east boundary of section 24. From that point it appears to follow the valley of the tributary to Hay river above mentioned. Owing to the proximity of the Bullrush mountains (altitude over 8,000 feet), which at that late season might have proved a formidable obstacle to the production of the line farther south, the survey of the sixth meridian was discontinued at the northeast corner of township 52. On November 14, I moved my camp to the northeast corner of township 52, range 27, west of the fifth meridian, and on the following days I surveyed south twelve miles more to the thirteenth correction line.

DESCRIPTION OF THE COUNTRY ADJOINING THE EAST BOUNDARY OF TOWNSHIPS 52 AND 51, RANGES 26 AND 27, WEST OF THE FIFTH MERIDIAN.

Beginning at the fourteenth base line the east boundary of township 52, range 27, west of the fifth meridian, passes through three-quarters of a mile of rolling and wooded land, having a loamy soil resting on a clay subsoil. Beyond this the line enters a burnt forest and ascends gradually to the eastern slope of a range of hills which divide the basin of Hay river, west of the line, from a troughlike depression running parallel with the line at an average distance of one mile and a half east of it.

The surface of the southern part of this township is broken by hills rising to an altitude of 6,000 feet and whose tops and slopes are covered with burnt timber, most of which is still standing, whilst lower down where the ground is often marshy, some small areas support live spruce.

The central part is high rolling country merging into a series of benches of decreasing altitudes as one approaches Hay river, a mountain stream fifty yards wide and with a swift current flowing over a stony bottom. In the bottom lands, adjacent to the river the soil is good, on the benches, it is sandy clay overlying gravel.

The pack trail from Jasper House to Big Smoky river intersects the east boundary of this township in section 36. It then runs west two miles farther and after crossing a deep gulch with a creek which drains an extensive spruce swamp this trail continues northwesterly across the north boundary of section 34 towards the ford on Hay river about one mile farther on. At this point (altitude 4,050 feet) in the month of September the water was three feet deep in the channel. Some prairie land exists along the left bank of the river and this spot used to be a favourite camping ground for the Indian hunters as there is an abundance of good feed for their ponies. Above the ford the general course (south 20° west) of the river leads into the mountains, here the river flows between high cutbanks of gravel.

Below the ford, where the river turns to the northeast the banks are lower. Through repeated fires the spruce forest which once covered this valley has disappeared and to-day patches of cleared land are found in many places along this stream.

The general elevation of the valley of Hay river, near the ford is 4,050 feet. It enters the north boundary of this township in section 32, and from that point it continues for several miles in a southerly direction towards the Rocky mountains.

A narrow, but deep valley, bounded to the east by hills rising 1,400 feet above its level, runs across the whole length of township 52, range 26, from section 32 to section 5.

In this depression are many lakes; the two largest ones, three miles and a half apart are named Jarvis lake (altitude 3,875 feet) and Gregg lake. The upper lake is the larger and is studded with islands, all wooded; the other one is very shallow; both are teeming with whitefish, pike and ling. These lakes are all connected and by the outlet of Gregg lake drain into Hay river, which flows into Baptiste river, itself an important western tributary to the Athabaska.

Jarvis lake covers nearly three-fourths of section 32, and Gregg lake the greatest part of section 5 and the half of section 8. In these lakes and all the streams which empty into them, the water is fresh.

What constitutes the only level land in this township would be included in section 17, the soil being wet and swampy, and sections 20 and 29, which contain some good prairie land, well drained. This strip of arable soil is bounded on the west by Gregg creek and on the east by a succession of hills culminating in a terrace or table land (1,400 feet above the valley).

The west slope of this high land drops abruptly to the eastern shore of Gregg lake, it has no vegetation thus exposing to view many ledges of sandstone. The southern slope, however, is densely wooded, not so abrupt and terminates at the edge of two other lakes (4,200 feet) draining towards the valley of Jarvis lake.

The pack trail between Jasper House and Big Smoky river passes from south to north through this township, which it enters in section 6. Here it follows the pine ridges along the west shore of Jarvis lake. In sections 17 and 29 it crosses Gregg creek. From the last crossing it goes to the west shore of the lower lake, where a branch of this trail follows close to its shore and eventually leads also to Hay river. The main trail, however, takes a westerly direction and intersects the east boundary of township 52, range 27, in section 36.

In section 17 another well travelled pack trail starts from the Jasper House and Big Smoky river main trail and passing at a short distance south of two small lakes enters a pass (4,350 feet) opening into the valley of Athabaska river, whence it leads in a southeast direction to a point on the river opposite the mouth of Prairie creek. At this point Athabaska river is not fordable, and the crossing is usually effected on rafts. Here also to the south very high perpendicular cliffs extend some distance along the west bank of the river. The opposite bank is low and close to it is an island wooded with spruce and cottonwood.

From the landing on the right bank of the river start two trails, one leading south follows the valley of the Athabaska, whilst the other one after winding up the steep side of high hills leads to Jock's ranch, three miles farther in the valley of Prairie creek. Jock's ranch is the first inhabited place we come to on the road to the Yellowhead pass, after leaving the 'big eddy' settlement, on Macleod river.

In sections 6, 12 and 13, of township 52, range 26, the timber is mostly jackpine from six to ten inches in diameter, spruce and poplar. The soil is a yellow clay mixed with gravel; in the hills the land is stony.

From the northeast corner of township 51, range 27, the line descends gradually to the level of the depression in which are Jarvis and Gregg lakes. In section 1, it passes over Solomon mountain (altitude 5,200 feet) a sandstone bluff with precipitous sides to the west, while north and east its foothills spread far into the interior of the next range.

The surface of this township is also very hilly and deeply furrowed by the valley of Solomon creek and the gulches of its tributaries.

The soil is sandy, but the subsoil is gravel or stones mixed with clay; nearly all the timber has been destroyed by fire, a few scattered small patches of green bush appearing, however, here and there on the slopes of the highest hills.

The pack trail from Jasper House to 'Grande prairie' crosses the line in section 13. It winds through some open land, which slopes down to the southwest and extends to the valley of Solomon creek. Beyond this stream, a stretch of partly open country, one mile or so in width, continues for six miles farther south to the foot of the Bullrush mountains (altitude 8,000 feet).

Towards the east, this prairie land ends at a narrow strip of green timber growing along the west shore of Brulé lake, (altitude 3,200 feet) an enlargement of Athabaska river.

The depression which crosses from north to south in township 52 continues also on the same bearing and with the same features through township 51. The open land begins at the southern extremity of Jarvis lake (altitude 3,875 feet) in the middle of section 32. It forms a strip less than a mile wide and which extends through sections 29, 30, 19 and 18, where, owing to the vicinity of Solomon mountain (altitude 5,200 feet) it turns to the southwest. This prairie land has soil of sandy loam twelve inches deep overlying a subsoil of gravel mixed with clay. Where its edge merges into the foothills the surface is covered with much scrub poplar and willow brush while the top soil is also shallow.

In the middle of section 18 there is a hay meadow. The pack trail between Jasper House and Big Smoky river crosses the west boundary of this township in section 18, whence it turns north and winds two miles and a half across well drained and open land. In section 30 it enters the open pine woods along the west shore of Jarvis lake. Spruce and jackpine grow in sections 19, 30 and 31, but on the high hills which cover the rest of this township all the timber is burnt.

My next work was a traverse survey eighteen and one-quarter miles long. Its initial point was the temporary post planted at the southeast corner of township 51, range 27, west of the fifth meridian on the north side of the road allowance along the thirteenth correction line.

By that traverse the distance between this line and the mouth of Solomon creek is two and one-quarter miles. This creek is a western tributary of Athabaska river which it joins at the point where the river flows out of Brulé lake. Thence the survey continues for seven miles along the western shore of this lake which, at the time of survey (November 26) was nearly dry, the subsiding waters being confined to a single channel winding amongst the quicksands and banks of fine silt which form the bottom of the lake.

At the southern end of Brulé lake it was necessary to carry the survey over a high rocky ridge which projects eastward from the mountains and ends abruptly at the water's edge of Athabaska river. The pack trail ascends also nearly 1,000 feet along the mountain side. Beyond this ridge instead of following the river whose banks are heavily wooded, the survey was continued westwards along the foothills and in close proximity to the pack trail which passes through the more open sections of the country. In section 18, township 49, range 27, it descends to a large flat and after crossing Moose creek, which rises from a lake in the mountains, it leads through level prairie land which covers parts of sections 18 and 7. On leaving this prairie the survey passes over high and partly timbered hills overlooking Athabaska river whose left side it follows up to the east boundary line of section 1, township 49, range 1, west of the sixth meridian. This line was surveyed south from the quarter section post to the northeast corner of township 48, where the thirteenth base line should intersect the sixth meridian.

REMARKS ON THE COUNTRY ADJOINING ATHABASKA RIVER, ABOVE AND BELOW BRULÉ LAKE.

Brulé lake is a shallow expansion of Athabaska river. It is about one mile and a quarter wide and six miles and a half long, with its longer axis in the direction

of the meridian. On its eastern shore are sandy dunes denuded of vegetation. Dunes were also noticed along the right bank of the river a few miles above the lake and especially near the mouth of Fiddle creek where standing live trees at the edge of the woods, which here extends to the water's edge, are buried to the depth of fifteen or twenty feet in this fine sand which is constantly being driven in that direction by the prevailing southern winds. These dunes also apparently supply part of the material which is gradually filling Brule lake.

Very different is the country along the west shore which is low and bordered with green timber next to which comes level prairie land gently rising towards the escarpment of Bullrush mountains, forming an impassable barrier one mile west of the lake. The strip of prairie land is six miles long by one mile wide, is well watered by numerous small mountain streams and its altitude above the sea is practically the same as the place twenty-five miles farther south where Messrs. Swift and Moberly Bros. and others raise grain and root crops. This land should be just as fit for farming as any of the other places.

This prairie land is easily accessible from two directions. After the Athabaska has been crossed one road starting from Athabaska Landing opposite the mouth of Prairie creek, leads to it by following a southwesterly direction over the grassy benches along the left bank of the river. On this road at about three miles above the landing we passed some good prairie land and extensive hay meadows at the upper end of which Mr. Smith has built a house. One mile beyond Smith's ranch the trail crosses a large creek flowing in a very deep gulch with high precipitous banks and ascends to a plateau several hundred feet above the river level. A mile farther the trail bifurcates. The left branch keeps along the eastern edge of the plateau which overlooks Athabaska river and continues across prairie for three miles farther, when it enters open woods of pine and scattered spruce averaging eight inches. This forest extends easterly to the river which runs within half a mile of the edge of the plateau. South and west it extends to the valley of Solomon creek and the foothills of Solomon mountain. In crossing this forest the trail keeps at the same altitude descending at last to the level of Athabaska river, where it receives Solomon creek. After crossing the creek near its mouth, the trail follows for a quarter of a mile close to the shore of Brulé lake and ascends to the top of some timbered ridges which shut off the valley of Solomon creek from the south. Shortly after it debouches in the prairie lands previously referred to. The right branch of this trail turns more to the southwest and skirts the western edge of the forest at the foot of Solomon mountain, crossing Solomon creek three or four miles above its confluence with the Athabaska, whence it leads also to the prairie lands adjacent to the west shore of Brulé lake. These lands could also be reached from the south by a road which leaves the main Yellowhead pass road close to Stony river but in my opinion the others are shorter and easier to travel.

Above Brulé lake, Athabaska river divides into innumerable channels, separated sometimes by wooded islands but more frequently by large gravel bars covered with large quantities of drift wood through which grow thick willows.

Where it issues from the lake the river is confined to a single channel and a quarter of a mile below the lake it turns to the northeast. Here its channel is obstructed by large boulders. With this exception its course is remarkably free from obstacles and continues in one channel, only an occasional wooded island being encountered, till at Trail creek, one of its eastern tributaries, another rapid occurs in a sharp bend of the river. A bad canyon, however, is reported to exist somewhere near the confluence of this river with Baptiste river.

On December 5, having completed the survey of the sixth meridian as far as instructed, I started for Athabaska river, crossing on the way Stony river near the place where it leaves the mountains. The river which here runs in a single channel is quite deep and very swift, but I found a better ford half a mile farther down

where it divides into several shallow channels spreading through a wide stony flat. After crossing this river the trail which we had followed thus far, connects with the Yellowhead pass trail. From the junction of these trails, we travelled through an extensive prairie as far as the left bank of the Athabaska, which we forded without difficulty, as it was still free of ice at that late date. This is the place where all pack trains bound for Yellowhead Pass cross the Athabaska. It is a long and intricate ford, and its crossing should not be attempted at high water by parties unacquainted with the location of the different gravel bars which have to be partly followed. There are many channels to cross, some of them quite deep and swift. This network of channels is a feature of the river in this vicinity. Below the crossing they extend to the head of Brulé lake, where years ago there used to be another ford just where Drystone creek enters the river from the east; but the gravel bars here having been partly washed away, the ford is not practicable to-day except at very low water.

On December 6 I continued my journey along the right bank of the river and camped that night on Fiddle creek, one of its eastern tributaries.

The approach to Fiddle creek from the north may be properly called the gateway to the Rocky mountains in the neighbourhood. Their massive escarpments of grey limestone rising in successive tiers to seven and eight thousand feet above the sea add much to the landscape on both sides of Athabaska river, and the scenery compares favourably with that of other sections of the Rockies.

In the angle formed by the valleys of Fiddle creek and Athabaska river stands 'Roche à Miette,' a prominent landmark, visible from a long distance. It is the abrupt western termination of the high range of mountains which divide the valleys of Drystone and Fiddle creeks. This last stream flows from east to west through a deep narrow gorge, cut through rugged and high peaks. At about three mile up one of its southern affluents are several hot springs; two of them are reported to have a very high temperature. From the junction of these streams it is about twelve miles to the valley of Athabaska river. At present it is difficult to reach these hot springs, for the only path which leads to them is very faint in many places, and winds high up the precipitous sides of the mountains south of the creek.

On December 7, we left Fiddle creek and two and one-half miles farther forded Drystone creek, another mountain stream. One mile north of the ford we came to pine and spruce woods on the divide between Drystone creek and Prairie creek. The forest gradually disappears as one travels northward and within four miles of Jock's house the country which has been burnt over repeatedly has a generally open appearance. Through this flows Prairie creek and three miles above its confluence with Athabaska river stands Jock's house. Here Jock and his partner J. J. Gregg, settled eighteen years ago and for a long while theirs was the only habitation between the new settlements at the eastern extremity of Chip lake and Moberly's ranch at the foot of the mountains. Lately it became the distributing point for several parties of engineers sent by the Grand Trunk Pacific company to explore the passes for their railway. Though the land along Prairie creek is fertile, very little cultivation has been done by these men who divide their spare time between trading with the natives and ranching for which this country is well adapted.

As a result of the warm Chinook winds which frequently blow down the valley, the winters here are not severe and the fall of snow is so light that hay is never put up for cattle or horses, nor shelter provided for them.

On a small tributary which springs from the hills east of Prairie creek into which it flows, beds of coal have been discovered and coal claims were staked during last summer.

A pack trail seldom travelled by whites, starts from Jock's ranch and proceeds eastwards along the valley of Coal creek which it follows to the divide, it continues in the same direction till near McLeod river it meets another trail running at right

angles to the former and which connects 'The Leavings' on McLeod river with the head waters of McLeod, Pembina and Brazeau rivers. At first I intended to reach the big eddy of the McLeod by following this trail and thus examine this new section of country so as to be able to report on it but, being informed that the grain ordered for the return trip to Edmonton had not yet been delivered, I reluctantly gave up my project and had to take the old yellowhead pass trail, which follows the right bank of Athabaska river to its intersection with the fourteenth base line where I knew oats had been cached by Mr. Geo. Ross, D.L.S.

The country adjacent to the trail connecting Athabaska river with the big eddy of McLeod river is so minutely described by Mr. Geo. Ross who surveyed the fourteenth base line which runs through it that I need not further refer to it.

To sum up, the larger portion of the country visited last summer, if we except some scattered areas of arable land which have proved productive, will be more suited to stock-raising than to farming, after the land which is quite rough and has a light soil, has been cleared of the windfall which at present covers the greater part of it. In many places along the valleys of the largest streams will be found bluffs of spruce and poplar, and clumps of thick willow which make fine shelter for cattle. In the intervals are patches of prairie land and hay meadows, some of them quite large.

During the summer while engaged in the survey of the sixth meridian, I never missed an opportunity of taking measurements from proper elevations along the line to all the most prominent peaks of the Rockies which came into view.

With these data I have worked out their altitude above the sea and also the position of these mountains relatively to the sixth meridian, but, owing to the greater elevation of the country west of the sixth meridian and sometimes also to thick bush near my stations no outlook to peaks farther west than thirty-five miles could be obtained. Beginning at the valley of the Athabaska and proceeding westward we have the Bullrush mountains which extend eastwards beyond the sixth meridian, northeasterly they extend to Solomon creek and southwesterly to stony river. To the northwest they are separated from the main range of the Rocky Mountains by Hay river, which flows out of Rocky lake fed by mountain streams. Extensive prairies surround this lake which is much frequented by the natives during the summer as its vicinity affords ideal camping grounds. South of the lake is a low divide between the valleys of Hay and Stony rivers which approach within half a mile of each other.

Northwest of Bullrush Mountains from which they are separated by the valley of Hay river are other mountains presenting a fairly regular outline bearing north 70° west and apparently terminating twenty miles farther at a conical shaped peak (altitude 8,850 feet). From that point the mountains seem to recede towards the southwest.

Returning to the valley of the Athabaska and looking southwards from the middle of the east boundary of section 1, township 49, on the sixth meridian, one cannot help noticing an isolated high peak (altitude 9,100 feet) of pyramidal shape and standing apparently in the middle of the valley. In reality it occupies the angle formed at the entrance to Yellowhead pass by Athabaska and Miette rivers. Near the base of this peak stood the old 'Henry House,' a trading post long ago abandoned. On Capt. Palliser's map this peak is called Pyramid Mountain.

Of the mountains east of Athabaska river the most prominent summits of the range separating Drystone creek from Fiddle creek were determined as far east as the sources of McLeod and Pembina rivers.

As for the next range rising north of Rocky river, only these mountains at its western extremity and a few peaks near the head waters of this river were located, as the intermediate peaks are hidden from view by the first range above mentioned.

Regarding the climatic conditions in this country, I may state that up to the middle of August we suffered great discomfort and experienced vexatious delays due to continuous heavy rains, often followed by ten or twelve inches of snow, which,

however, would melt away in a few days. I may also add that in midsummer, ice half an inch or more in thickness frequently formed during the night on water left in receptacles in my tent. Such unusual occurrences could, however, be accounted for by keeping in mind the great elevation (4,400 feet) of the country.

These daily outpours which had prevailed in the district where I was surveying so long as we remained thirty or forty miles away from the mountains, gradually decreased in frequency and intensity the nearer we got to them. The reason for this change is apparent. Western storms originate in the mountains, as on any bright day we could plainly see the clouds forming around the highest peaks. In the interval a vacuum is caused in the superheated air on the plains to the east. Hence the rush of the colder air from the higher altitude towards the lower level of the plans, carrying before it the storm clouds; precipitation from those would begin only when at already some distance from the origin. However, these may be only local conditions.

To compensate for the disagreeable weather of the early part of the season we were favoured with the finest fall weather it has ever been my luck to experience in the northern country, and up to November the days were balmy; as there was very little snow on the ground the survey work could be carried on without interruption.

Large game is plentiful in this country and consists of moose, along the valleys of Baptiste and Hay rivers; black, cinnamon and silver-tip bears are numerous throughout. Mountain sheep and goats live in the foothills and appear in great numbers west of Brulé lake. Beavers were noticed at work on the headwaters of Simonette river and on some tributaries of Baptiste and Hay rivers. Small game, such as grouse, rabbits and waterfowl are scarce, but the lakes are teeming with whitefish and pike; and in the running streams trout of many species were caught.

On December 7, I returned with my outfit to Gregg's ranch, near Prairie creek, and arranged with him for the transport to Lake St. Ann of part of my outfit, some of my pack horses being so poor as to render them unfit to carry heavy loads on such a trip at that season.

On December 9 we left for Lake St. Ann, which we reached on the 20th. Three days later I was in Edmonton.

On the 26th, having received the necessary funds, I paid off the party and on the 29th left for Ottawa, where I arrived on January 2.

I have the honour to be, sir,
Your obedient servant,

A. SAINT CYR, *D.L.S.*

APPENDIX No. 35.

REPORT OF J. B. SAINT CYR, D.L.S.

SETTLEMENT SURVEYS IN PEACE RIVER DISTRICT.

MONTREAL, February 24, 1908.

E. DEVILLE, Esq., LL.D.,
Surveyor General,
Ottawa.

SIR,—I have the honour to submit the following general report on my field operations during the past season in Peace River district.

In accordance with your instructions, dated March 1, 8 and 15, 1907, I left St. Anne de la Perade on March 22 for the west. I arrived in Edmonton on the 29th of the same month. I began making the necessary arrangements and hired the men, and on April 10, I left Edmonton with three teams. On the 13th we arrived at Athabaska Landing and on the night of the 17th, we reached the lower end of Lesser Slave lake. On the evening of the 25th we arrived at Peace River landing, where the ice had broken two days before. The banks and shores of the river were regular walls of blocks of ice and a place for landing could not be seen on either side of the river. In order not to stay idle waiting for a more favourable chance to cross, we commenced the subdivision of Peace River Landing settlement and worked at it until May 6, when we could take my outfit across the river.

On May 8, we left Peace River landing on our way to Dunvegan, where we arrived on the 11th. On the 14th and 15th the teamsters which I sent for, came to Dunvegan and took my outfit to Spirit river, and on the 17th of the same month we started the survey of Spirit River settlement. Before giving any description of this Spirit River country, I will mention 'Little prairie,' about twenty miles southeast of Peace River landing on Lesser Slave lake trail as a good location for some future survey. There are a few squatters there and each one of them is very anxious to have a surveyor locate him and to make some subdivision. There is quite a long stretch of good country, prairie and bluffs at 'Little prairie' along the wagon trail.

North Heart river drains that country, furnishing a permanent supply of good water. Timber for building purposes is also plentiful in the vicinity of 'Little prairie,' and in fact all along the trail. Peace River landing is a very small flat, surrounded by hills ranging from six hundred to eight hundred feet above Peace river. The flat itself is about fifteen feet above the river at low water. The greater portion of that level land was surveyed by me in the spring, as above stated.

Eight miles above Peace River landing and on the west side of the river begins Shaftsbury settlement, occupying a narrow but very long flat of the best soil. The crop raised this year in that settlement was magnificent, the oats and wheat being of the highest grade. Squatters are scattered from this settlement to Peace River landing along the river waiting for the survey of this tract of land. The country there is undulating and gently rolling, but the soil is comparatively good. From Shaftshury settlement two trails, one southwest and the other west, diverge for a certain distance to meet again east of Burnt river, forming there the Dunvegan wagon trail. The more southerly trail crosses a very good farming country. The soil is richer and contains more moisture than on the upper trail. A spring creek

flowing through township 81, range 25, west of the fifth meridian, runs both in winter and summer, supplying the best of water. Hundreds of settlers could locate with those already established there. The subdivision of a few townships in that vicinity is urgent. On the other trail the country is mostly prairie with the exception of the land bordering on Burnt river, where it is prairie and bluffs. Later on townships 82, 83 and 84, range 1, west of the sixth meridian, might be subdivided and afford a good location for newcomers. Burnt river runs until late in the summer and timber for building purposes is plentiful along its banks. The country has a very fine aspect and is nearly level.

Dunvegan as well as Peace River landing is another navigation point. The flat on the north side of Peace river is all taken up; it is surrounded by hills varying from 400 to 600 feet high. The survey of that settlement will probably be completed next summer. A belt of timber six miles wide borders Peace river on the south side along Spirit river road. South of that timber the country is prairie and bluffs. The land is gently rolling from the timber towards the south for about four miles, where it begins to be level as far as Spirit river, a distance of about nine miles. The open country around Spirit river extends about ten miles to the north, eight miles to the southeast, four miles to the south and about fifteen miles to the northwest. All this land is well adapted for farming and ranching purposes. Spirit river with a few lakes here and there furnishes a good supply of water nearly all the year around. Timber for building purposes and wood for fuel are plentiful. The climate is very good in all that district and early summer frosts are not frequent. There are a few squatters on the Dunvegan road, north of Spirit river, asking for subdivision survey in that direction next summer. The grain and vegetables raised there last summer were exceedingly good. The people of that country are satisfied so far. Settlers will certainly before long join those pioneers of the country.

The survey of Spirit river settlement was commenced on May 17 and was completed on June 22, 1907. The settlement lies on both sides of Spirit river with two rows of lots. It measures about four and a half miles from east to west by about two and a quarter miles in depth and contains fifty-nine lots of different sizes all of the best farming land. The people of that settlement are well encouraged and expect to have a saw-mill in operation next summer and to have threshing machines and a boring outfit, as they intend to bore wells in different parts of the district.

Following out my instructions, we left Spirit river on June 23 on our way to 'Grande prairie, where we arrived on the 26th of the same month. We first surveyed the north, east and west boundaries of townships 72 and 71, range 6, west of the sixth meridian and subdivided a portion in each township, also Flyingshot Lake settlement, in township 71, range 6. These surveys commenced on June 24, and were completed on August 20. 'Grande prairie' had a very fine appearance this summer and no better grazing land and hay land can be seen anywhere. The surface is prairie and bluffs, gently undulating. The soil is a deep black loam and deep black sandy loam overlying a clay or sandy clay subsoil. That open country may extend from east to west about forty miles and nearly twenty-four miles from north to south. Streams cross the country in all directions and there are also a few good sized lakes of soft water. Timber for building purposes is plentiful and can be procured almost everywhere. The land is suitable for farming and ranching purposes. The climate is very good and early summer frosts are not frequent. Vegetables and grain are successfully raised there. The few scattered squatters of 'Grand prairie' appear to be satisfied and have great faith in the future of that country, which is large enough to make a province by itself. The means of communication for reaching that district are improving every year and people can travel with more comfort and in less time to that northwestern country than before. I never witnessed such fine weather anywhere as last fall in that district. Having completed the above mentioned surveys in 'Grande prairie' we came to Spirit river to outfit for further surveys north of Birch hills and across Brulé river, Spirit and Peace river as far as the twenty-first base line.

On August 27, we left Spirit river for Grizzly Bear prairie where we arrived two days later. That prairie is nothing but a narrow strip of prairie following a wagon trail, as far as township 77, range 2, west of the sixth meridian, a distance of about twenty miles from Spirit river. According to additional instructions received in August we began the survey of the east boundaries of townships 77, 78, 79 and 80, ranges 3 and 4 and made the subdivision of township 78, range 3, west of the sixth meridian. These surveys were commenced on August 30 and were completed on December 24. The country surveyed is mostly thick bush with the exception of that portion of township 77, range 3, situated north of Birch hills, which is prairie and bluffs. The remaining portion of that township, viz.: four miles by six miles on Birch hills, is thickly timbered with spruce, poplar, birch and large willow with patches of jackpine here and there. The spruce timber is of good quality and suitable for lumbering purposes. The average height of Birch hills above the prairie is about two hundred and twenty-five feet. In township 78, range 3, half way between Brulé river and the wagon road, there is another belt of fine spruce timber suitable for making lumber extending nearly five miles from west to east with an average width of about a mile. The soil is fairly good from the foot of Birch hills to a mile north of the trail, but in the remaining portion of township 78 and all township 79, the soil is of inferior quality and thickly timbered with poplar, spruce and large willow with windfall here and there. The hills bordering Brulé river in townships 78 and 79, range 3, west of the sixth meridian vary in height from three hundred to four hundred feet. Those of Spirit river in township 79, range 3, average two hundred feet in height, while the hills of Peace river in township 80, range 3, are from four to six hundred feet high. In this last township the surface is prairie and bluffs, viz.: for that portion situated on the north side of Peace river. The soil is very good and well adapted for farming and ranching purposes. There is a narrow flat on the river bank in that township, called 'Green Island' flat; it is about two miles long and is all occupied by squatters outside of the Indian reserve. From the top of Peace river hills as far as the view extends the country is level.

While travelling on Spirit river and in making the traverse of Brulé river, I noticed in the cutbanks oxide of iron here and there. Pieces of coal were also found in the cutbanks of Spirit river, in township 79, range 3. I am sending to the department some specimens gathered on the above mentioned rivers.

On December 27 we went to Dunvegan to survey a portion of township 80, range 4 west of the sixth meridian, and to make some measurements in Dunvegan settlement. On January 7, 1908, we left for Peace River Landing, where we made a traverse from the twenty-second base line to the northwest corner of Peace River Landing settlement. It took two days to perform this work, and I started afterwards for Edmonton, where I arrived on January 23, and at Ottawa on the 29th.

From what I have seen these last two years and also from reliable information from the residents of Peace river district, I must say that regarding the climate, the quality of the soil, the hay, the water supply, the timber, &c., this northwestern country has more advantges than the other parts of the west. The days are much longer in summer and the grain and vegetables grow more rapidly than farther south. The fall is much nicer and not so cold as in many parts of the west, and also the spring is comparatively early. Means of communication are getting better every year, so that there is nothing to prevent settlers from going into that country, where they can make a success of mixed farming. When the district is more settled that will certainly induce the railway companies to build a line to that country. I believe that in the near future it will prove to be exceedingly good as a farming and ranching country.

I have the honour to be, sir,

Your obedient servant,

J. B. SAINT CYR, *D.L.S.*

APPENDIX No. 36.

REPORT OF B. J. SAUNDERS, D.L.S.

SURVEY OF PARTS OF THE FOURTH AND FIFTH BASE LINES EAST OF THE PRINCIPAL MERIDIAN

EDMONTON, ALTA., August 3, 1907.

E. DEVILLE, Esq., LL.D.,
Surveyor General,
Ottawa.

SIR,—I have the honour to submit the following report on the survey of the fourth base line through ranges 13, 14 and part of 15, and the fifth base line through ranges 13, 14, 15, 16 and 17, east of the principal meridian, in the province of Manitoba, surveyed under your instructions, dated May 25, 1906.

Having undertaken some private surveys before receiving your instructions, I was unable to proceed with this base line work until early in the autumn of last year. In any case, from knowledge gained of the conditions of the country, I considered it advisable to defer the work until the swamps and muskegs had partly dried up.

I shipped my horses and outfit from Edmonton to Winnipeg on September 21, via the Canadian Northern railway, and they arrived in Winnipeg on the 28th. On the following day I went to Lac du Bonnet and Whitemouth to look the ground over before deciding which base line to start first, and from what I learned, made up my mind to proceed with the fourth base line and leave the fifth base line until winter time, when the ice had formed on the lakes and rivers.

Having found out that no men were available at Whitemouth, I organized my party in Winnipeg and returned to Whitemouth on October 9, where my assistant had been engaged for the previous week examining the country east of Whitemouth to find a convenient route into the northeast corner of township 12, range 12. Two or three days were spent in getting the camp in shape, road-making and building a temporary bridge across Bog river, as well as forwarding supplies.

On October 13 we moved camp from Whitemouth to the east side of Bog river, on section 2, township 12, range 12, to within six or seven miles of our starting point, and by the end of the following week got the camp to within three-quarters of a mile of that point by making use of an old timber road.

On Saturday, October 20, the production of the base line was started from the northeast corner of township 12, range 12, and the work was carried on until December 15, by which time we had reached the northeast corner of section 34, township 12, range 15. Work was discontinued at this time in compliance with your letter of December 4, instructing me to proceed at once with the survey of the fifth base, so that the subdivision of the townships adjacent thereto could be undertaken at an early date.

As embodied in the reports of the several ranges through which this (fourth) base line passes, the country consists chiefly of rocky land and muskeg, and has been more or less burned over. In my opinion, very little of it is adapted for agricultural pursuits.

At the present time there is practically no timber left that would be of use for lumber. In ranges 13 and 14 there is a fair amount of standing dead timber that could be utilized for firewood, and in favourable seasons could be hauled to Darwin

station on the main line of the Canadian Pacific railway. The wood industry east of Winnipeg has become quite important, and large quantities are shipped to that city during the winter months from Molson, Whitemouth and Darwin, on the main line of the railway, and from all the stations along the Lac du Bonnet branch north of Molson.

Around Whitemouth mixed farming operations are carried on to a large extent, hay being one of the chief commodities grown. Timothy and clover grow luxuriantly and are easily marketed.

At the present time extensive operations are going on in railway construction in double-tracking the main line of the Canadian Pacific railway and in the construction of the new Transcontinental line which passes only a few miles south of Whitemouth.

The fourth base line crosses Whiteshell river near the east side of range 14 and again in range 15 at the point where the survey was discontinued. This river forms the drainage channel of Whiteshell and Cross lakes, and of other lakes in that neighbourhood. It widens out a number of times into lakes between which there is usually a small fall or rapids.

No economic minerals were met with.

On Sunday, December 16, camp was struck and a start made back to Whitemouth where we arrived on the following day. Two or three days were employed in purchasing hay and oats and shipping them by rail to Lac du Bonnet. On the following Saturday we started across country with the camp, over a fairly good winter road for Lac du Bonnet station, reaching that point the next day. Our car having arrived it was unloaded on the 26th, and the greater part of our supplies stored. Early the next morning a part of the camp pulled out for the fifth base line and camped that night at the mouth of Oiseau river near the northeast corner of Lac du Bonnet proper. The few days following were spent in taking up the line in range 12 and waiting for an observation for azimuth. Having been at length successful in getting a satisfactory observation, the survey of this base was commenced on January 6, and on March 12 it was completed to the east side of range 17.

The survey of this base line was found to be a very difficult and trying piece of work owing to the great depth of snow which prevailed last winter, combined with the intense cold.

The country along this base line consists chiefly of rocky formation broken by muskegs. Lac du Bonnet extends about a mile and a half into range 13. Adjacent to the north boundary of township 16, range 15, there is a lake about two and one-half miles in length. In range 16 there are three lakes adjacent to and intersected by the line, while in range 17 as many as five lakes are so situated. The end of the line established falls in a lake some three or four miles in width.

The shores of these lakes generally speaking are rocky but owing to the quantity of snow on the ground we were unable to judge of the probability of their carrying minerals of economic value. I do not consider any section of this country adapted to agricultural pursuits.

In range 13, adjacent to Lac du Bonnet, there is some fair sized timber consisting of spruce and poplar, while in the other four ranges the timber is very small and of no merchantable value. It consists chiefly of second growth, pitchpine, poplar and spruce.

At the present time that portion of Winnipeg river lying to the south of this base is attracting considerable attention in connection with the development of water-power for the transmission of electrical energy to Winnipeg. At Point du Bois falls in township 15, range 14 and 15, the city of Winnipeg has called for tenders for the work in connection with the installation of a power plant to develop about twenty thousand horse-power. On Pinawa channel of Winnipeg river the Winnipeg Electric company have a large power plant in operation and for over a year have been transmitting electrical energy to Winnipeg, a distance of some sixty or seventy miles.

During the past winter they have been improving their water supply by the construction of a wing dam to divert a greater flow of water from the main stream into this channel.

I have the honour to be,
Sir,
Your obedient servant,

B. J. SAUNDERS, *D.L.S.*

SESSIONAL PAPER No. 25b

APPENDIX No. 37.

REPORT OF B. J. SAUNDERS.

SURVEY IN THE PROVINCE OF MANITOBA.

EDMONTON, April 29, 1908.

E. DEVILLE, Esq., LL.D.,
Surveyor General,
Ottawa.

SIR,—I have the honour, in accordance with my instructions, dated August 23, 1907, to submit the following report on the survey of block outlines east of the principal meridian in the province of Manitoba, made the past fall and winter.

Having engaged a packer, I shipped my horses and outfit from Edmonton to Winnipeg on September 26, via Canadian Northern railway; they arrived in Winnipeg in due course and were transhipped via Canadian Pacific railway to Selkirk. Having organized my party in Winnipeg and purchased my supplies, I chartered the steamer *Mikado* to take the whole outfit from Selkirk to Fort Alexander, near the mouth of Winnipeg river, where we arrived on October 16. After obtaining permission from the officer in charge of the Hudson Bay Company's post at Fort Alexander, camp was pitched on the company's reserve.

The following day I began looking for the starting point of my survey at the northeast corner of township 18, range 8, east of the principal meridian, by going in almost directly west of the fort, but was unsuccessful in finding the objective point on account of the great difficulty in getting about in the deep water which covered the whole of the muskeg lying in that direction. Finally, I decided to go around by boat to Catfish creek, and follow that stream up to the Indian reserve boundary, and then go along this boundary and run a trial line into where I computed the northeast corner of township 18, range 8, should be found. This method proved successful, and the remains of the post marking this corner were duly located, also the bearing tree which witnessed the position of the post. Having obtained observations for time and azimuth, the work of running a meridian north was commenced for the purpose of locating the northeast corner of township 19A, range 8, in accordance with your supplementary instructions of October 11. This line runs through fractional township 19, range 8, Fort Alexander Indian reserve, and across Traverse bay, at the mouth of Winnipeg river.

By the time I got the triangulation made across Traverse bay, the weather had become very stormy, with prevailing high winds, alternating between southeast and northwest, but we were able to get some of our supplies moved down the east side of Lake Winnipeg as far as Black river Indian reserve, taking them down by sailboat. From November 15 until near the end of the month we were practically tied up on account of climatic conditions. During this time, ice formed across Winnipeg river at Fort Alexander three times, and was broken twice by the winds and spells of mild weather. This interval was employed in building a stable for the use of our horses when coming to the fort for supplies during the winter, and in getting flat sleighs made, and generally preparing for the winter's work.

On November 30, the ice in the river having become sufficiently strong to carry a man, work was resumed on the line, and on December 4, with two men, three horses and flat sleighs, I moved some supplies down the lake about twelve miles from Fort

Alexander, and on the following day moved camp to Spruce point, a little further down the lake shore.

From this time on, the work progressed quite satisfactorily. The meridian outline was run between ranges 8 and 9, from township 19A to where this outline strikes the east shore of Lake Winnipeg, in township 26, also the sixth base was run east from this outline across range 9 east and west about half a mile to the shore of Lake Winnipeg in range 8. Similarly the seventh base was run across range 9, and west a little over four and three-quarters miles to the shore of Lake Winnipeg, in range 8.

All the country traversed by these lines is practically flat, with the exception of that along the north half of the line through township 25. A few rocky ridges are met with on both base lines in range 8. These rocks belong to the Laurentian formation and their general direction is northeast and southwest. The timber met with is mixed in variety and consists of spruce, tamarack, balsam, poplar, and birch with pitchpine on rocky ridges. Some elm and ash were noted at different points along the shore of the lake. The land is of rather poor quality, and is very wet on account of its being so flat and only about eight or twelve feet above the level of lake Winnipeg. It is not adapted to agricultural pursuits in its present condition.

Fort Alexander is an old and important post of the Hudson's Bay company, having been established in the early days of the company. It is situated on the southwesterly or left bank of Winnipeg river about three miles up from its mouth. The company's reserve consists of some six hundred and fifty acres and is situated within the Fort Alexander Indian reserve. This Indian reserve extends along both sides of Winnipeg river, a distance of nearly ten miles from its mouth. There are two Church of England schools, and one Roman Catholic school on the reserve. The latter is a large and modern structure having accommodation for about one hundred and fifty children for both residence and tuition.

Above Fort Alexander there is a farming settlement known as St. George settlement stretching along the river a distance of ten miles or more and as far up as Silver falls on Winnipeg river. At this falls it is proposed to develop water-power for generating electricity. There are also two sawmills near Fort Alexander and St. George, the surplus lumber manufactured being shipped to Selkirk by water during the period of navigation.

In township 21 and 22, ranges 8 and 9, is situated Black River Indian reserve at the mouth of Black river. There is a Church of England mission school here.

The Indians of this reserve, like those at Fort Alexander, find employment in fishing, cutting cord wood and railway ties and similar work. In township 25 the meridian outline between ranges 8 and 9 crosses the mouth of the Manigotagan or, as it is locally known, Bad Throat river. On this river there is a settlement also, but agricultural pursuits are not followed to any extent worthy of note. There is a large sawmill at Manigotagan belonging to the Lake Winnipeg Lumber company but nothing was being done last winter towards getting out logs for this summer's cut. The country around Manigotagan has been lumbered over quite extensively for some years.

The meridian outline between ranges 8 and 9 crosses a number of small bays of Lake Winnipeg in townships 20, 21, 22 and 25, and intersects the lake shore again in township 26, where the line was discontinued as instructed. The production of this line will cross the northeast end of Black island, one of the largest in Lake Winnipeg.

Opposite the end of the line, to the east, lies the mouth of Wanipigow, or as it is locally known, Hole river. Hole River Indian reserve is situated at the mouth of this river and the Hudson's Bay company has a trading post there.

About half a mile east of the line at this point, there is a gold prospect which has been worked for some years, but on account of lack of capital not much progress has

been made. I have noticed recently from press reports that a company has been formed to thoroughly exploit this prospect. On Black island during the past winter work was being carried on in opening up an iron ore location.

On Saturday March 15 we started back for Fort Alexander, arriving there the next afternoon. A halt was made for two days to straighten up business matters and to wait for the incoming mail, before proceeding to the fourth base line northeast of Whitemouth, where work was discontinued in December, 1906. We proceeded to Whitemouth by way of Lac du Bonnet station which was reached in two days by the winter road through St. George and up along Winnipeg river and Lac du Bonnet. From the latter point a timber road was taken across what is known as 'The Island' lying between the two branches of Winnipeg river. We struck the main river again above the seven portages and having crossed over were able with some difficulty and danger to pick our way down along the shore ice to where we found a settler's trail a short distance above Whitemouth river.

Whitemouth was reached on Saturday, February 22. A few days were spent here in getting supplies down from Winnipeg and in purchasing horse feed. On the following Friday the whole outfit was shipped by rail to Dagero station on the Canadian Pacific railway. From this station I took a contractor's road in to the Transcontinental railway line for a distance of five miles, and then followed down a small lake to the Cross lake waters. Proceeding down these waters a temporary camp was made near their junction with the waters coming from Whiteshell lake to the north. On March 4 the end of the fourth base line was located at the northeast corner of section 34, township 12, range 15 where its survey was discontinued in December, 1906. Having taken up the line it was produced east to the east boundary of Manitoba, which it intersects just south of the forty-fifth mile post on that boundary as located by the Ontario and Manitoba boundary commission of 1897. This intersection is near the east side of range 17.

The portion of the line surveyed in March is similar to that described in my former report on this line with the exception that more lakes are met with. As a matter of fact the whole country from range 15 to the Ontario-Manitoba boundary is a network of lakes. Moose and caribou are found in large numbers and in their season duck are very plentiful on account of the large fields of wild rice on and along the lakes. It has frequently struck me that a large portion of eastern Manitoba should be set aside as a park, forest and game preserve, for which purpose it is almost ideal, besides it is not adapted to agricultural pursuits. After the completion of the new Transcontinental railway it will be still more easily accessible and should become of great interest to people desiring to get away from the cares of business life for a holiday season.

On March 29 we returned to Dagero, and having arranged for a car I shipped my horses and outfit to Winnipeg the next day. I had them transferred to the Canadian Northern railway at Winnipeg on March 31.

On the whole, last winter was a favourable one for field work, and although we had a number of cold dips they were not of long duration.

In conclusion I desire to express my thanks to the commissioner and officers of the Hudson's Bay company at Winnipeg and Fort Alexander for the assistance they gave me in every possible way, and I also must express the same feeling towards my assistant, Mr. G. W. MacLeod and several members of the party for their unflagging interest in the prosecution of the work.

I have the honour to be, sir,
Your obedient servant,

B. J. SAUNDERS, *D.L.S.*

APPENDIX No. 38.

REPORT OF HENRY W. SELBY, D.L.S.

SURVEYS IN NORTHERN ALBERTA.

TORONTO, January 31, 1908.

E. DEVILLE, Esq., LL.D.,
Surveyor General,
Ottawa.

SIR,—I have the honour to submit the following report on the survey of township outlines, and the subdivision of lands situated at the west end of Lesser Slave lake, which has been done in accordance with your instructions, dated February 26, 1907. Upon receipt of these, the necessary supplies were ordered by telegraph and sent in on the ice. On April 25 I left for Edmonton, where my party was organized. We arrived at Athabaska Landing on May 14 in time to take the first York boat on Athabaska river for Lesser Slave lake. We arrived at the lake on May 22, but could not cross it as the ice had not yet broken up. The boat was unloaded there, and went back to Athabaska Landing for another load. Teams and wagons were engaged to transport the party and baggage around the north shore of the lake, rather than await the return of the York boat. This, owing to the low stage of the water, is not at all difficult to do, as the beach is wide, and with the exception of about ten miles of boulders is good for travelling with waggons, but it is bad for that ten miles and it cannot be avoided, until a road is cut through the woods along the shore. This, it is expected, will be done during the next year by the provincial authorities. It may be stated here that prospective settlers and others may, during the time of high water in the rivers (usually about two to three months) take passage by steamer at Athabska Landing to the mouth of Lesser Slave river, thence by wagon road to the head of the rapids, about twenty miles, where another steamer can be taken to the west end of Lesser Slave lake, by this means making the trip in three days, which ordinarily takes from eight to ten days. Contractors are now putting in wing-dams on Lesser Slave river. A dredge was at work all fall until ice formed, and it is expected it will continue next spring, to deepen the channel where necessary, so that steamers may go up the rapids, and, without breaking bulk, deliver their load at its destination. If this can be done, it will be a great convenience to those who are obliged to make this journey. The season for surveying being considerably longer than for navigation renders this means of transportation of little value to the surveyor.

A ferry has been put in across the Athabaska river at Athabaska Landing, and a wagon road cut out from the ferry landing to Moose portage, where it connects with the road cut by me in the spring of 1904 to Lesser Slave lake, and from the east end of the lake, a proposed road has been blazed around the north shore, to avoid the boulder strewn beach. This follows the beach, when the travelling is good to Lesser Slake lake, and the Peace river road, so that it will be quite possible to travel by wagon from Edmonton to Dunvegan, without encountering insurmountable difficulties. Those of us who have seen this gradual development look upon the task of getting into the Peace river country now as quite an easy one for light loads. The building of the railroad from Edmonton to the Pacific coast via Sturgeon lake and Grande prairie, the contract for which is reported to have been awarded, will make some difference in the cost of freighting supplies. At present freight costs $3.25 per 100 lbs. from Edmonton to the west end of Lesser Slave lake, and at the season when roads are bad

from Sturgeon lake to Lesser Slave lake it costs $3 per 100 lbs. and the same from Lesser Slave lake to Peace river landing, a distance of about 90 miles over a road on which many thousands of dollars have been spent. The traffic over those roads is largely composed of heavily loaded wagons, which cut into the newly made road of clay from large portions of which the sun's rays are excluded by the dense growth of timber on each side. It is noticed that upon such portions of the road where the sun's influence is felt, the clay hardens, and it is not so easily cut up, once it gets dried out in the spring. Freight rates are regulated by the quantity hauled per team and the time occupied in making the trip; consequently the condition of the road is the prime factor in fixing freight rates, on a dry season the rate being little more than half that on a wet or rainy season. Last summer it took me two and a half days to move my outfit over a road, which when dry can be travelled easily in one day, and both man and beast are in better heart at the end of the shorter period.

Arriving on May 27 at the warehouse near the Hudson's Bay company's post, where my supplies had been cached, I delayed only long enough to check over and re-pile these, get the outfit in order, axes hung and ground, and other needed repairs made, and on the 29th moved into township 75, range 14 west of the fifth meridian. The timber is in belts of quite heavy spruce and poplar, but this is being cut every year and made into lumber, and fire has over run these cut-over areas, leaving them much easier to clear. There is no reason why this land should not be soon occupied, adjoining as it does a large settlement where the timber is required for building purposes, a wagon road cutting across it to shorten the distance around Shaw's point, and the soil being excellent for farming purposes and lying with a gradual descent towards the lake. Although there are no hay lands, except on the west boundary, still hay is found in townships 75 and 76, range 15, which is sufficient for a large population for many years.

Portions of townships 77, ranges 15 and 16, were subdivided because the Peace river road furnishes access to them, and when cleared of the light timber they will make beautiful farms. These sections are well supplied with good water, and the prairie spots seen furnish abundance of hay and vegetation.

Townships 74 and 75, range 15, have large areas of prairie, and several settlers have made small improvements. Wheat, oats, barley, potatoes and other vegetables were grown this year, and although there had been a great deal of injury from frost throughout the Northwest, still very little harm had been done here.

The main roads from Lesser Slave lake to Sturgeon lake pass through these townships, and the timber being small when found alongside of them, they are generally good. No public money has been used to open these roads, but when a little can be obtained for culverts, bridges and draining water holes, settlers will have little difficulty in reaching the objective points, Lesser Slave Lake post office and the half dozen stores, blacksmith shops, churches, &c.

The large number of cattle and horses seen throughout this country, invariably in good condition, goes to prove that, with foresight enough to provide for a severe winter, should it come, stock-raising should be profitable. Township 74, range 14, is composed mainly of timbered land, the trees generally being of small size and not standing very thick. The soil is black loam on clay, and evidences its fertility by the thick growth of grass among the trees and willow bunches. A slight descent towards the north and the climatic influence of a large body of water alongside of it should make this, when cultivated, a fine agricultural area. A wagon road from Lesser Slave Lake post office crosses the lake at a ford near Willow point. This ford permits of a wagon being drawn across empty, a canoe or boat being used to convey the load over. I was informed before leaving this work that the provincial authorities contemplate building a bridge across the lake at this point, which will be a great convenience, and which has now become a necessity. After leaving the ford the

road follows the beach easterly and southerly, crossing a creek near its mouth, where the water is 75 feet wide and from one to two feet deep, and a smaller creek about a mile farther on, where the water is about a chain wide and nine inches deep, the bottom being good in both cases. Neither of these creeks has much water in it over a mile up from the shore, where in the event of the water of the lake rising and covering the beach a road could be easily made. The width of the creeks being so much less, only small bridges need be built. The road follows the beach, except at a few points where the shore is rough with boulders, easterly to Driftpile Indian reserve, where it runs inland and still easterly to Swan river. Several settlers who have located near the nineteenth base line in range 10 use this road to get to the post office and stores. There is also a wagon road running southerly through township 74, range 14, leaving the lake shore in section 14, which I travelled to the nineteenth base line, and found fairly good that far. It is cut through to Edmonton. At least I was told so by a settler named Beaudry, who drove to that place in October, but on account of having cattle to bring back in November, came around by Athabaska Landing and Lesser Slave river, where he could get hay to feed his cattle. Several parties came into the lake by this road, but all agree that it is very hilly and requires a good deal of fixing, numbers of trees having to be cut out of the way, and it has the further disadvantage of scarcity of feeding grounds for stock.

My operations in the field were concluded on November 8, when the outfit was stored with the Hudson's Bay company, at Lesser Slave lake. Two teams and wagons were engaged to take the party and baggage to Edmonton, going by the north shore of the lake and by the new road to Athabaska Landing, where we arrived on the 21st. The ferry had been taken out of the river to avoid the running ice, so we had to have a York boat put in to cross the teams and wagons. A few days later we arrived in Edmonton, where the party was paid off. I then left for Toronto, where I arrived on December 4.

From the foregoing remarks it will be noted that the country surveyed under your instructions is all suitable for present occupation by the farmer and stockraiser. The settlers will find very little difficulty in reaching any part of it, and the climatic conditions are such that mixed farming can be profitably engaged in provided the seed is grown in the country and is planted as early as it is possible to get it in the ground. The past season was very cold, a great deal of rain fell, and frosty nights occurred every month; still, very little damage to crops was spoken of. The only farmer who had threshed before I left the lake told me his oats weighed 44 pounds to the bushel, and seven acres yielded 600 bushels, and the potatoes on less than an acre returned over $200.

Drift coal is found in many places on the lake shore and in the main streams, indicating the presence of seams underlying the district, but the quality can scarcely be judged from samples seen.

Rolling stone is found in township 75, range 14, but no rock in place, such as would make a quarry. Many intending settlers have visited the country, some locating and others going out, intending to return when the facilities for getting in are improved, and with the prospect of a railway to carry their produce to market. I met two settlers, who have located at Swan river who told me there were eleven in their party ready to locate now and that in the spring as many more would come to take up land.

The scarcity of game within the territory in which my surveys were made is no doubt caused by the constant movement of the Indians and half-breeds who, with their horses and cattle, are moving about for food, and if a moose or deer happens to stray into the vicinity, it is at once hunted down. Lesser Slave lake whitefish make excellent food. Two years ago they were shipped to the Atlantic coast for the hotel trade and because of their good quality they were called Lake Superior whitefish. Indians catch tons of them for their own use and for dog food in the winter. This was more

particularly so the past year as the rabbit, the Indian's daily food, is practically extinct. Ducks and geese are plentiful on the lake in the late fall, but there are no feeding grounds about the lake so that only a few remain through the summer.

I have the honour to be, sir,
Your obedient servant,

HENRY W. SELBY, *D.L.S.*

APPENDIX No. 39.

REPORT OF C. C. SMITH, D.L.S.

SURVEYS IN SOUTHWESTERN ALBERTA.

BRAMPTON, ONT., March 9, 1908.

E. DEVILLE, Esq., LL.D.,
Surveyor General,
Ottawa.

SIR,—I have the honour to submit the following report on the surveys performed by me during the past season in southwestern Alberta.

In accordance with your instructions, I proceeded, on May 1, to Moosejaw, where C. F. Miles, D.L.S., was to deliver over to me the survey outfit used the previous season by Mr. Warren. My outfit arrived in Moosejaw on May 6, and the following day I loaded a car and started to Macleod. On May 10 I arrived in Macleod and proceeded to engage men and complete my outfit. I found very great difficulty in getting good men. However I got a sufficient number of men to begin work with and started on May 13, for township 10, range 29, west of the fourth meridian.

The trail from Macleod to Porcupine hills passes through a splendid ranching country, but along all the coulées were scattered the cattle which had perished during the winter and spring. It was a severe blow to the old method of ranching. The inrush of settlers and the consequent fencing of the ranges is fast driving the ranchers from the prairies. The ranges are becoming small. Twenty years ago, so I was told by the manager of the Walrond, cattle ranged from the Gap in the Livingstone mountains to Macleod, a distance of fifty miles; now they are confined to the land owned by the New Walrond company around Callum creek and Oldman river. The country will in a few years, probably raise more cattle on the farms than were raised on the large ranches, for the cowboy romance and the great spring and fall roundups of the oldtime ranchers, are fast being replaced by the more prosaic but more economical methods of the farmers. In August when I came back over this trail I was astonished at the rapidity of the transformation; many houses had been built, and in many places I had to leave the trail where a wire fence cut it off and follow the fence to the proper road allowance.

Having camped on Five Mile creek I began the subdivision of township 10, range 29, at the northeast corner of section 3. I found that the meridian through this corner had been run so I proceeded to the survey of the remainder of the township. The old surveys in many of the townships in this hilly country seem to be rather irregular. This is due I think to the fact that the surveyors tried to chain accurately by breaking chain. In a very hilly country this is impossible for the ordinary chainman. While at the Crowsnest I lost my clinometer, and while awaiting another, chainmen chained three miles with the utmost care, using a short chain. When my clinometer arrived I chained the three miles (which I had not yet mounded) and found half miles chained with the short chain to be short from 10 to 40 links.

Porcupine hills, an exceedingly rough range, run through the southwesterly part of township 10, range 29. The northerly and easterly parts of the township are well adapted to farming and ranching. Almost every quarter section is well watered by fine spring creeks. The valleys have a fine fertile soil, and grain, roots and vegetables grow and ripen well.

On June 17, I finished the subdivision of township 10, range 29, and moved over a very rough trail into township 9, range 30. The southerly part of this township is covered by an Indian reserve. I ran the meridians south from the north boundary of the township and ran a random line along the north boundary of the reserve to locate, if possible, the monuments placed in the survey of that boundary. Some of these monuments I could not find and some I found were so far from the places shown in the notes of the survey that I decided to defer the completion of the subdivision until I got further instructions from you.

While at these surveys and at subsequent surveys, I investigated the necessity of subdividing the remaining portions of townships 10 and 11, range 1, west of the fifth meridian. These portions are in Porcupine hills, are generally heavily wooded and at that time there was no urgent necessity for immediate survey of all the remaining portions. However, there are some good coulées running into the hills, and it would seem well to complete the subdivision of the townships when the quarters affected by these coulees are being surveyed. Many excellent homesteads in this district await suitable settlers. There is much good building timber in Porcupine hills, springs of beautiful water are plentiful, the valleys have a deep rich loam that is easily worked and the good creeks in the valleys would furnish easy and inexpensive means of irrigation if that were necessary or desirable. It is very necessary, however, that the government should take some means of preserving the timber.

My next work was in township 10, range 2, west of the fifth meridian. The rougher parts of this township had been left and it was these that I was completing. However, most of it was good grazing and farming land.

Much of township 11, range 2, is cut by very high hills, but along the coulées there is some land well adapted to farming and grazing.

On July 16 I began the survey of the south boundary of township 11, range 3. This line afforded sufficient difficulties to satisfy a surveyor for a whole season. The line crossed Oldman river five times within three miles. The velocity of the current, swollen by the late spring thaw and by summer rains, was such as to prevent our crossing otherwise than by horses.

At the Gap, the south boundary of this township crosses the Livingstone mountains, where it is impossible to climb so we had to run a traverse along the foot of the cliff forming the side of the Gap. On joining the traverse to the southeast boundary of section 6, I found a considerable discrepancy between my distance and the theoretic distance, so in re-running the line I made another traverse through the Gap. This confirmed my previous measurements. While at these surveys we saw a number of seams of good coal. No doubt a railway will soon be constructed to this place, and the country will become very productive. Frequent showers were the only phase of the climate that was at all disagreeable, and these happened almost daily.

At your suggestion I arranged to proceed to the surveys at Crowsnest before the season was too far advanced. We found a good wagon road along the valley of the middle fork through Frank, Blairmore and Coleman as far as the easterly end of Crowsnest lake. From here we had to take an old construction road, which many told us was impassable, to the westerly end of the lake. In townships 7 and 8, ranges 5 and 6, we were engaged in subdivision work, and in running a connecting traverse to the Crowsnest coal area. My experience in the Gap had confirmed my opinion that wherever a man can possibly climb it saves time and is more satisfactory to run the line straight than to traverse; hence, except the east boundary of section 6, township 8, range 5, I ran all the lines straight over the mountains, though it necessitated some very difficult work. In connection with this subdivision, it was necessary to traverse the height of land forming the boundary between British Columbia and Alberta. This was an easy matter where the watershed was narrow and well defined as was generally the case. In one place we found a spring forming a pool from which a stream flowed from the western side down to Michel creek and on to the Pacific, while another little stream flowed from the easterly side down to Crowsnest lake and thence on to the

Arctic. But in many places the watershed develops into heavily wooded plateaus. In the northerly part of township 8, range 6, there was a basin-shaped area at the watershed. To determine the position of the watershed we had to run many lines of levels. There seems to be a necessity for having the boundary permanently marked. This boundary had evidently been traversed before, and while, so far as I can tell, my traverse agreed with the previous one as to the position of the watershed, there were apparently some small differences and it would be impossible in many places for a settler or prospector to tell upon which side of the boundary he was.

While engaged at this work we had a three days' snowstorm which delayed work somewhat. The snow melted off the trees very slowly and for several days we were drenched to the skin from morning until night with ice cold water. However, afterwards we had ideal weather.

On receiving your telegram instructing me to proceed to the survey of Grassy Lake townsite, I loaded the outfit on a car at Crowsnest and arrived at Grassy Lake on October 19. Grassy Lake is most inappropriately named as there is no lake within miles and at the time we were there very little grass was to be seen. There is, however, plenty of good farming land around, settled for the most part by industrious and progressive Americans from Utah, and there is coal in abundance, so that Grassy Lake seems destined to become a good town. To the north of the Canadian Pacific right-of-way, Messrs. Cherry and Driggs had already opened a large store and were engaged in mining operations. On receipt of your instructions I proceeded to investigate and correct an error in the position of a quarter section post in township 10, range 22, west of the fourth meridian.

The season being now too far advanced to permit my returning to the mountains to complete the work there I arranged for wintering the horses and storing the outfit and paid off my party in Lethbridge.

I have the honour to be, sir,
Your obedient servant,

C. C. SMITH, *D.L.S.*

APPENDIX No. 40.

REPORT OF A. G. STACEY, D.L.S.

SURVEYS IN THE RAILWAY BELT, KAMLOOPS DISTRICT, BRITISH COLUMBIA.

LITTLE BRITAIN, ONT., March 10, 1908.

E. DEVILLE, Esq., LL.D.,
Surveyor General,
Ottawa.

SIR,—I have the honour to submit the following general report on my survey operations in the Kamloops district, British Columbia, during the season of 1907.

On April 26, I left Ottawa for Kamloops, British Columbia, where I met Mr. J. E. Ross, D.L.S., with whom I arranged a division of the work lying within the Kamloops district. It was decided that Mr. Ross would undertake the surveys to the east of Kamloops, while I devoted my attention to those townships lying to the west of the city. A week was spent at Kamloops in organizing the party and outfitting for the season's operations. In this task I was most generously assisted by Mr. Ross, who had had considerable experience in the work, and was thoroughly acquainted with local conditions. It was considered advisable not to purchase any transport outfit, but to hire such services as they were required.

On May 13, we left Kamloops, a party of seven, for our first camp on the left bank of Thompson river in township 20, range 18, west of the sixth meridian. Selecting what appeared to be a desirable location, we pitched camp on what afterwards proved to be an island separated from the mainland during high water by a narrow channel which, at that time, was perfectly dry. The water rose so rapidly that in four days' time we were forced to wade the channel through two feet of water and transfer our camp outfit to higher and safer quarters. The work in this township consisted, for the most part, in attempting to locate the boundaries of old provincial lots, and to connect them with the section lines of the Dominion lands system. The results of such work are likely to prove unsatisfactory both to the department and to the surveyor in charge. Where the corners of lots were originally marked with wooden posts and stone monuments they can usually be located with little difficulty; but where the positions were defined only by wooden posts driven a few inches into the ground, it is often impossible to locate the original corners. This is particularly true in the case of lot corners situated within or near the right-of-way of the Canadian Pacific railway. The company seems to have exercised no care whatever in the preservation of survey marks, almost every monument placed in the immediate vicinity of its premises being utterly destroyed, either during the construction days or by fires kindled by the company's employees at various times since then. A most thorough search for the different corners of the various lots mentioned in the instructions was made, and while in several cases the search proved futile, I believe a sufficient number of points have been located to enable the draughtsman to place the lots in their correct positions with reference to the section lines. In any event, the best information that can be gained by a careful survey of the ground has been obtained.

Some of the old section line surveys in the southern part of the township seem to have been very carelessly performed. More retracing of lines affecting the closing of blocks in which we worked could have been made to advantage, though it is diffi-

cult to estimate where this retracement would cease if satisfactory results are to be obtained. Owing to the number and urgency of other surveys demanding attention, I decided to leave further retracements for some later date. The work being located near Kamloops can easily be attended to by Mr. Ross at his convenience.

Quartersection monuments were found on the east boundaries of sections 8 and 9, though the department seems to have no record of such. These may have been located from a traverse of the boundaries of lot 443. They were left undisturbed, the lines joining them with the section corners to the south being retraced in both cases.

We were fortunate in securing the use of a small gasolene launch for crossing and re-crossing the river while at work on the north side.

On the forenoon of May 30 the party, with the addition of another member, moved by launch to Savonas, a small town at the mouth of Kamloops lake. From Savonas a good wagon road leads southward up Threemile creek valley to the divide between Thompson and Nicola rivers, thence, following Guichon creek, leads into Nicola valley. A thirteen mile drive up this road brought us to the crossing of Threemile creek, where we encamped for subdivision work in township 19, range 21. In this township some heavy timber was encountered, especially in the eastern tier of sections, where the progress of the work suffered for want of additional axemen. I endeavoured, my mail, to secure temporarily the services of two more men, but the effort was unavailing. In consequence, the survey of 26 miles of section lines and four miles of traverse kept us employed continuously from May 31 to July 17. The elevation here is about 4,000 feet above sea level; the nights were invariably cool, and the not too excessive heat of the day was relieved by frequent thunderstorms. The location is, in many respects, ideal for the prosecution of survey work during midsummer months.

From this plateau we moved to the southern shore of Kamloops lake about three miles west of Cherry Creek station in township 20, range 20. After running a few miles of section lines and locating such corners of lots 407 and 417 as could be found, we proceeded to make certain check and triangulation surveys in the vicinity of Kamloops lake, in accordance with instructions under date of June 3, 1907. The disagreement between the surveys on the opposite shores of the lake was pretty thoroughly checked by means of five distinct triangulations and a number of connecting traverses joining together the different surveys made along the northern shore. Through these ranges telegraph poles were used almost exclusively as reference marks for Canadian Pacific traverse stations, and as the original poles have long since been replaced by new ones the stations are lost. Finding it impossible to tie the surveys to Canadian Pacific traverse stations, connection was made with section and quarter section monuments near the railway, many of which were doubtless established directly from Canadian Pacific traverse stations. Near the township line between ranges 20 and 21 a pine tree used as a reference mark, for a Canadian Pacific traverse station, was noted and the survey tied thereto.

The results of this work indicate that throughout range 19 and the eastern half of range 20 the monuments on the north side of the lake are approximately 3 chains too far south, while those in the western half of range 20 are approximately 6 chains too far north. An error was found in the position of the monument marking the northeast corner of section 27 in township 20, range 19. It is 1·71 chains too far north to agree with the positions of the monuments immediately to the west and was found by Mr. Ross to be about 2·50 chains too far north to correspond with the positions of the monuments to the east. Another error was located in retracing the survey lines about the southeast quarter of section 14 in township 21, range 21. The west boundary of this quarter section was found to be one chain short and the north boundary 2·73 chains short of the theoretical lengths. These errors were corrected, new monuments erected and section lines run connecting this survey with that in range

20. With the exception of these errors, the old survey lines on the northern shore of the lake would seem, from the retracement, to have been surveyed with unusual accuracy both as to alignment and measurement. Unfortunately the opposite seems to have been the case with many of the early surveys made along the southern shore.

For this work we hired the use of a fairly good skiff, which proved a great convenience in travelling to and from camp while working along the northern shore, where the surface of the country is extremely rough. For crossing the lake a boat of some kind was a necessity. Though we shifted camp no less than three times we were frequently obliged to work at considerable distance from headquarters, entailing much loss of time and energy. This, however, seemed unavoidable owing to the scattered and irregular nature of the surveys. The members of the party seemed less concerned with the hardships and inconvenience of the situation than with the danger constantly occasioned by the presence of the deadly rattlesnake. Fortunately none of the party were bitten though a number of these reptiles were encountered.

In making the survey of section 36, township 20, range 22 a quarter section monument of which the department had apparently no record, was discovered on the east boundary of section 35. It was presumably established from the Canadian Pacific traverse survey. The monument was renewed and the section line extended therefrom. The old witness monument on the east boundary of section 36 being lost, a new one was erected.

On August 27 we made our first move by rail, from Savonas to Semlin, a railway siding in township 21, range 23. There being no trail on the south side of the river it was impossible to secure a conveyance for transferring the outfit and supplies to the nearest camping ground on the bank of the river about one-third of a mile distant. It was therefore necessary to resort to the laborious process of packing the entire outfit on our backs; an interesting experience repeated some eleven days later when again breaking camp. In this township an old witness post and cairn were found near the northeast corner of section 11 on the left bank of Thompson river. The post had no distance marked on it. As this corner was also witnessed by a monument on the right bank of the river it seemed a case of duplicate marking for the same corner. Some subdivision surveys having been made on the north side I decided to destroy the witness monument placed on the south side and leave the corner as located from the north in agreement with these surveys. There is no crossing of the river in this vicinity, so a member of the party was sent around by way of Ashcroft to locate this witness monument, but failed to find any trace of it. The corner was consequently re-established from the witness monument marking the quarter section corner on the east boundary of section 14. Upon producing southward the section line thus defined another monument was found for the quarter section corner on the east boundary of section 11. This I also destroyed and erected a new one in agreement with the monuments established on the section line farther north. The northeast corner of section 6 was also re-established from the north, the original monument having been destroyed. A wooden post and stone mound was found marking the northeast corner of township 20, range 24. Though its position does not agree with the surveys in township 21, range 23, the monument was left undisturbed, and the line joining it to the quarter section monument to the north was retraced. The lands affected by this disagreement are not very valuable and hence there is no urgent need for readjustment.

From the various cases cited above, it would seem that a consierable number of section and quarter section corners, convenient to the railway, were established some years ago, probably from Canadian Pacific traverse stations, but that no record of such monuments was furnished the department. When in the extension of the subdivision surveys, these unrecorded monuments are met with, the surveyor must either recognize them and leave all the discrepancies of the survey in the closing or destroy the monuments and erect new ones in accordance with his own survey. The surveyor must, in each case, after carefully considering local conditions, depend upon his own judgment

in deciding which course he is to pursue. Complications are apt to arise in the case of witness monuments for corners falling within the bed of the river, as the surveyor making the subdivision on the north side of the river is not likely to discover witness monuments placed on the south side, and hence duplicate markings result.

After travelling by train to Ashcroft and making the surveys required in township 20, range 24, we moved to township 29, range 23, and made sufficient subdivision surveys to cover all the desirable land in that township. The road leading from Ashcroft to this plateau is very winding with an exceedingly heavy grade. Despite the fact that the roadbed was hard and smooth, four good horses found difficulty in hauling up the outfit, the outfit weighing probably less than a ton.

On September 26 we moved into Ashcroft, purchased additional supplies and the same day drove seventeen miles up the Cariboo trail to the correction line between townships 22 and 23, in range 25. In performing the surveys required in these townships, we were careful to connect with the corners of all lots and surveyed mineral claims affecting the lands being surveyed. It is possible that in one or two cases connecting traverses were made which were not absolutely necessary, but in the absence of positive information that such work had previously been performed by another surveyor, it was deemed advisable to make the connections. In most cases, where section lines interseeted the boundaries of lots and surveyed mining locations, monuments were placed at the intersections. The work in township 23 brought us within one mile of the limit of the railway belt. We produced the section line another mile and placed a monument on the limit which is not surveyed through this township.

The work in township 22, range 26, was attended to next. While camped there three of the party made a flying camp to township 20, range 26, up the Hat creek road and connected lot 1072 with the Dominion lands system. In order to furnish the agent of Dominion lands with some additional information concerning this lot, I retraced all the boundaries thereof and made complete topographical notes of the adjacent lands and improvements.

On October 31 we moved by wagon into Ashcroft and secured transportation to Spence bridge on the first local freight passing southward. The same evening we moved across the river and some three miles up country, where we were generously accorded the use of a vacant house while working in township 17, range 25.

The branch line of the Canadian Pacific railway up the Nicola valley afforded easy means of transportation to township 15, range 23. The wooden post placed at the southeast corner of lot 566 in this township has been washed away by Nicola river, which at that point has encroached considerably upon the lands situated on the right bank. Connection was made with bearing trees at the northeast corner of this lot, with other lots previously connected with lot 566 and with the northeast corner of the Lower Nicola Indian reserve, number 10.

In order to reach the Skuhun creek valley we ran east across the north boundary of section 10, thence due north three miles over the divide between Nicola river and Skuhun creek valleys. At this point the divide reaches an altitude of 2,500 feet above Nicola river and the ascent from either valley is steep and difficult, though fortunately no inaccessible barriers were encountered. A squatter in section 26 has constructed a wagon road from the mouth of Skuhun creek to within two miles of his cabin. By travelling down the Nicola valley to the Indian village at the mouth of the creek and following this newly constructed road up the valley, the outfit was brought by wagon to our new camping ground in section 27. In this valley section lines were run west as far as the Indian reserve and north and east to the limit of the railway belt effecting a closing at the northeast corner of section 1, in township 16, range 22. For the completion of this work one more camp shift was necessary, and for the first time during the season's operations pack-horses were employed. It was intended, while in this valley, to extend the surveys so as to include some meadows lying approximately in sections 34 and 35, township 15, range 22, but owing to the scarcity of provisions in stock, the severity of the weather, the depth of the snow and the difficulty experienced

in securing pack-horses under such unfavourable conditions, we were unable to do so. The elevation here is about 7,000 feet, above sea level, the snow was already fifteen inches deep and the weather decidedly cold. In the entire valley there are but two settlers located, neither of whom has made improvements of much value. It would seem, therefore, that further surveys are not particularly urgent, especially as the land best suited for settlement lies six miles beyond the upper termination of the wagon road, the only means of access being an Indian pack trail. From the section lines established subdivision lines can be projected as required to meet future demands.

On December 19, an Indian packing outfit brought the party down the Skuhun Creek valley to Clapperton, a station on the Nicola branch of the Canadian Pacific railway where we boarded the local train for Spence Bridge the same evening. Here the party was discharged with the exception of the assistant who accompanied me to Lytton on the following day, where I met the agent of Dominion lands and discussed with him the surveys to be made at that point. The work in Lytton was completed on the evening of December 25. The next morning we reached Kamloops, where the assistant was released, the outfit stored and all necessary arrangements completed for the closing of the season's field operations.

In the performance of the season's work every reasonable precaution to secure accuracy was observed. The alignment was checked by frequent astronomical observations and the measurements carefully rechained except in a few cases of closed surveys where no further check was considered necessary. In the early part of the season solar observations were used exclusively. During the long days in June satisfactory stellar observations, with a glass diaphragm, could not be obtained until late in the afternoon, and as camp was usually some miles distant the solar observations were more convenient. During the latter part of the season observations were made on polaris. A sidereal watch, corrected by observing the transit of time stars, was used for noting the time. As a rule, at least two observations were taken at each observation station to guard against possible errors in recording vernier readings. The measurements were made with a five-chain steel tape and a clinometer.

The surveys were scattered and irregular, constantly necessitating the starting of new lines. Old surveys had to be connected or retraced, doubtful monuments investigated, fresh obstacles due to the mountainous character of the country almost daily surmounted, in all of which the closest personal supervision of the surveyor was required. The valley lands, being the most valuable, were surveyed many years ago and the lines gradually extended up the hillsides, with the result that the surveyor has now to climb to an elevation varying from 500 to 2,000 feet above the camp in the valley in order to reach the lines he is projecting. The devotee of the strenuous life need seek no more congenial field than that enjoyed by the surveyor in charge of a party performing miscellaneous surveys in the Kamloops district.

All necessary supplies can be secured at any of the small towns along the railway, though the cost of provisions and camp equipage is much greater here than at either Vancouver or Winnipeg. This financial disadvantage to the surveyor is, to a certain extent, compensated for in the enjoyment of a fairly good mail service and other conveniences consequent upon the proximity of the railway, so often denied other members of the fraternity in the pursuit of their profession.

The city of Kamloops with a population of about 2,500 is the most important centre in this district. It is a progressive little city operating its own water works and electric lighting systems. As a divisional point of the Canadian Pacific railway and a distributing centre for the north Thompson valley and the ranching country to the south it is the scene of considerable commercial activity. A court house, provincial asylum and hospital are located here. Ashcroft, a town of five hundred inhabitants, is the gateway of the Cariboo country to the north. From here great freight wagons drawn by eight and ten-horse teams and laden with tons of supplies leave for

their tedious journey of two hundred and fifty miles into the interior. A splendid stage service with headquarters at Ashcroft forwards the mail and provides accommodation for the travelling public. This busy little town is supported partly by the forwarding industry, though there is also a considerable local trade. Savonas and Spence Bridge are small railway towns forming supply stations for sparsely settled ranching districts.

This district boasts of a delightful climate. After traversing nearly one thousand miles of bleak, frozen prairie with scarcely a green blade to give promise of the approaching spring we were ushered through the gate of the Rocky mountains, past the magnificent scenery of the Selkirk range and down the western slope into the smiling valleys of the interior, already richly clothed in nature's verdant garb. Vegetation here is several weeks in advance of that in either Ontario or the prairie provinces. The long summer season is usually very dry and the air clear and invigorating especially in the Thompson river valley, which is becoming a favourite health resort for sufferers from pulmonary trouble. The autumn weather is ideal, warm, bright and cool, cloudless nights following each other with almost monotonous regularity throughout the greater part of the season. The winters are short and cold with a light snowfall in the valleys. Peach orchards, vineyards, &c., rarely suffer from the severity of the climate. Leaving the river valleys and ascending the hills a gradual yet very preceptible change in climate is experienced. As the elevation increases, the temperature lowers, summer frosts become frequent, rendering the cultivation of vegetables and cereals impossible, the precipitation increases and the winters lengthen.

In the valleys of the Thompson river and of its larger tributaries, Bonaparte and Nicola rivers, the country is largely prairie dotted with small scattered pine and fir. The nutritious bunch grass, which at one time covered these ranges, furnishing ideal pasturage, has disappeared and in its stead flourishes, in many places, the worthless and unsightly sage brush. The sparse growth of other grasses gives the country a somewhat barren appearance, though herds feeding on these grounds look remarkably well. Where irrigation is employed, the soil proves very productive. Back from the valleys the hills furnish good grazing lands for the summer months. Though there are open patches on some of the plateaus, the country is mostly covered with a forest of bullpine and fir. The former makes very good lumber for ordinary uses. The latter is largely manufactured into square timber, being strong and durable, though it does not produce a good quality of lumber. Many of these forests would be valuable lumbering centres, were it not for the difficulty of getting the logs to some navigable stream. Sawmills are at present in operation at both Kamloops and Savonas, though the lumbering industry has not assumed very large proportions in this district. Some of the plateaus are covered with banksian pine which is of little value, except for fuel. These forests support a luxuriant growth of grass and are usually free from underbrush. The cattle, however, much prefer the shorter grass of the more open patches and resort to the timber pastures only when the other fails or the weather proves too severe in the open. The lakes on these plateaus are almost invariably alkaline, though fresh water of excellent quality is found in almost every stream. Cattle ranching has been, and still is, the chief industry. Such rich bottom lands as could be easily irrigated were secured by early settlers engaged in this industry. These holdings yield two crops of hay during a season, furnishing winter provender for herds which, during the summer months, roam at will over the neighbouring hills.

Another industry of some promise, attracting increasing interest during recent years, is the cultivation of fruits and vegetables. In various places throughout the valley of Thompson river small areas have already been given over to the cultivation of these products, with most gratifying results. The character of the climate, combined with the richness of the soil, when properly irrigated, furnishes a product absolutely unexcelled in quality. Exhibitors from this valley have carried off the highest awards at international exhibitions on both sides of the Atlantic. An excellent home market

for these products helps to make the industry a very profitable one. The returns from this kind of farming are so great in comparison with the returns being at pesent realized that the early abandonment of cattle ranching in favour of the cultivation of fruits and vegetables seems inevitable. This would provide accommodation for a much greater population than the valley now supports, and would undoubtedly have the effect of directing more immigration to these parts. Promoters of this industry are already securing possession of some of the most valuable holdings. Meadows in higher altitudes could be utilized by those engaged in cattle ranching, so that this industry need suffer little more than the inconvenience of being driven farther from the railway.

This district is undoubtedly rich in minerals, though the mines have been little developed as yet. Low grade ores predominate. Capital is required both for the working of the mines and the erection of smelters for treating the ores. Copper is the mineral most in evidence.

Good government roads have been constructed through the valleys of the different tributaries of Thompson river. Heavy grades are often unavoidable, but the roadbed is usually solid and kept in good repair. In early summer, many of these highways, following the innumerable windings of the picturesque mountain streams as they noisily tumble from their dizzy sources to the stately river below, through valleys rich in scenic grandeur and heavy with the prefume of wild roses blooming in gorgeous profusion on every hand, are beautiful beyond description.

One of the noticeable features of the Pacific province is the cosmopolitan character of its inhabitants. Chinese, Japanese, Hindoos, native Siwashes, English immigrants and Canadian bred citizens, constitute the chief elements in this confusion of races. Institutions sacredly guarded in eastern Canada receive little consideration from many of these people. The problem of the unassimilative elements is everywhere confronted and has already become the peculiar possession of the western statesmen.

In conclusion I wish to express my appreciation of the splendid services rendered the party by my assistant, Orville Rolfson, B.A.Sc., of Walkerville, Ontario, and by W. G. McElhanney, B.A., of Vancouver, B.C., who served in the capacity of articled pupil.

I have the honour to be, sir,
Your obedient servant,

A. G. STACEY, *D.L.S.*

APPENDIX No. 41.

REPORT OF W. THIBAUDEAU, C.E.

INVESTIGATION OF WATER POWER ON WINNIPEG RIVER.

OTTAWA, March 24, 1908.

E. DEVILLE, Esq., LL.D.,
Surveyor General,
Ottawa.

SIR,—In accordance with your instructions, dated July 29, 1907, re preliminary investigation of the water-powers on Winnipeg river, Manitoba, from lake Winnipeg to the western boundary of Ontario, I have the honour to submit my report thereon, including the first falls of English river in Keewatin and the first rapid on Winnipeg river across the eastern boundary of Manitoba. The extent of watershed, the area drained by this river, and the extent and description of the natural resources tributary thereto, are also included.

DESCRIPTION OF RIVER.

Winnipeg river has its source in the lake of the Woods, Ontario, a distance of about fifty miles along the ri er from the western boundary of the province of Ontario. The lake has an area of over 1,200 square miles, and is controlled at Kenora by a dam twenty feet high. The river has a drainage basin of 52,050 square miles, of which 21,650 square miles is contributed by English river. Its length is about one hundred and fifty miles and it has a descent of about three hundred and fifteen feet. From its mouth to the east boundary of Manitoba, a distance of about one hundred miles, the descent is two hundred and sixty-four feet or about 2·64 feet per mile. This descent is concentrated at many places, producing a large number of valuable water-powers. From the east boundary of Manitoba, the river flows northwesterly to Lamprey falls, where it turns abruptly in a southeasterly direction to Sturgeon falls. From this point it runs westerly to Whitemouth river, thence northerly to Whitemud falls, and from this last point northwesterly to lake Winnipeg. From Kenora, at the point where the lake of the Woods joins Winnipeg river, to lake Winnipeg, the river flows through a formation of bare granite gneiss of a red colour, well polished by glacial action. The river is practically a succession of inland lakes varying in width from one-third of a mile to one and one-half miles. The average depth is thirty to forty feet. In no place did I find bottom at less than fourteen feet.

Years.	1896.	1897.	1898.	1899.	1900.	1901.	1902.	1903.	1904.	1905.	1906.	1907.
Stations.												
Winnipeg	26·29	17·59	27·19	19·82	18·58	23·90						
Port Arthur	21·48	24·51	20·14	26·53	27·10	23·95						
Kenora							18·49	23·30	22·53	25·26	22·41	23·76
Winnipeg river drainage basin	23·88	21·05	23·66	23·17	22·84	23·92	18·49	23·30	22·53	25·26	22·41	23·76
Precipitation, ft. second	47,500	42,000	47,000	45,000	43,400	47,500	36,600	45,100	44,500	49,000	44,300	47,000
Average run off	37,500	33,200	37,000	35,500	34,700	37,500	29,000	36,600	35,100	38,700	35,000	37,000

In the wider parts of the river, or lake portions, there are numerous small islands having abundant verdure. The principal growth along the river banks is poplar and spruce, while the same growth is found on the flats. Where the shore is rocky the growth consists of jackpine and some white birch. At Fourmile Portage island is a small grove of white pine. From a few miles above Islington to Lake Winnipeg there are a few oak, elm and white birch. The forest on both sides of the river has an undergrowth of thick hazel and willow underbrush, while the country on both sides as far as Sturgeon Falls is rough; rocky knolls and ridges are numerous, averaging from fifty to one hundred feet high, interspersed with swamps and small lakes. From there to the head of Seven rapids the roughness of the country gives place to a plateau-like country overlaid with yellow loam, which extends to lake Winnipeg.

The water at Winnipeg river is of a clear, dark colour, although it drains a terri tory a great part of which is muskeg and swamp. The water contains no perceptible vegitable matter in suspension. The clearness of the water, I think, is due to the faet that it passes through so many lakes which operate as settling basins. In very few places are grass and weeds seen growing along the shore, or in the water.

The river in places is well stocked with fish; pike, sturgeon and whitefish abound, and there are some salmon trout. In December tracks of moose, caribou, otter, mink and marten were seen, and in the upper part of the river wolves and foxes were heard.

About six miles down the river from the Ontario boundary, the Hudson's Bay company have a post on the west bank, which they use during a portion of the year for trading purposes.

At Pointe du Bois falls on the west side, the Winnipeg City Power company have cleared a space for a power house site and erected several log buildings for the use of their men. At the head of Pinawa channel, and at the diversion weir, the Winnipeg Street Electric Railway company have large camps.

The first farm seen from the boundary is at the mouth of Whitemouth river on the west side. From there, beginning at a point three or four miles farther down, small farms are scattered along the river on both sides to the south of Lac du Bonnet. Lac du Bonnet station is the Canadian Pacific terminal of the Lac du Bonnet branch; the population of this place is about two hundred, mostly employed cutting cordwood in winter, and in summer working in the brick-yards and sawmills. There is an Anglican and a Roman Catholic church and a public school. At the Grand du Bonnet falls some clearing has been done and a large log building has been erected as a camp.

The next settlement is at the foot of Silver falls and extends on both sides of the river to Fort Alexander at lake Winnipeg; considerable farming is done in this settlement.

FARMING LAND.

From the Ontario boundary to Sturgeon falls farming land is found only in spots and from there to Seven rapids, there is slightly more of it; from there to Lake Winnipeg along the river, the land is fair farming land overlaid with yellow loam.

MINERALS.

About five miles down the river from the Ontario boundary to Pointe du Bois I found in several places white mica with cleavage two or three inches square, but no other mineral. The red granite referred to makes a fine building stone and in many places blocks of large size could be quarried.

MERCHANTABLE TIMBER.

Very little timber was seen. It consists of spruce, balsam and tamarack and is suitable only for pulpwood.

PULPWOOD.

The drainage basin of Winnipeg river in Manitoba, exclusive of ten miles on both sides of the Canadian Pacific railway right-of-way, and exclusive of the farming lands, has an area of about 1,840 square miles, which, added to the drainage basin of English river, in Keewatin, which joins Winnipeg river east of the boundary and covers an area of 9,500 square miles, forms a total of 11,340 square miles. Assuming about half this area to be covered by rivers, lakes and swamps, the balance 5,670 square miles or 3,628,800 acres is forest, averaging twenty cords to the acre, this equals 72,576,000 cords of pulpwood, which is a conservative estimate. Assuming this to be equal to a supply for twenty years, it would allow a consumption of 3,628,800 cords per year or about 3,000,000 tons of pulp, or 9,615 tons per day, which would require about 500,000 horsepower to convert it into pulp.

Within the area alluded to the proportion of pulpwood from my own observations and information gathered from many sources is about as follows: poplar, 55 per cent spruce; balsam and tamarack, 25 per cent; jackpine and a few white birch, 20 per cent. Poplar is found mostly along the rivers and lakes on the flats. As one goes inland spruce, balsam and tamarack, take the place of poplar. Jackpine is found on rocky ridges. The present size of the timber is a growth of about twenty years.

Outside the pulp area already described, but tributary to Winnipeg and English rivers in Ontario, there are 12,000 to 15,000 square miles of the same kind of wood, existing under the same conditions, and which would average about the same per acre.

To preserve the pulpwood industry it is imperative that stringent regulations should be adopted and enforced prohibiting the cutting of trees under a certain size, say three inches in diameter. The owner of the timber berth should not be allowed to cut over the same area twice in twenty years, except in special cases.

I saw only two places where the timber had been destroyed by fire.

Although the country is rough it would be easy to construct a railway logging road at a reasonable cost. Logging with teams would have to be done in winter owing to the swampy character of a portion of the ground.

WATER-POWER.

By controlling the water-power at Kenora, the minimum efficiency of the water-power of Winnipeg river would be increased from 2,200 horsepower per foot fall to 4,080 horsepower per foot fall.

Lake of the Woods has a storage area of over 1,200 square miles by twenty feet deep or 21,172 foot-seconds the year round, or 2,340 horsepower per foot fall per day the year round. The lake is controlled at Kenora by a dam. The average run-off of Lake of the Woods, Rainy river and lake drainage basin is about 22,000 foot seconds.

The storage of the Lake of the Woods would contain about 70 per cent of the yearly run-off, taking the year 1902 as the lowest for the last eleven years, or nearly double the minimum flow of Winnipeg river, 36,000 foot-seconds, 4,080 horsepower the year around per foot fall. This demonstrates the immense importance of controlling the water at Kenora dam for the future development of the water-powers of Winnpeg river.

THE IMPORTANCE OF WINNIPEG WATER-POWERS COMPARED WITH NIAGARA FALLS.

Winnipeg river has 264 feet descent from the Ontario boundary to lake Winnipeg; with the control dam at Kenora 247 feet descent is available for water-power, yielding 903,300 minimum horsepower which could be utilized, and without the control dam at Kenora, 486,800 minimum horsepower which could be utilized. Compared

with Niagara falls which has a minimum of 2,600,000 horsepower, of which 80 per cent is on the Canadian side, the water-powers of Winnipeg river would be as follows: with the control dam at Kenora, forty-three per cent of Niagara falls on the Canadian side, and without the control dam twenty-three per cent.

WATER-POWER AND COAL.

A coal consumption per indicated horsepower for condensing engine would be one and one-half pounds per hour as minimum consumption, under test conditions, with the most efficient machinery uuder favourable conditions. On this basis the consumption of coal per horsepower per day would be thirty-six pounds or six and one-half tons per year. Winnipeg river water-power with the control of Kenora dam is the equivalent of coal consumption of 5,871,450 tons a year which would be required to generate the same power, without the control of the Kenora dam, the water-power would be the equivalent of a coal consumption of 3,564,200 tons a year.

The quantity of coal required to produce power equal to the water-power of Winnipeg river, with and without control of Kenora dam conveys an idea, not only of the value of the water-powers of Winnipeg river, but also the desirability of controlling Kenora dam.

WINNIPEG POWER PLANT.

Upon Winnipeg river at Pointe du Bois falls the City of Winnipeg Power department are about to construct a large power plant. They have cleared a portion of the site and built some workmen's log houses. To assist in the installation of the plant they are building a railway from Lac du Bonnet station to Pointe du Bois. The rails are already laid from the Canadian Pacific railway station to the crossing about two and one-half miles, and that part of the line has been ballasted. From Winnipeg river to Pinawa channel the grading is nearly completed, except for a couple of small rock cuts. From Pinawa channel to Pointe du Bois, about half the clearing, grading and rock cutting has been done. In December they were building crib piers filled with stone for their bridge over Winnipeg river.

PINAWA CHANNEL.

The Winnipeg Street Railway and Power company have accomplished a large amount of rock cutting from the head of Pinawa channel for a distance of about four miles, their diversion weir raised the water about six feet. On the north channel the weir is a crib dam and on the south channel a loose rock dam. The spillway and control dam are substantially constructed of cement masonry. The generating station (20,000 H.P.) has a foundation of cement masonry, the upper part being of brick. It is solidly built and is of a permanent character. The dam is also a solid structure of cement masonry. Half a dozen good brick houses, each with stone foundations, have been built. All the stone used is pink coloured granite, and was quarried in the vicinity, while the brick was obtained from the Lac du Bonnet brickyard.

At the Winnipeg City Power tramway crossing, there have been two big rock cuts to improve the channel to dispose of the tail-race water. The trouble with tail-race arises, I think, in consequence of the channel being of rock and not overlaid so deep with sediment as expected.

It was contemplated at first that the great quantity of water passing out would scour the channel, but for the reasons given this was not the case. The dam has since been raised 30 inches with square timber, and this should greatly facilitate the passing off of the tail-race water. The quantity of water passing through Pinawa channel at the power house at the different times I have been there was about 7,500 to 8,000 foot-

seconds, which is about equal to twenty-seven per cent of the minimum flow of Winnipeg river.

The transmission line from the power plant at Winnipeg is carried on steel towers of first class workmanship.

WATER-POWER OF FALLS.

The first fall on English river has a descent of 8·74 feet. The minimum flow is estimated at 8,310 foot-seconds or 1,012 horsepower per foot fall. It is practical to build a dam ten to twelve feet high. I do not know whether it would flood the Indian reserve on Loneman lake. Minimum horsepower, 8,845.

The first fall or rapids on Winnipeg river is about two and one-half miles east of the boundary of Manitoba. It has a 4·04 foot descent and is of no commercial importance. A dam built eight to ten feet high would flood the best grazing and hay land of Islington Indian reserve. The river is divided in three channels, one of them would have to be dammed about three miles from the main channel. Minimum flow estimated at 19,400 feet per second; minimum horsepower, 8,888

LAMPREY FALLS.

This falls is situated on section 24, township 16, range 15, east of principal meridian. It has a descent of 14·26 feet. The water could not be raised higher than six feet without flooding the Islington Indian reserve. The length of dam is 1,350 feet on rock bottom abutment. Minimum horsepower, 31,372.

POINTE DU BOIS FALLS.

This falls situated on section 36. township 15, range 14, has a descent of 31·63 feet. A dam could not be built without destroying a part of Lamprey falls. I would suggest building a dam to raise the water 23·28 feet. This would obliterate Lamprey and Boundary falls. Minimum horsepower, 69,586.

EIGHT-FOOT FALLS.

This falls situated on section 25, township 15, range 14 and section 30, township 15, range 15, has a descent of 8·30 feet. Minimum horsepower, 18,260. The water could not be raised without interfering with Pointe du Bois falls. As is stands it could be utilized cheaply.

SLAVE FALLS.

Slave falls is situated on sections 1, 2, 11 and 12 township 15, range 14. It has a descent of 17·39 feet, minimum horsepower 40,018. In building a dam the water could be easily diverted on the west side where there is a fine millsite.

STURGEON FALLS.

Sturgeon falls is situated on section 8, township 14, range 4. It has a descent of 4·35 feet, minimum horsepower 9,570. The water could not be raised without interfering with Slave fall.

OTTER FALL.

This fall situated on section 7, township 14, range 13, has a descent of 1·10 feet, minimum horsepower, 2,420. This fall used to be five or six feet high, but has been reduced to he present height owing to the diversion weir built below Pinawa channel.

DIVERSION WEIR.

The diversion weir is situated below Pinawa channel has a descent of 6·10 feet. It is built in two channels, on the north channel cribwork, on the south channel loose rock work, of no commercial value to generate power.

UPPER SEVEN RAPIDS FALLS.

This fall is situated on section 36, township 13, range 11 and section 31, township 13, range 12 at the bay, descent 23·13 feet; minimum horsepower 50,886. It is practicable to build a dam to divert the water on the east side, where on the bay there is an ideal millsite.

NO. 1 MCARTHUR FALL.

No. 1 McArthur fall is situated at the outlet of Lac du Bonnet, on sections 27 and 35, township 16, range 11. It has a descent of 6·95 feet minimum horsepower, 15,312.

NO. 2 MCARTHUR FALL.

No. 2 McArthur fall is situated on sections 34 and 35 township 16, range 11. It has a descent of 6·81 feet, minimum horsepower, 14,982. On the two channels it is practicable to build dams to raise the water to the ordinary level of Lac du Bonnet.

GRAND DU BONNET FALLS.

This fall situated on sections 14, 15 and 22 township 17, range 11 has a descent of 34·09 feet, minimum horsepower 74998. It is practicable to build a dam on the two channels about 730 feet long to divert the water on the northwest side where there is a good millsite.

FALL.

This fall situated on section 27, township 17, range 11, has a descent of 8·86 feet, minimum horsepower, 19,492. It is not practicable to raise the water without interfering with Grand du Bonnet fall, but it could be economically used in its present condition.

WHITEMUD FALLS.

Whitemud falls situated on sections 29, 30, 31 and 32, township 17, range 11 has a descent of 12·19 feet, minimum horsepower 26,818. It is practicable to build a dam and divert the water on the east side where there is a good millsite.

SILVER FALLS.

Silver falls is situated on section 1, township 18, range 10. It has a descent of 22·72 feet. Minimum horsepower, 49,984. It is practicable to build a dam to divert water on both sides.

PINE FALL.

This fall, situated on section 29, township 18, range 10, has a descent of 7·79 feet, minimum horsepower 17,138. It is practicable to build a dam and divert the water through the old mill race.

Inasmuch as the water-powers in some cases occur within a short distance of each other, I suggest that the power should be concentrated as much as possible, which can

be accomplished without any loss of power. The distance between any two water-powers would be navigable for vessels drawing ten feet of water. The horsepower given below is based on an assumed minimum flow of 19,400 feet of water per second.

1. Pointe du Bois falls are situated on section 36, township 15, range 14. A dam should be built to raise the water 23·28 feet. This would give a descent of 54·91 feet, minimum horsepower, 120,802. This dam should be about seven hundred and twenty feet long, and would be intersected by two rocky islands the bottom and abutment would be on solid granite foundation. The water should be diverted on the west side where there is a good millsite. Very little rock excavation would be required but some filling on the east side of the channel might be necessary.

SLAVE FALLS.

2. Slave falls is situated on sections 1, 2, 11 and 12, township 15, range 14. A dam should be built to raise the water 8·19 feet. This would give a descent of 25·58 feet. Minimum horsepower, 56,276. This dam should be about three hundred and fifty feet long. The bottom and abutment would be on bare solid granite foundation. This dam would obliterate the eight foot fall. The water should be diverted on the west side, where there is a good millsite. Little rock excavation would be required on the canal.

UPPER SEVEN RAPIDS FALLS.

3. This falls is situated on section 31, township 13, range 12 and section 36, township 13, range 11. The dam should be built to raise the water 15·57 feet, which would give a descent of 39·40 feet. Minimum horsepower at the bay, 50,039. On the upper and lower Seven Rapids falls the amount of water going through Pinawa channel, or 8,000-foot seconds, has been deducted. This dam should be about four hundred feet long, the bottom and abutment being on bare solid granite formation. This dam would obliterate Otter and Sturgeon falls. The water should be diverted on the southeastern side to the bay where there is an ideal millsite. Little or no rock cutting would be required on the channel.

LOWER SEVEN RAPIDS FALLS.

4. This fall is situated on sections 26, 27, 33, 34 and 35, township 13, range 11; from the head of Second falls below the bay at Upper Seven rapids a dam should be built to raise the water seven feet. This would give a descent of 24·60 feet, minimum horse-power 31,807. This dam should be about 930 feet long and would be intersected by two rocky islands. The bottom and abutment would be on solid bare granite formation. There is a good millsite on the northeastern side, which I think would be the best side to divert the water.

GRAND DU BONNET FALLS

5. Grand du Bonnet falls is situated on sections 14, 15, 22 and 23, township 17, range 11. A dam should be built to raise the water fourteen feet. This would give a descent of 48·09 feet, minimum horsepower, 105798. The dam would require to be about 795 feet long, and would be intersected by one island. The bottom and abutments would be on solid bare granite. The water should be diverted on the northwesterly side where there is a good millsite. A considerable amount of rock cutting would be required on the channel. This dam would obliterate McArthur 1 and 2 falls and would raise the water to the general level of Lac du Bonnet.

SILVER FALLS.

6. Silver falls is situated on sections 1, 2, 11 and 12, township 18, range 10. A dam should be built to raise the water 20·90 feet. This would give a descent of

43·62 feet,—minimum horsepower, 95,964. The dam would require to be about 800 feet long and would be intersected by one rocky island. The bottom and abutment would be on solid granite formation. This dam would obliterate Whitemud fall and the fall below Grand du Bonnet falls. The water could be diverted on either side.

PINE FALLS.

7. Pine falls is situated on section 29, township 18, range 10. A dam should be built to raise the water 4·08 feet. This would give a descent of 11·87 feet, minimum horse-power 26,114. This dam would require to be about 860 feet long. The bottom and abutment would be on solid bare granite formation. The water should be diverted on the southern side along the old mill-race, where there is a good mill-site.

FIRST FALL ON ENGLISH RIVER.

8. The first fall on English river is situated about ten miles up from its junction with Winnipeg river. It has a descent of 8·6 feet. It would be safe to raise the water by a dam about 6 feet which would give a descent of 14·6 feet—minimum horsepower, 14,168. This dam would require to be about 530 feet long. The bottom and abutments would be on solid bare granite. The water should be diverted on the west side.

WATER-POWER AT THE FALLS.

I would suggest that the water-powers be concentrated in as few places as possible; this would make it cheaper to develop the power per horsepower. No dam should be built at any of the water-power falls without the sanction of the government. The dams should be water-tight, and so constructed as not to interfere with other water-power; however, water not used at a lower plant, millsite or generating station should be at the disposal of the government as should any portion of millsite not used.

If a large quantity of power were used at any of the proposed water-powers to be developed, it might be found necessary to have some legislation enacted to prevent the owners of the Kenora dam flooding unnecessarily the power people on Winnipeg river, or to reduce for weeks the minimum flow of the river to one-half or less than what it would naturally be, if not interfered with by the unnecessary closing or opening of their dam.

I have measured the flow of English river at 'the Narrows,' about one mile below the first fall and found the depth of water to be from fifty to eighty feet. In determining the velocity at this point, I could not arrive at any satisfactory conclusion without using a current metre. The results obtained were certainly in excess of the correct figures. I have deducted the minimum flow of English river from its drainage basin.

HIGH WATER MARK.

There is a well defined high water mark about five and one-half feet to six and one-half feet above ordinary water. I am informed by old Indians that the water has not reached that height for years past. If the range beween high and low water is not more, it is probably due to the greater number of lakes in the Rainy lake and Lake of the Woods district.

I transmit herewith the following plans:—

1. The general plan of the country from Kenora to north of lake Winnipeg and west of the city of Winnipeg, showing general location of water-powers, and location of generating station of Winnipeg City Electric railway, their transmission line, the proposed location of the Winnipeg City Power generating station at Pointe du Bois, their tramway under construction, and their proposed transmission line.

2. Diagram showing discharge mean velocity and area, cross section, &c., &c. These rating curves were determined by two cross-sections, one made by the Winnipeg City Power company on March 7, 1906, at Pointe du Bois falls, and the other by myself September 12, 1907, about a mile above Lamprey falls, both connected with the gauge height at Pointe du Bois falls. The quantities were deduced by Kutter's formulæ after many trials and compared with the snow and rain fall of the past eleven years.

The great variation shown at the gauge height beween April 10 and 20, 1907, are not natural; they are due to the opening or closing of the control dam at Kenora.

Loss by the average yearly run off is about twenty-one per cent.

3. The gauge height for three hundred and twelve days in 1907 was furnished to me by the Winnipeg City Power company, also the cross-section above Pointe du Bois falls. The velocity of the water was taken by a current metre at every four feet in depth, and at distances about twenty feet apart.

4. The profile showing all the bench marks, height of falls, &c.

5. Detailed plans of all the water-powers on a scale of six chains to one inch.

6. Table showing upper and lower gauge reading at Pointe du Bois falls from January 23, 1907, to March 31, 1908.

By means of the diagram and table, the quantity of water and horsepower for every day from January 1, 1907, to March 31, 1908, may be fully ascertained by using the upper gauge reading.

7. Table showing the ground required for millsites.

8. Table of land that might be flooded by proposed millsite, &c.

I have the honour to be, sir,
Your obedient servant,

W. THIBAUDEAU, *C.E.*

GAUGE reading at Pointe du Bois Falls, taken by the City of Winnipeg Power Department, January 23, 1907 to March 31, 1908.

Date.	Upper Gauge Reading.	Lower Gauge Reading.
January 23	0·6	0·5
24	....	....
25	....	....
26	0·3	0·6
27	....	....
28	....	....
29	0·2	0·9
30	....	....
31	0·2	1·0
February 1	0·2	0·9
2	0·2	0·7
3	....	....
4	0·1	1·0
5	0·1	1·1
6	0·1	1·1
7	0·3	1·0
8	0·3	0·8
9	0·3	0·3
10	0·3	....
11	0·3	0·3
12	0·3	0·2
13	0·3	0·3
14	0·3	0·0
15	0·3	0·5
16	0·3	0·5
17	0·4	....
18	0·4	0·6
19	0·4	0·4
20	0·4	0·4
21	0·4	0·3
22	0·4	0·5
23	0·4	0·5
24	....	....
25	0·4	0·3
26	0·4	0·1
27	0·5	0·1
28	0·5	0·3
March 1	0·5	0·5
2	0·4	0·5
3	0·4	....
4	0·4	0·7
5	0·4	0·6
6	0·4	0·5
7	0·4	0·6
8	0·4	0·6
9	0·4	0·7
10	0·4	....
11	0·4	0·9
12	0·4	0·8
13	0·5	0·7
14	0·6	0·8
15	0·5	0·7
16	0·5	0·8
17	0·5	....
18	0·6	0·8
19	0·6	0·8
20	0·6	0·8
21	0·6	0·9
22	0·6	1·0
23	0·5	1·0
24	0·5	....
March 25	0·5	1·0
26	0·4	1·1
27	0·4	1·1
28	0·5	1·1
29	0·5	0·9
30	0·5	....
April 1	0·5	0·9
2	0·5	1·0
3	0·6	1·2
4	0·6	1·2
5	0·6	1·3
6	0·6	1·2
7	0·6	....
8	0·6	1·3
9	0·6	1·3
10	0·7	1·3
11	0·9	1·3
12	1·1	1·3
13	1·3	1·3
14	1·2	....
15	1·1	1·3
16	0·9	1·3
17	0·8	1·3
18	0·7	1·3
19	0·7	1·3
20	0·6	1·3
21	0·6	....
22	0·6	1·3
23	0·6	1·3
24	0·7	1·3
25	0·7	1·2
26	0·7	1·3
27	0·6	1·3
28	0·6	....
29	0·6	1·3
30	0·6	1·3
May 1	0·6	1·3
3	0·6	1·2
3	0·6	1·2
4	0·6	1·3
5	0·6	....
6	0·6	1·2
7	0·6	1·2
8	0·6	1·1
9	0·6	1·1
10	0·6	1·2
11	0·5	1·2
12	0·5	....
13	0·5	1·2
14	0·5	1·2
15	0·5	1·2
16	0·5	1·1
17	0·4	1·1
18	0·4	1·0
19	0·4	....
20	0·4	0·9
21	0·4	0·8
22	0·4	0·8
23	0·3	0·7
24	0·3	0·7
25	0·3	0·7

GAUGE reading at Pointe du Bois Falls—*Continued.*

Date.	Upper Gauge Reading.	Lower Gauge Reading.	Date.	Upper Gauge Reading.	Lower Gauge Reading.
May 26	0·2	0·7	August 3	1·4	1·4
27	0·2	0·6	4	1·4	1·4
28	0·1	0·5	5	1·4	1·5
29	0·1	0·4	6	1·4	1·3
30	0·0	0·3	7	1·4	1·3
31	0·1	0·3	8	1·4	1·3
June 1	0·1	0·3	9	1·3	1·3
2	0·2	0·2	10	1·4	1·3
3	0·3	0·1	11	1·4	1·3
4	0·4	0·0	12	1·4	1·3
5	0·4	0·1	13	1·4	1·3
6	0·5	0·2	14	1·4	1·3
7	0·5	0·3	15	1·4	1·3
8	0·5	0·3	16	1·4	1·3
9	0·5	0·3	17	1·4	1·3
10	0·6	0·4	18	1·5	1·3
11	0·8	0·6	19	1·6	1·5
12	0·9	0·8	20	1·6	1·6
13	1·0	0·9	21	1·7	1·6
14	1·0	0·9	22	1·7	1·7
15	1·1	1·0	23	1·7	1·7
16	1·1	1·1	24	1·7	1·7
17	1·2	1·1	25	1·7	1·7
18	1·3	1·2	26	1·9	1·7
19	1·3	1·3	27	1·9	2·0
20	1·3	1·3	28	1·9	2·0
21	1·4	1·4	29	1·9	2·0
22	1·5	1·5	30	2·0	2·0
23	1·5	1·6	31	2·0	2·0
24	1·5	1·6	September 1	1·9	2·1
25	1·5	....	2	1·9	2·1
26	1·5	1·7	3	2·0	2·2
27	1·5	1·8	4	2·0	2·2
28	1·6	1·8	5	2·0	2·2
29	1·6	1·8	6	2·0	2·2
30	1·6	1·8	7	2·0	2·3
July 1	1·6	1·9	8	2·0	2·3
2	1·6	1·9	9	2·0	2·3
3	1·6	1·9	10	2·0	2·3
4	1·6	1·9	11	2·0	2·3
5	1·5	1·9	12	2·0	2·3
6	1·5	1·9	13	2·0	2·3
7	1·5	1·9	14	2·1	2·5
8	1·5	1·8	15	2·1	2·5
9	1·5	1·7	16	2·1	2·5
10	1·5	1·6	17	2·1	2·5
11	1·5	1·6	18	2·1	2·5
12	1·5	1·6	19	2·1	2·5
13	1·5	1·5	20	2·1	2·5
14	1·5	1·5	21	2·1	2·5
15	1·5	1·5	22	2·1	2·5
16	1·5	1·5	23	2·2	2·5
17	1·5	1·5	24	2·2	2·5
18	1·5	1·5	25	2·2	2·5
19	1·5	1·5	26	2·2	2·5
20	1·5	1·5	27	2·3	2·7
21	1·5	1·5	28	2·3	2·7
22	1·5	1·5	29	2·3	2·7
23	1·5	1·5	30	2·3	2·7
24	1·5	1·5	October 1	2·3	2·8
25	1·5	1·5	2	2·4	2·9
26	1·4	1·4	3	2·4	2·9
27	1·4	1·4	4	2·4	2·9
28	1·4	1·4	5	2·5	3·3
29	1·4	1·4	6	2·5	3·3
30	1·4	1·4	7	2·5	3·3
31	1·4	1·4	8	2·5	3·3
August 1	1·4	1·4	9	2·5	3·3
2	1·4	1·4	10	2·5	3·3

GAUGE reading at Pointe du Bois Falls—*Continued.*

Date.	Upper Gauge Reading.	Lower Gauge Reading.	Date.	Upper Gauge Reading.	Lower Gauge Reading.
October 11	2·6	3·3	December 18	2·5	2·7
12	2·7	3·4	19	2·5	2·7
13	2·7	3·4	20	2·5	2·6
14	2·7	3·4	21	2·5	2·5
15	2·7	3·4	22	2·5	2·5
16	2·7	3·4	23	2·5	2·5
17	2·7	3·4	24	2·5	2·5
18	2·7	3·4	25	2·5	2·5
19	2·7	3·4	26	2·5	2·5
20	2·7	3·4	27	2·5	2·4
21	2·7	3·4	28	2·5	2·3
22	2·7	3·4	29	2·5	2·3
23	2·7	3·4	30	2·5	2·4
24	2·7	3·4	31	2·5	2·3
25	2·7	3·4	January 1	2·5	2·3
26	2·7	3·4	2	2·4	2·3
27	2·7	3·4	3	2·4	2·4
28	2·7	3·4	4	2·4	2·3
29	2·7	3·4	5	2·4	2·3
30	2·5	3·3	6	2·4	2·3
31	2·5	3·3	7	2·4	2·4
November 1	2·5	3·3	8	2·4	2·4
2	2·5	3·3	9	2·4	2·3
3	2·5	3·3	10	2·4	2·4
4	2·5	3·3	11	2·4	2·3
5	2·5	3·3	12	2·3	2·3
6	2·5	3·3	13	2·4	2·3
7	2·5	3·3	14	2·4	2·3
8	2·5	3·3	15	2·4	2·4
9	2·5	3·3	16	2·4	2·3
10	2·5	3·3	17	2·4	2·3
11	2·5	3·3	18	2·5	2·3
12	2·5	3·3	19	2·5	2·3
13	2·5	3·3	20	2·5	2·3
14	2·5	3·3	21	2·5	2·3
15	2·5	3·3	22	2·5	2·3
16	2·5	3·3	23	2·5	2·3
17	2·5	3·3	24	2·5	2·0
18	2·5	3·3	25	2·5	2·0
19	2·5	3·3	26	2·5	2·1
20	2·5	3·3	27	2·5	2·2
21	2·5	3·3	28	2·5	2·5
22	2·5	3·3	29	2·6	2·7
23	2·5	3·3	30	2·6	2·9
24	2·5	3·3	31	2·6	2·9
25	2·5	3·3	February 1	2·6	2·9
26	2·5	3·3	2	2·7	3·0
27	2·5	3·3	3	2·7	3·0
28	2·5	3·3	4	2·7	2·7
29	2·5	3·3	5	2·8	2·9
30	2·5	3·3	6	2·8	2·9
December 1	2·5	3·3	7	2·8	2·9
2	2·5	3·3	8	2·8	3·0
3	2·5	3·3	9	2·8	2·8
4	2·5	3·3	10	2·8	2·6
5	2·5	3·3	11	2·9	2·3
6	2·5	3·2	12	2·9	2·2
7	2·5	3·1	13	2·9	2·0
8	2·5	3·1	14	2·8	2·0
9	2·5	3·0	15	2·8	2·0
10	2·5	3·0	16	2·8	2·0
11	2·5	3·0	17	2·8	2·0
12	2·5	2·9	18	2·8	1·9
13	2·5	2·9	19	2·8	2·0
14	2·5	2·8	20	2·8	1·9
15	2·5	2·8	21	2·7	1·9
16	2·5	2·7	22	2·8	1·8
17	2·5	2·7	23	2·8	1·8

GAUGE reading at Pointe du Bois Falls—*Continued.*

Date.	Upper Gauge Reading.	Lower Gauge Reading.	Date.	Upper Gauge Reading.	Lower Gauge Reading.
February 24	2·7	2·3	March 16	2·8	1·5
25	2·6	2·5	17	2·8	1·7
26	2·6	2·5	18	2·7	1·5
27	2·7	2·5	19	2·7	1·5
28	2·7	2·5	20	2·7	1·5
29	2·7	1·9	21	2·8	1·4
March 1	2·7	1·8	22	2·7	1·5
2	2·8	1·7	23	2·8	1·3
3	2·8	1·7	24	2·8	1·3
4	2·8	1·6	25	2·8	1·3
5	2·8	1·6	26	2·7	1·3
6	2·7	1·6	27	2·7	1·2
7	2·7	1·6	28	2·7	1·2
8	2·7	1·7	29	2·7	1·1
9	2·7	1·8	30	2·7	1·0
10	2·7	1·8	31	2·7	1·0
11	2·7	1·6			
12	2·8	1·5			
13	2·8	1·6			
14	2·8	1·5			
15	2·8	1·5			

N.B. C.P.R. levels.

Upper gauge ..... 962·69

Lower gauge ..... 930·95

DISCHARGE and Horsepower Table for Winnipeg River, Manitoba—Pointe du Bois, Upper Gauge, 1907-1908.

Upper gauge reading.	Discharge foot-second.	Theoretical Horsepower per foot fall.	Upper gauge reading.	Discharge foot-second.	Theoretical Horsepower per foot fall.
3·00	72000	8180	0·80	33500	3624
2·90	69500	7700	0·70	32420	3512
2·80	67100	7300	0·60	31300	3386
2·70	64500	6855	0·50	30350	3285
2·60	62025	6710	0·40	29450	3186
2·50	59600	6448	0·30	28450	3078
2·40	57350	6205	0·20	27500	2976
2·30	55250	5978	0·10	26550	2880
2·20	53200	5791	0·00	25600	2770
2·10	51250	5545	−0·10	24700	2672
2·00	49550	5356	−0·20	23950	2592
1·90	48025	5196	−0·30	23123	2500
1·80	46600	5042	−0·40	22300	2413
1·70	45150	4886	−0·50	21550	2331
1·60	43700	4728	−0·60	20800	2250
1·50	42300	4560	−0·70	20050	2169
1·40	41000	4435	−0·80	19400	2100
1·30	39100	4278	−0·90	18750	2018
1·20	38420	4156	−1·00	18100	1978
1·10	37150	4020	−1·10	17450	1888
1·00	36000	3900	−1·20	16800	1816
0·90	34600	3747	−1·30	16150	1740

Approximate list of parcels of land that are liable to be flooded if dams are built as suggested. Generally, any land where the water is not to be raised more than twelve feet is not likely to be flooded.

SILVER FALLS TO WHITEMUD FALLS.

Section 1, east half section 2, township 18, range 10 east of the principal meridian, section 36, north half and southeast quarter section 25, and northeast quarter

section 24, township 17, range 10, southwest quarter section 6, township 18, range 11, north half section 30, section 31 and west half section 32, township 17, range 11.

GRAND DU BONNET FALLS.

Sections 2, 3, 10, 11, 14, 22, east half section 15, southeast quarter and west half section 23, township 17, range 11.

LOWER SEVEN RAPIDS FALLS.

North half section 27, northeast quarter section 28, east half section 33, section 34 and west half section 35, townships 13, range 11.

UPPER SEVEN RAPIDS FALLS.

Sections 31, 32, 35 and 36, northeast quarter section 34, north half section 33, township 13, range 12, south half section 5, sections 1, 2, 3 and 4, south half sections 10 and 11, township 14, range 12.

POINTE DU BOIS FALLS.

East half section 35, section 36, township 15 range 14, west half section 31, township 15, range 15, section 1 east half section 2, south half and northeast quarter section 12, township 16, range 14, northwest quarter section 3, north half and southwest quarter section 4, sections 5, 6, 7, 8, 9, 14, 15, 16 and 23, north half and southwest quarter section 10, north half section 11, east half and southwest quarter section 17, south half sections 21 and 22, township 16, range 15.

LAND RESERVED FOR MILLSITE.

POINTE DU BOIS.

Section 36, township 15, range 14 east of principal meridian.

SLAVE FALLS.

Southeast quarter section 11, southwest quarter section 12, northwest quarter section 1 and northeast quarter section 2, township 15, range 14.

UPPER SEVEN RAPIDS FALLS.

West half section 31, township 13, range 12, section 36 and north half section 25, township 13, range 11.

LOWER SEVEN RAPIDS FALLS.

West half section 35, section 34, north half section 27, east half section 33 and northeast quarter section 28, township 13, range 11.

GRAND DU BONNET FALLS.

Sections 14, 22, 23, north half section 15, township 17, range 11.

SILVER FALLS.

North half section 1, south half section 12, northeast quarter section 2 and southeast quarter section 11, township 18, range 10.

PINE FALLS.

Northwest quarter section 18, west half section 28, north half section 19 and section 29, township 18, range 10.

APPENDIX No. 42.

REPORT OF J. N. WALLACE, D.L.S.

SURVEY OF THE BOUNDARY BETWEEN BRITISH COLUMBIA AND THE YUKON TERRITORY ACROSS THE DALTON TRAIL.

CALGARY, ALTA., January 6, 1908.

E. DEVILLE, Esq., LL.D.,.
Surveyor General,
Ottawa, Ont.

Sir,—I have the honour to submit the following report of the survey of part of the boundary between British Columbia and the Yukon Territory, undertaken in accordance with your instructions of May 13, 1907:—

I left Calgary on May 27 and reached Vancouver on the 30th, having stopped over for two days at Kamloops, B.C., where I purchased thirteen pack horses.

The party was organized and the outfit completed at Vancouver. We left there on June 7 by the Canadian Pacific steamer *Princess Beatrice*, and reached Skagway on the evening of June 11.

My instructions were to offset the monuments on the Yukon boundary between lake Bennett and Windy arm, and then to proceed with the survey across the Dalton trail. I, therefore, divided the party at Skagway; the head packer and three men were sent with all the horses and the bulk of the outfit across to Pyramid harbour, which is about three hours run southwest from Skagway, and is on the west side of Chilkat inlet. This portion of the party immediately set to work to get the outfit up Chilkat river and then up the Dalton trail as far as possible. The boundary between British Columbia and the Yukon crosses this trail about one hundred and five miles northerly from Pyramid harbour.

I myself, with my assistant, Mr. Blanchard Dodge, and the remainder of the party left Skagway by the White Pass and Yukon railway on June 13 and reached Pennington, B.C., fifty-two miles north, the same afternoon. Next day the outfit was moved up to the boundary and work commenced on the part east of lake Bennett.

The boundary monument known as 'H' stands about fifty yards east of the White Pass and Yukon railway track, which here runs along the east edge of lake Bennett. It is plainly visible to anyone passing on the train, and is about one mile and a quarter north of Pennington. There is only a residence for an operator and two parties of railway sectionmen at Pennington, but all trains stop there, and it is possible for a person to stop there over night.

The boundary crosses a long steady incline as it goes easterly from monument 'H.' At a distance of a mile and a quarter it reaches the summit of the first mountain east of lake Bennett, at an altitude of about two thousand feet above the lake. As the line nears this summit it goes through a good deal of spruce timber, and a person standing on the shore of lake Bennett can clearly see three lines cut out against the sky at the summit. The most northerly of the three lines is the boundary between British Columbia and the Yukon.

Between lake Bennett and the summit just referred to there is a monument on a local shoulder about seven-eighths of a mile east of the lake. After reaching the summit the remainder of the boundary to Windy Arm is across a rough mountainous country. While it is unfit for pack horses, and we had to pack our outfit across our-

selves, there is no difficulty in reaching any of the boundary monuments, and, except the eastern slope from mount Racine down to Windy Arm, there are no precipitous areas near the line. This section has already been described in detail in the departmental report for the year 1901. The total horizontal distance from lake Bennett to Windy Arm is a little over eight miles. There are monuments on the shores of both lakes and ten intermediate ones. The monument on the west shore of Windy Arm is known as 'G.' The next one west is three-quarters of a mile from Windy Arm, and stands in dense timber on the top of the westerly bank of a small stream flowing north and about one hundred feet up from its junction with Racine creek, which latter flows easterly around the north slope of mount Racine and empties into Windy Arm about half a mile south of the boundary. The next monument west is on the summit of mount Racine. Windy Arm is a little over a mile wide along the boundary. The most easterly post offsetted was that standing on its east shore.

The town of Wynton is situated just south of the boundary on the west shore of Windy Arm. Conrad is about six miles to the north. Much valuable ore has been found in this locality and a large amount of development work has been done, and several miles of aerial tramways have been constructed on the west shore north of the boundary. Some small work has also been done south of the boundary on the east shore.

There is a kind of pass by which one may easily cross the mountains from Wynton to Pennington, keeping near the boundary line. The route lies up the valley of Racine creek, keeping on the north side high up above the stream, until nearing its sharp turn to the south. Here the creek should be crossed and the southeasterly bank followed, which leads to a grassy open valley containing a small elongated lake through which Racine creek flows north . A boundary monument may be seen here, standing about 30 feet up the westerly slope of the valley, and about 100 feet northwest of the north end of the lake. After proceeding a quarter of a mile south of the lake, a wide, rough trough-shaped valley may be seen extending to the south of west. By following it westerly a stream flowing west is ultimately found. This should be followed down until about two and a half miles from the lake where it should be left, and a route taken a good deal higher up along the lower slopes of some mountains forming the southerly side of the wide valley. By proceeding along these slopes, the summit overlooking lake Bennett is reached with nothing worse than some deep ravines which run at right angles across the route. The descent to White Pass railway is easy, if one keeps a little north of the boundary.

The work near Windy Arm was completed on July 3 and next day we went by the steamer *Gleaner* to Cariboo on the White Pass railway and from there to Skagway. This steamer runs from June 1 to November 1 and connects Cariboo, Atlin, Conrad and Wynton. There are also smaller steamers on Windy Arm.

We left Skagway for Haines on July 6 and reached there after an adventurous voyage of two hours in the little mail steamer *Hegg* against a very rough sea Haines is about eighteen miles southwest of Skagway.

From Haines we proceeded up the Chilkat and Dalton trail to the Yukon boundary. As the route taken is that usually followed, it is here described in some detail as far as Dalton Post which is seventy miles north of the international boundary.

Haines is the best seaport from which to proceed up the Dalton trail, provided no horses are taken. A long tongue of land runs down to the sea, between Chilkoot and Chilkat inlets. Haines is on the Chilkoot or east side; 'Hindistuckie,' five miles from Haines, is the name given to the point of embarkation for proceeding by water up the Chilkat, and is on the west side of the tongue of land. It is merely a name, and uncertain at that as I could not find anyone who would assume the responsibility of spelling it.

If horses are taken, there is only one trail for them at present up the Chilkat, and that is on the far side from Haines and 'Hindistuckie.' In order to avoid cross-

ing them over the dangerous quicksands of the Chilkat, they should be landed, in the first instance, on the west side of this inlet at Pyramid harbour. This is a fine harbour and the Alaska Packers Association have a wharf there, but it is not a regular calling place for steamers.

From either 'Hindistuckie' or Pyramid harbour, canoes carrying two tons of freight each travel up the Chilkat as far as Wells, about twenty-seven miles up stream. They depend upon a prevailing south wind to take them against the currents. If this wind is not on hand when wanted, there is no redress. It is necessary to wait for it, as no headway can be made by any other means. We had to wait a day and then had such an apology for a wind that, after eleven hours on the water, we had to camp near midnight at Klukwan, a mile short of Wells. With a good wind which is fairly frequent, the distance to Wells is covered in six hours. When coming down in October we had a small gale blowing up stream against us.

Wells is on the west side of the Chilkat, at its junction with Klehini river, and is the head of navigation so far as freight is concerned. From here to Porcupine is thirteen miles. The United States authorities are building a first class wagon road between Wells and Porcupine, already sufficiently far advanced to save two dangerous crossings of the Klehini. The intention, I believe, is to extend the road northerly to Pleasant Camp to connect with the Canadian road from there, and also to build a road along the east side of the Chilkat from 'Hindistuckie' to Wells. When this is completed, Haines will be the best landing place for all outfits, with or without horses.

At Porcupine there is a postoffice and extensive mining works, and a trading store of the Porcupine Gold Mining company. It is seven miles over a good wagon road from here to 'Pleasant Camp,' but Klehini river must be crossed on the way. 'Pleasant Camp' is, in summer at least, a beautiful spot just within Canadian territory.

Beyond 'Pleasant Camp' only pack horses can at present be used, but a wagon road is now being constructed to 'Rainy Hollow,' which is fourteen miles farther. Some excellent copper ore has been found near 'Rainy Hollow' and a good deal of work is now in progress. The mining district is all in Canadian territory and, if reports are justified, it should become famous.

Two routes can be followed at present from 'Pleasant Camp' to 'Rainy Hollow;' one follows the valley of the Klehini, keeps low down in the timber, and is very bad; the other strikes high up in the mountains a couple of miles out from 'Pleasant Camp.' This upper trail crosses a kind of summit pass and is difficult to follow in bad weather. Most summit passes have no definite land marks. Their topography is open and rolling and there is often danger in a fog or snowstorm, that one may get down over the wrong watershed. The elevation of 'Rainy Hollow' is stated to be 2,700 feet.

The next stage to 'Glacier Camp' is about twenty-two miles, with no possible intermediate camping ground and no shelter of any kind if bad weather comes on. Timber is left at 'Rainy Hollow' and the trail gradually rises to an elevataion of 3,800 feet. Just before the crossing of Clear creek, and about half way, the trail begins to descend and at 'Glacier Camp' is about 3,200 feet elevation. When nearing this camp the trail follows down the gravel bed of a large stream flowing northerly called Nadahini river (a branch of the Chilkat.) As soon as it leaves this river and turns up on the westerly bank, some spruce timber may be seen to the west, and it is better to camp here than to go on to the 'Cabin' where there is no firewood. This would be about a mile before reaching the 'Cabin.' Horses will surely go back to 'Mosquito Flats,' a kind of little prairie about four miles south of the 'Cabin,' but they will go back in any case. The 'Cabin' is about a quarter of a mile back from Nadahini river and visible in the high willows only when it is very close.

From 'Glacier' to 'Bear Camp' is fourteen miles. About nine miles from 'Glacier' the trail passes around the east side of a lake and then down a little canyon in which

flows Mansfield creek, the trail following the edge of the stream. It then enters an extensive open dry area with willow bushes.

The boundary between British Columbia and the Yukon can now be easily identified, although still about six miles to the north. The valley of the Tatshenshini stretches away a little west of north, with a group of mountains standing out in the far distance, which are north of Dalton post. To the west of north and about seven miles away may be seen a high sharp ridge, running east and west. At the extreme east end of this ridge there is a dome-shaped prominence with a small terrace a little below its summit. The dome is the most easterly prominence on the sky line west of the Tatshenshini valley. On the summit of this dome there is a boundary monument. The ridge referred to is plainly visible from a point about a mile south of 'Glacier Camp,' and at intervals thereafter along the Dalton trail. On the east of the Tatshenshini valley is a high even-topped mountain range, running almost north. The boundary crosses about a quarter of a mile down the shoulder at the extreme southerly end of this range, and then passes east up the valley at its foot, which is the valley of Blanchard river. After travelling across the above mentioned open area the old ford across Tatshenshini river is reached, about seventy yards below the junction of a large stream coming in from the east. The ford is partly washed out and a better one may be obtained about a mile higher up the Tatshenshini. 'Bear Cabin,' a former stopping place of the Royal Northwest Mounted Police, stands apart from any river and about two miles northeast of the old ford. The best camping ground is obtained by leaving the Dalton trail shortly after entering the open area and going about a mile northeast to the large stream just mentioned.

From 'Bear Camp' to Dalton post is about twenty miles, with, however, several possible intermediate camping grounds. Two junctions of streams are crossed in deep valleys, called Sheep canyon and Horse canyon, and distant five and eight miles from the old ford. Either of these forms a good camping ground if the canyon is followed down a quarter of a mile from the trail. It is stated that a good pass is obtained across the mountain range west of the Tatshenshini by following up the most northerly of the two streams uniting in Sheep canyon. This pass leads to the head waters of a stream flowing westerly into the Tatshenshini, about two miles north of the boundary. I believe the dalton trail reaches its highest elevation between Sheep canyon and the old ford. The trail enters timber about six miles north of Horse canyon and keeps in timber to Dalton post. The Tatshenshini can be forded opposite the 'post' if the water is very low, but the best ford is obtained a mile lower down. The 'post' is on the farther side. From Dalton post it is seventy-three miles to 'Champagne Landing,' and from there sixty miles by stage to Whitehorse. A branch trail runs southwest from Dalton post for forty miles along the west side of Tatshenshini river, which flows southerly after leaving Dalton post.

We left Haines on July 9 and reached Wells next day, where I found all the pack horses and the four men sent on from Skagway on June 12. They had transported all the outfit as far as 'Pleasant Camp,' and about three-quarters of a ton to 'Glacier Camp,' eighty miles from Haines. We all reached the boundary line in Horse canyon on July 23, having been delayed by high water in all the rivers and having to double trip part of the journey. Cloudy weather prevented observations for latitude being taken until the nights of July 29 and 30, when a point was established from the observations of twenty-four pairs of stars with the zenith telescope, with a probable error of 0.23 of a second. The point of observation was on the west bank of the Tatshenshini, about three-eighths of a mile south of the monument known as 'M.'

By August 7 a trial line had been run west from 'M' for a distance of nearly five miles to the summit of the mountain range west of the Tatshenshini. This range extends many miles southerly and northerly as far as Dalton post, where the Tatshenshini flows around the north end. It caused us delays aggregating at least two weeks during the season, and I refer to it below as the Barrier range. It was hard enough to get the

line across, but out of the question to get the camp over, so we had to travel around by Dalton post, necessitating two crossings of Tatshenshini river in order to get at the end of the line west of the range.

I may say that both the Tatshenshini and Klehini rivers were constant sources of trouble and danger all season. Their current is so swift that a man on foot cannot ford them if the water is even up to his knees. Fords exist one day and are washed out the next, and added to all is the fact that the muddiness of the water prevents its depth from being known and the presence of huge boulders makes footing very insecure. Horses new to such rivers at first allow themselves to drift off a ford and pay no attention to their responsibilities, but after a time they learn to maintain their ground against the current to a remarkable degree. The average rate of the Tatshenshini is six miles an hour and the Klehini is swifter.

Having found the end of the line, it was continued on the Tatshenshini near station 'N,' where a long hunt for the former post ensued. It was subsequently ascertained that this post had been washed away in a flood on the river. Observations for latitude were taken again here on the east bank of the Tatshenshini on the nights of August 24 and 25, when a point was established from the results of the observation of twenty-one pairs of stars, with a probable error of 2.24 of a second. In the matter of taking observations for latitude Mr. Blanchard Dodge gave the most valuable assistance and I think will make a name for himself as an observer. The final boundary line was then run back easterly, the posts being offsetted to the true line and a new line cut out in the timber, and the whole completed to the summit of the Barrier range. Camp was then moved back easterly around by Dalton post, and the remainder of the boundary completed to the Tatshenshini at station 'M.'

On September 21 a trial line running east from 'M' was commenced and continued for five and three-quarter miles, where we ended operations for the season.

We started back for the coast on September 30. On the night of October 1, we were camped at 'Glacier' at an elevation of 3,200 feet, and four inches of snow fell. We crossed the summit next day in a snowstorm, which turned to fog and rain within a few miles of 'Rainy Hollow.' Next day the journey was continued to Porcupine in pouring rain, while no doubt heavy snow was falling on the summit we had just left, for on October 8 there was a depth of over three feet of snow there.

We reached Haines on October 6, and in the early morning of the 8th we crossed over to Skagway in the steamer *Georgia,* which plys beween Juneau, Skagway and Haines. On the evening of the same day I paid off all the men, except one, allowing them their time to the date of their arrival at Vancouver, October 13.

I then proceeded with one man to Windy Arm where I corrected the position of a post on the boundary and returned to Skagway on October 14. Skagway was left on the 17th by Canadian Pacific steamer and I reached Vancouver on the 20th and Calgary October 23.

BOUNDARY LINE FROM STATION 'M' TO STATION 'N.'

Monument 'M' is situated in a dense growth of spruce on the east bank of Tatshenshini river about one hundred and thirty yards from the river, and twenty-two feet above its level. It is about half a mile above the junction of the stream coming down from Horse canyon. It can be reached from the Dalton trail by following down the north side of the streams in either Sheep canyon, which is best, or in Horse canyon, but the Tatshenshini has then to be forded in a bad place. I believe a trail could be cut north from 'Bear Camp,' keeping back some distance east of the Tatshenshini and striking the boundary where it crosses Blanchard river, when it is only a short distance west across a hill to 'M.'

The Tatshenshini is about one hundred and twenty feet wide and varies much in depth. As a rule it cannot be forded on the boundary line. Immediately after leaving the Tatshenshini the land rises rapidly to the first monument west of 'M,' which is

distant five-eights of a mile and is 800 feet above it. It stands on a rough plateau overlooking the valley of Horse canyon to its northwest. The next monument is in the valley of Horse canyon, a little over half a mile west. It is one hundred and eighty yards west of where the Dalton trail crosses the northerly of the two streams which unite here, and is in poplar timber, about thirty feet above the level of the stream. The dome shaped mountain previously referred to can be seen here west of Dalton trail. It has apparently a double top with a small depression in which will probably be seen a wedge shaped snow patch. This mountain is referred to as Mount Kona. The monument on its summit is a mile and a quarter from the one near Dalton trail and 2,270 feet above it. Between these two there is another one on a rough turfy plateau of the kind known as a 'tundra.' It is nearly half a mile west of Dalton trail.

West of Mount Kona, on which is monument XIII at an elevation of 5,600 feet, the boundary crosses a very mountainous region for two miles and a quarter to the summit of the Barrier range. This portion contains two large snow fields and glaciers. There are two monuments, XII and XI, at altitudes of 6,140 feet, on spurs whose surface is a mass of boulders. About half a mile northwest of XII is a small lake at an altitude of 5,600 feet, whose border is a mass of ice.

The next monument, number X, is on the summit of the Barrier range and is at 6,520 feet altitude. From this point the huge mass of Mount St Elias can be clearly seen on the far western horizon, about one hundred miles away. About half a mile to the northwest of number X is Mount Beaton (6,900 feet), the highest peak in this neighbourhood. From the summit of this range there is a space of one and three-quarter miles, and a fall of 1,800 feet to the next monument farther west, the various spurs in the intervening area being composed of loose rocks, liable to slide at any moment, and not affording any stable position for a monument. This next monument is on the summit of a round topped mountain, altitude 4,728 feet. Number VIII is on a rough turfy plateau between the foot of the round-topped mountain and a small stream flowing south across the boundary. Number VII is three-eighths of a mile farther west and sixty feet west of top of the valley of the same stream. The elevations of these last two are 3,720 and 3,600 feet.

The boundary now enters timber and continues in it more or less all the way to the Tatshenshini. Monument VI is a little over a hundred yards east of the crossing of a large stream flowing northwest and is in thick spruce timber. I believe some valuable mineral will be found up this stream. It is the stream previously referred to as having its head waters connected by a pass with the stream flowing east through Sheep canyon on the Dalton trail.

The remaining four monuments to Station 'N' are in a rolling country. Monument 'N' is east of the Tatshenshini on a plateau 160 feet above the river and 132 feet back from the edge of the top of the bank. The elevation of the river is here 1,600 feet, a fall of 1,100 feet occurring in the river during its course of thirty-five miles from 'M.' The distance between monuments 'M' and 'N' along the boundary is a little less than eleven and one-half miles.

Any person looking for post 'N' should proceed southwest along the pack trail from Dalton post. After about thirteen miles a large stream, called Whitestone river, joins the Tatshenshini from the west; the trail crosses this river close to its junction with the Tatshenshini. About a mile below Whitestone river is Bridge creek, also on the west side, which flows in a small canyon. The boundary is between five and six hundred yards below the mouth of Bridge creek. The production of the line was cut out across a small timbered island and for a short distance into the timber on the west bank. The island is being rapidly washed away. It is difficult to ford the Tatshenshini near 'N,' and it is too swift for a raft. We forded it between Bridge creek and Whitestone river, but the horses had frequently to swim.

West of the Tatshenshini, the country contains rolling spruce covered hills for possibly fifteen miles when it reaches the foot of a lofty snow covered range running northwest, which attains an altitude of about 8,500 feet and holds many glaciers. Near

the boundary there is a good deal of timber around Bear camp, where an extensive belt of spruce runs around the lower slopes of the hills which stand on the east side of the Tatshenshini valley between Mansfield creek and Blanchard river. On the west side of the valley there are also small areas of spruce. Along Tatshenshini river itself timber commences about two miles below the old ford near 'Bear camp,' and continues thereafter down the whole course of the river. Spruce follows up the Blanchard for about fifteen miles from its junction with the Tatshenshini. Small poplar occurs up the sides of nearly all the small streams. The limit of spruce appears to be about three thousand two hundred feet altitude. Poplar exists at a higher elevation than spruce in small sheltered valleys, and may be found up to three thousand four hundred feet, but on the open mountain sides and wide valleys it cannot live even as high as spruce. The nature of the soil may, of course, have something to do with this difference. Willow occurs as high as three thousand eight hundred feet if good soil happens to exist so high. The last of vegetation is reached, as a rule, about four thousand three hundred feet. The limit of poplar is almost reached on the boundary at the monument in Horse canyon which is at an elevation of three thousand three hundred and thirty feet. West of this there is no timber until monument VII is reached. The monument, at an elevation of two thousand eight hundred feet, is in thick timber and thereafter westerly the whole country is timbered. South of Dalton post a good deal of spruce occurs. There is no pine of any kind in the country.

With regard to any elevations given in the neighbourhood of the boundary, it may be stated that the elevations of points on the boundary were connected by trigonometrical processes and may be relied upon relatively. If any correction should be applied to the whole, such correction could be most easily found by a reference to the boundary monument in Horse canyon. This monument is close to the Dalton trail and therefore easily accessible to any person who believes he can ascertain its true elevation above sea level.

The season as a whole was fine. When we first reached lake Bennett on June 15 there was no snow even at altitudes of six thousand feet, except a few patches. I believe, however, that the country along the boundary near the White Pass railway has a milder climate than that near Dalton trail. June and July were fine with spells of heavy rain, but August had many fogs in the higher altitudes. The weather does not appear to change suddenly but oscillates back and forth from fine to bad weather. A storm may generally be expected to culminate four or five days after the first appearance of clouds following a spell of fine weather. The weather then slowly recovers. When preparing to take observations it is well to bear this in mind. On September 3, snow fell to an altitude of 5,900 feet, but four days afterwards a heavy rainstorm occurred and washed all the snow off up to 6,600 feet. I am inclined to think this storm would have been snow in most seasons. On September 18 four inches of snow fell as low as 3,000 feet, but this was obliterated by rain subsequently up to 4700 feet, which was the snow line when we started homeward on September 30. On October 1 snow began to fall at 3,800 feet, and at this altitude there was a depth of three feet of snow on October 8. As regards the valleys, though both latitude and altitude are high, while the season lasts there is no very great difference from the season in the prairie provinces, but it ends suddenly and months earlier than in the provinces. To show that the climate is milder near lake Bennett and Windy Arm than farther west near Dalton post, I may say that when I was at Windy Arm on October 14, there was no snow at all along the boundary line, and even on the neighbouring higher peaks there was less snow than in the early summer.

Along the Dalton trail there is good grass nearly everywhere up to 3,500 feet, and horses do well during the season. I believe the country north of Dalton post opens earlier in spring than to the south, but people who have been to Dalton post both by the Whitehorse and by the Chilkat recommend the latter as the best route. The season for the passage of horses across the summits of the Dalton trail between

'Pleasant Camp' and Dalton post would appear to be from June 5 to October 5. I would rather try to begin earlier than make any attempt to stay later. We were very fortunate, but I saw enough to be able to appreciate the dangers of these summits in bad weather.

Throughout the season I met with the utmost courtesy from all United States officials and others, while passing through Alaska, and wish to express my acknowledgment of the same.

I have the honour to be, sir,
Your obedient servant,

J. N. WALLACE, D.L.S.

APPENDIX No. 43.

REPORT OF ARTHUR O. WHEELER, D.L.S.

PHOTO-TOPOGRAPHICAL SURVEY OF THE ROCKY MOUNTAINS.

CALGARY, ALTA., November 28, 1907.

E. DEVILLE, Esq., LL.D.,
Surveyor General,
Ottawa.

Sir,—I have the honour to submit the following report on the past season's operations:—

Work in the field was commenced on June 21, and a party sent to Paradise valley, near lake Louise, where it was required to obtain some missing photographic data. Here also the party, under instructions from the deputy minister, assisted the Alpine Club of Canada in the organization and effectiveness of its second annual camp. Without such assistance the camp would have been impossible, for there are as yet few trained mountaineers in Canada, and the members of my climbing parties acted as guides upon this occasion. These, through long experience, are the equals and in some respects the superiors of Swiss guides.

A word concerning the Alpine Club may not be amiss. It was organized on March 27, 1906, with a membership of 79, which has in less than two years increased to over 300. Members are scattered through the length and breadth of Canada, from Halifax to Vancouver. The membership is not confined to Canada, but extends to Australia, South Africa, France, England, Ireland and the United States of America, where it has representatives in ten states of the union. Three members of the Alpine Club of England, the oldest and most exclusive of all the Alpine clubs of the world, and three Fellows of the Royal Geographical Society, are among the Canadian club's members.

The result of the organization is the springing up of a most enthusiastic appreciation of Canada's mountain regions by Canadians, especially noticeable during the past summer, when more real mountaineering was done in the Canadian Rockies than for three years previous, not only by our own people but by people from other countries.

The value of the club was immediately recognized by the Canadian Pacific Railway company, and this powerful corporation has given it all possible assistance since its inception, quickly foreseeing that the thousands of which its membership will ultimately consist will be the best possible medium for converting the splendid Alpine tracts of Canada into a revenue producing centre, such as the European Alps, from the inflow of tourists.

On July 15 the survey party was sent to Golden, B.C., in charge of M. P. Bridgeland, D.L.S., my chief assistant, and climbing and photography for mapping purposes was immediately begun.

Accompanied by two assistants and a packer I made a flying trip up the Yoho valley to the Yoho glacier, where metal plates had been set out the previous year for the purpose of ascertaining the rate of movement of the great ice tongue here outflowing from the Wapta ice field. Too little attention has been bestowed upon this branch of science by the government surveyors in the mountains, and, though possessing the best opportunities owing to the vast areas of ice and snow distributed

along the higher portions of the several mountain ranges, most of the observations made so far have been by scientists from other countries.

Having checked the movements of the plates for the year, and made a quick photographic survey of the icefall and surrounding valley, I proceeded to Golden and, organizing two parties, crossed Columbia river. One party under Mr. Bridgeland was put to work in the Dogtooth mountains on the headwaters of Grizzly and Quartz creeks. With the other I carried the work southward along the west side of Columbia river.

On August 25 Mr. Bridgeland's party recrossed Columbia river and commenced a survey of the Beaverfoot range southward along Columbia river valley. At the same time I pushed into the Spillimacheen mountains with the intention of paralleling the work of the party on the east side of the Columbia.

Much delay and hindrance was caused to the work by the exceptionally stormy wet weather encountered during the months of August and September. It was intended that Mr. Bridgeland's party should work southward to the junction of Kootenay and Columbia rivers, but it was found impossible to get farther than thirty miles from Golden.

On the other side of the Columbia the dense forests extending many miles back from the stream forced us to keep to the heads of the tributary streams and to work from these sources to the peaks overlooking the valley of the main waterway.

Between the north and south branches of Spillimacheen river and southward therefrom lies a magnificent tract of truly Alpine country, with wide icefields reaching in every direction, from which rise sharp peaks, snow-clad domes and rocky precipices in the wildest confusion, many of the peaks attaining an altitude of little less than 11,000 feet above sea level. Icefalls are everywhere and waterfalls leap from sheer heights many hundreds of feet, to the beautiful Alpine valleys below. This tract is practically unknown and unmapped; the peaks are unnamed, and, except in so far as it has been visited by the mining prospector, it is a new region and yet remains to be explored. It is the home of the caribou and wild goat, and would furnish a paradise for the tourist and lover of nature if properly brought to notice. Moreover, Columbia river as a navigable waterway, and pony trails made by prospectors up the main valleys to numerous mining prospects, render it comparatively easy of access.

On September 19, owing to the continued wet weather, and the necessity of doing some work up Blaeberry river, and along the Columbia below Golden, I crossed the river and called in Mr. Bridgeland's party. This party was now sent up the Blaeberry to obtain sufficient data to enable the work carried northward from Kicking Horse valley to be mapped along the Blaeberry.

With my own party, I made a flying trip up Bluewater river and occupied several peaks in that vicinity. I then, with Donald as a base, occupied three of the outlying peaks of Dogtooth range as far as Quartz creek near Beavermouth, thus completing the work which Mr. Bridgeland had been unable to finish owing to bad weather.

The last two weeks of October were occupied by Mr. Bridgeland's party in making a traverse up Blaeberry river to tie in the camera stations he had previously occupied. With my own party I made a traverse along the railway from Donald to Beavermouth, using the railway as a base to tie in the camera stations occupied on both sides of the Columbia valley.

October was an exceptionally fine month and good work was accomplished, thus saving an otherwise disastrous season. The survey was closed upon that previously made of the Selkirk range and information is now at hand to furnish topographical maps of the mountain area lying along both sides of the Canadian Pacific railway between The Gap at the eastern escarpment and Revelstoke at the second crossing of Columbia river. This belt of topographically surveyed country extends largely to the limits of the railway belt.

During the season forty peaks were climbed and seventy-seven samera stations occupied thereon. In addition twenty-four camera stations were occupied along the railway at various points of vantage. Four hundred and thirty-one plates were exposed and data completed to enable the mapping of more than one thousand square miles of mountain country, which work will be performed during the coming winter and spring.

I have the honour to be, sir,
Your obedient servant,

ARTHUR O. WHEELER, *D.L.S.*,
Topographer of the Department of the Interior.

DESCRIPTIONS OF TOWNSHIPS

DESCRIPTIONS

OF

SURVEYED TOWNSHIPS

SUBMITTED BY DOMINION LAND SURVEYORS DURING THE SEASON OF

1907-1908

APPENDIX No. 44.

LIST OF TOWNSHIPS DESCRIBED.

EAST OR PRINCIPAL MERIDIAN.

Township.	Range.
14, 15	7
15, 16, 17	8
15, 16, 17	9
16, 17	10
6, 12, 13, 14, 15, 16, 17	13
6, 7, 8, 12, 13, 15, 16	14
1, 12, 15, 16	15
16	16
16	17

WEST OF PRINCIPAL MERIDIAN.

Township.	Range.
26, 27, 28	1
28	2
28	3
18, 22, 28	4
14, 15, 21, 22, 28	5
14, 22	6
22	7
22	8
21, 25, 26, 28, 29, 32	10
25, 26, 28, 32	11
26, 28, 32	12
26, 28, 32	13
23, 26, 28, 32	14
10, 32	15
10, 32, 51	16
32	17
32	18
32	19
41	25
41, 42, 43, 44	26
44	27
44	28
44	29

WEST OF PRINCIPAL MERIDIAN—*Con.*

Township.	Range.
24, 44	30
44	31
30, 44, 45	32

WEST OF SECOND MERIDIAN.

Township.	Range.
37, 38, 45	1
37, 45	2
37, 38, 45	3
38, 39, 40, 45	4
38, 39, 40, 45	5
37, 38, 39, 40, 45	6
39, 40, 45	7
45	8
45	9
38, 40, 45	10
38, 39, 40, 45	11
41, 42, 43	12
30, 31, 50, 51, 52	15
30, 31, 50, 51, 52	16
1, 2, 30, 51, 52	17
1, 2, 51, 52	18
49, 51, 52	19
50, 51, 52	20
50, 52	21
44, 51, 52	22
4, 46, 50, 52	23
4, 51, 52	24
9, 51, 52	25
9, 45, 49, 52	26
9, 41, 12	27
41, 42	28
6, 20, 21, 22	29
4, 5, 6, 17	30

List of Townships Described—*Continued.*

West of Third Meridian.	
Township.	Range.
4, 5, 6, 7, 8, 9, 10, 11, 21, 22, 24, 33, 34, 35. 37, 38, 52	1
4, 5, 6, 7, 8, 9, 10, 11, 12, 21, 22, 23, 24, 33, 34, 38, 52	2
5, 11, 12, 51	3
11, 12, 50, 51	4
10, 11, 12	5
11, 12, 34, 35, 48	6
11, 12, 48, 49	7
11, 12	8
11, 12	9
11, 12	10
47	11
11, 12, 49	12
10, 11, 49	13
49, 50, 51, 52	14
49, 50, 51, 52	15
8, 52	16
8	17
8	18
8	19
8	20
8	21
51, 52, 53, 54	27
54	28

West of Fourth Meridian.	
4, 27, 28, 29, 30, 31	6
27, 28	7
1, 2, 3, 4	8
1, 2, 3, 4, 60	9
1	10
1	11
1, 7, 8	12
2, 8, 65, 66	13
1, 2, 33, 34, 67, 68	14
29, 30, 33, 34, 66, 67, 68	15
29, 30, 33, 34	16
33, 34	17
29, 30, 31, 32, 33, 34	18
29, 30, 31, 33, 34, 66, 67, 68	19
29, 30, 31, 32, 33, 65, 66, 67, 68	20
29, 30, 31, 65, 67, 68	21
10, 11, 24, 66, 67, 68	22
60, 67, 68	23
10, 13, 65, 66, 67, 68	24
65	25
10	29

West of Fifth Meridian.	
Township.	Range.
13, 14	1
10, 11	2
11	3
20, 21, 22, 44, 47	4
48, 49, 54, 55, 56	5
49	6
54, 55, 57	7
54	9
53, 54, 55, 56	10
53, 54	11
53, 54	12
52, 53, 54	13
52, 53, 54, 73, 75	14
52, 53, 54, 73, 74, 75, 77	15
52, 53, 54, 77	16
51, 52, 53	17
52, 53, 54	18
52, 53	19
52, 53	20
52, 53, 84	21
52, 53	22
52, 53	23
51, 52, 53	24
30, 31, 51, 52, 53	25
31, 32, 52, 53	26
52, 53	27

West of Sixth Meridian.	
23	2
77, 78, 79, 80	3
80	4
19, 71, 72, 78	6
19	7
18	8
17, 18, 19	9
17, 18, 19	10
17, 18	11
18	12
18, 19	14
19	15
20	18
20	19
20, 21	20
19, 21	21
16, 20	22
15, 16, 20, 21	23
20	24
17, 22, 23	25
19, 20, 21, 22	26
2	29

DESCRIPTIONS OF TOWNSHIPS.

NOTE.—Numbers of townships are placed in heavy type on the left margin of the pages in the descriptions of townships.

TOWNSHIPS EAST OF THE PRINCIPAL MERIDIAN.

Range 7.

14. The greater portion of the west part of this township is rolling red sand and jackpine ridges while the remainder is poplar bush, tamarack swamp and sloughs. The soil in the tamarack swamps is generally of a quicksand nature. Most of the merchantable timber has been removed to market via Tyndale on the main line of the Canadian Pacific railway. Many old lumber roads are to be found also the almost decomposed remains of the old lumber camps. An old lumber trail was found throughout the length of the west boundary of the township. These are only winter roads impassable in the summer time.—*C. F. Aylsworth, D.L.S., 1907.*

15.—The greater portion of this township for two miles south of the Indian reserve is a floating tamarack muskeg, and the greater portion of the balance of this township is rolling jackpine, sand and gravel ridges.——*C. F. Aylsworth, D.L.S., 1907.*

Range 8.

15, 16 and **17.**—My route of approach to the east boundary or townships 17 and 16, range 8, and north boundary of township 15, range 9, was from the east by way of Lac du Bonnet, branch of the Canadian Pacific railway. I believe, however, that these lines may be more easily approached from the Brokenhead settlement on the west. The whole of the east boundary of townships 16 and 17, range 8 passes through an extensive marsh, containing a few scattered tamarack, willow scrub, rushes and long grass. The northern boundary of township 15, range 9 passes through a wooded district, except north of section 31, and the west half of 32 where the line is situated in the marsh. This district is therefore very flat and wet, the only dry portion being the north boundary of sections 33, 34, 35 and 36, township 15, range 9, where the surface is slightly undulating. The only timber occurring upon the above mentioned lines is found on the north boundary of sections 33, 34, 35 and 36, township 15, range 9, where spruce, tamarack and poplar are found, though not in sufficiently large quantities or dimensions to be of great value for lumbering purposes. There is a large amount of hay land extending along the eastern boundary of townships 17 and 16, range 8, and along the north boundary of sections 31 and 32, township 15, range 9, but because of the extremely soft nature of the ground upon which it grows the district is very difficult of access, although it is possible that it may be reached from the Brokenhead settlement. No bodies or streams of fresh water occur along the above mentioned lines, although abundance of surface water is found everywhere throughout the marshy sections. No water-power occurs along these lines. As the city of Winnipeg is only a short distance from this township the climate is very similar in both localities, being comparatively dry with occasional extremes of both heat and cold. It is, however, suitable for the successful growing of all the ordinary Canadian cereals. An abundant supply of fuel can be obtained from the surrounding forest. Coal is not known to exist in the locality. No stone quarres nor minerals of economic value are known to occur. Several species of large game are very plentiful in this district, particularly moose, many fine specimens of which were observed during our survey. A smaller variety of deer, commonly known as jumping deer are also numerous, and black bear are occasionally met with. Ruffed grouse and spruce partridge are comparatively common but few other birds of any description were observed.—*J. W. Tyrrell, D.L.S., 1906.*

TOWNSHIPS EAST OF THE PRINCIPAL MERIDIAN.

Range 9.

15. This township is situated about twelve miles south of Fort Alexander and about the same distance northwest of Lac du Bonnet, the terminal point of a short branch of the Canadian Pacific railway, from which point it is most easily accessible. On account of extensive marshes and swamps in the neighbourhood the township is very difficult of access, at any time of the year, except when the swamps are solidly frozen, which does not always occur even in winter, when a great depth of snow falls early in the season. There is nothing in the shape of a travelled highway, or even a well opened bush road into this township, the only means of access being over a winter road cut by the party during my survey. This road leads in a northwesterly direction from Lac du Bonnet into the centre of township 16, range 10, thence directly west to the centre of this township, and from this point in a northerly direction to township 17, range 9. The soil of this township varies from black muck in the western part to clay in the more central districts and sand and boulders in the east. Many central sections when cleared of timber appear to be well suited for general farming purposes, the eastern sections being more hilly and strewn with great boulders rendering the soil less fit for cultivation, but quite suitable for grazing purposes. As above stated, the eastern portion of this township is somewhat hilly. The end of a long gravel ridge, which reaches several miles to the east extends over portions of sections 13, 24 and 25. The summit of this ridge crosses the eastern boundary near the northeast corner of section 13, and is about one hundred feet above the surrounding country. A large portion of this ridge is covered by jackpine timber. The central portion of the township to the west of the above mentioned ridge is covered chiefly by poplar, birch and spruce timber, little of which was found to be of large size. The most westerly tier of sections is composed almost entirely of marshy land, overgrown in part with small tamarack, willow and alder scrub. This marsh even at the date of my survey (February) was still so soft as to barely carry our party, and was quite too soft to carry the teams. Although the greater portion of this township is covered with timber, little was found to be of sufficient size or quality to be of value for milling purposes. A few spruce occur in various places sufficiently large to be sawn into lumber. The same may be said of the jackpine covering the central portion of the eastern tier of sections, but the quantity is too limited to make the township of value as a timber berth. There is one large hay meadow in this township, occupying a portion of sections 22, 23 and 27 in the centre of which is a small open slough. Hay is also found on the most westerly tier of sections in the township, but because of the soft marshy nature of the country on which it grows access to it is very difficult and it will probably be of little value until a system of drainage is established. The only open water occurring in this township is found in a small slough situated upon the northeast quarter of section 22, although an abundance of surface water is found everywhere upon the marshy sections in the western portion of the township. It might be mentioned that some fresh water springs were observed on the northern slope of the centre ridge in sections 25, 24 and 13. No water-power exists in this township. As this township is close to the city of Winnipeg, the climate is very similar in both localities, being comparatively dry with occasional extremes both of heat and cold. It is however not such as to prevent the successful growing of all the ordinary Canadian cereals. The township is abundantly supplied with fuel from the forest. Coal is not known to exist in the locality, but there is an abundance of wood in all parts of the township. No rock exposures are known to occur in this township from which building stone might be quarried. No minerals of economic value are known to occur. Several species of large game are very common in this township and surrounding district, particularly moose, many fine specimens of which were observed, during our survey. A smaller variety of deer, commonly known as jumping

Range 9—Continued.

deer, are also numerous, while black bear are occasionally met with. Ruffed grouse and spruce partridge are comparatively common, but few other birds of any kind were observed.—*J. W. Tyrrell, D.L.S., 1906.*

15.—There is no summer road at present reaching this township but a good winter road crosses from Milner siding on the east to Brokenhead river country on the west passing across the southern part of the township. On May 24 this road was frozen solid where it crossed the muskegs. The only good land there is exists in isolated sections. The township is mostly swampy except some very stony ridges of sand. Most of the surface is covered with timber ranging from scrub and deadfall to large poplar and spruce. There are some hay meadows in the northeast corner of the township and also near the west boundary along the edges of marshes existing there. The water is all fresh. There are some small creeks but they were not located or noticed in the winter as the snow was deep. They flow from the muskegs westerly into the marshes. No stone, minerals, coal or water-powers were observed. Moose, deer, chicken, wolves and small game are found.—*Geo. H. Watt, D.L.S., 1906.*

15, 16 and **17.**—My route of approach to the east boundary of townships 17 and 16, range 8 and north boundary of township 15, range 9, was from the east by way of Lac du Bonnet, branch of the Canadian Pacific railway. I believe, however, that these lines may be more easily approached from the Brokenhead settlement on the west. The whole of the east boundary of townships 16 and 17, range 8, passes through an extensive marsh, containing a few scattered tamarack, willow scrub, rushes and long grass. The northern boundary of township 15, range 9 passes through a wooded district, except north of section 31, and the west half of 32 where the line is situated in the marsh. This district is therefore very flat and wet, the only dry portion being the north boundary of sections 33, 34 35 and 36, township 15, range 9, where the surface is slightly undulating. The only timber occurring upon the above mentioned lines is found on the north boundary of sections 33, 34, 35 and 36, township 15, range 9, where spruce, tamarack and poplar are found, though not in sufficiently large quantities or dimensions to be of great value for lumbering purposes. There is a large amount of hay land extending along the eastern boundary of townships 17 and 16, range 8, and along the north boundary of sections 31 and 32, township 15, range 9, but because of the extremely soft nature of the ground upon which it grows the district is very difficult of access, although it is possible that it may be reached from the Brokenhead settlement. No bodies or streams of fresh water occur along the above mentioned lines, although abundance of surface water is found everywhere throughout the marshy sections. No water-power occurs along these lines. As the city of Winnipeg is only a short distance from this township the climate is very similar in both localities, being comparatively dry with occasional extremes of both heat and cold. It is, however, suitable for the successful growing of all the ordinary Canadian cereals. An abundant supply of fuel can be obtained from the surrounding forest. Coal is not known to exist in the locality. No stone quarries nor minerals of economic value are known to occur. Several species of large game are very plentiful in this district, particularly moose, many fine specimens of which were observed during the survey. A smaller variety of deer, commonly known as jumping deer are also numerous and black bear are occasionally met with. Ruffed grouse and spruce partridge are comparatively common, but few other birds of any description were observed.—*J. W. Tyrrell, D.L.S., 1906.*

17.—Because of extensive swamps and muskegs, situated both to the east and west access to the township is very difficult except during the winter season,

Range 9—Continued.

when the swamps are solidly frozen. During the past winter while I was engaged in the survey of this township I found that the frost did not penetrate these swamps, owing to the deep snow occurring early in the season and they were but slightly frozen throughout the entire winter. Consequently it was with the greatest difficulty that I was able to gain access to the various parts of the township having to make roads by tramping the snow with snowshoes and allowing it to freeze solidly for some days previous to our passing over it. The township is situated about six miles directly south of Fort Alexander and when the swamps are frozen it is very easily reached from that place. The soil of the eastern portion of this township is composed chiefly of heavy clay, while the western part consists almost entirely of soft muskeg or marsh, which in some places is grown up with small scrub, tamarack and willow, while other parts are more open, containing only tall rushes and long bluejoint grass, which in some places was observed to be eight feet high. There is a considerable area of land in the eastern sections of the township well situated for general agricultural purposes, after being cleared of timber, but the whole western portion of the township is utterly unfit, in its present state, for occupation in any capacity. It seems quite probable, however, that even this marshy section of country can be drained as it is situated comparatively near Winnipeg river and at considerable height above it, and the construction of a drainage system, therefore, might change this marsh area into very valuable land. The surface of the eastern portion of this township is more or dess rolling and hilly in some places, but the western portion comprises one vast flat, marsh grown up, as already stated with tamarack, willow and rushes. The distribution of timber corresponds practically to that of the dry land, and thus occurs upon the eastern sections of the township. The chief variety is white poplar, although a few spruce and tamarack, large enough for lumber occur scattered throughout the various sections of the township. As a whole, the township may be said to contain a comparatively small amount of valuable timber, by far the greater portion being covered with small tamarack and black spruce. A large quantity of bluejoint and other varities of grass occur upon the western half of this township, but under present conditons it is of little or no value, as during the ordinary seasons access to it is quite impossible. On the west part of section 22 I discovered a small stack of hay, which had been cut several years previously but could not be removed owing to the land being too soft to admit of the passage of horses or wagons. No lakes or fresh water streams of any importance occur upon this township, but almost the entire surface is abundantly supplied with marsh or swamp water. No water-power occurs in this township. As the city of Winnipeg is only a short distance from this township the climate is very similar in both localities, being comparatively dry with occasional extremes both of heat and cold. It does not however prevent the successful growing of all the ordinary Canadian cereals. The township is abundantly supplied with fuel from the forest. Coal is not know to exist in the locality but there is an abundance of wood in all parts of the township. Few rock exposures occur in this township, as the greater part of the surface is composed of swamp or marsh. A few bluffs of granite however, were noticed in some of the eastern sections, and it is possible that from these good building stone might be obtained. No minerals of economic value are known to occur. Several species of large game are very abudant in this township and surrounding district, particularly moose, many fine specimens of which were observed during our survey. A smaller variety of deer commonly known as jumping deer is also very common and black deer are occasionally met with. Ruffed grouse and spruce partridge are comparatively common, but few other birds of any description were observed.—*J. W. Tyrrell, D.L.S., 1906.*

TOWNSHIPS EAST OF THE PRINCIPAL MERIDIAN.

Range 10.

16.—This township is situated about five miles northwest of Lac du Bonnet, the terminal point of a short branch of the Canadian Pacific railway and it is most easily approached by means of a winter road, from that place. On account of more extensive marshes and swamps in the neighbourhood, the township is more or less difficult of access, at any time of the year, except when the swamps are solidly frozen, which does not always occur even in winter, when a great depth of snow falls early in the season. There is nothing in the shape of a travelled highway or even a well opened bush road into this township, the only means of access being over a winter road cut by the party during my survey. This road leads in a northerly direction from Lac du Bonnet into the centre of the township. The soil varies from black muck and peat in the east to sand and boulders in the west and central sections, most of the latter being traversed by a high sandy ridge covered chiefly by jackpine timber. The greater portion of this township is entirely too wet in its present condition to render it suitable for settlement, although when a system of drainage is introduced the greater portion of it will doubtless be found quite suitable for cultivation and the raising of all ordinary farm produce. The central and western sections of this township are occupied by a high gravel ridge, the surface of which is strewn with huge boulders, and is otherwise covered with jackpine forest. The eastern and southern portions are chiefly flat and marshy and too wet in their present condition for cultivation. There is a very considerable amount of jackpine, spruce and tamarack timber occurring upon the sandy ridge occupying the west central sections of the township but the remainder is wooded with small poplar and tamarack scrub. A considerable amount of marsh hay occurs in the swampy sections of the eastern part of the township, although on account of the extremely wet, soft character of the ground upon which it grows it is of little value because access to it is very difficult. No bodies or streams of open water were observed in this township, although large quantities of surface water occur everywhere upon the marshy lands to the east and south. No water-power exists in the township. As the city of Winnipeg is only a short distance from the township the climate is very similar in both localities, being comparatively dry with occasional extremes of heat and cold. This does not, however, prevent the successful growing of all the ordinary Canadian cereals. The township is abundantly supplied with fuel from the forest. Coal is not known to exist in the locality, but there is abundance of wood in all parts of the township. Several exposures of granite occur upon sections 2 and 3 of this township and from these, as well as from enormous boulders scattered over the sandy ridge occupying the central and western sections of the township it is quite probable that a good quality of building stone may be obtained. No minerals of economic value are known to occur. Several species of large game are very numerous in this township and surrounding district, particularly moose, many fine specimens of which were observed during our survey. A smaller variety of deer, commonly known as jumping deer, is also plentiful while black bear are occasionally met with. Ruffed grouse and spruce partridge are comparatively common, but few other birds of any description were observed.—*J. W. Tyrrell, D.L.S., 1906.*

17.—This township is situated about eighteen miles east of the south end of lake Winnipeg, thirty miles north of the main line of the Canadian Pacific railway and twelve miles northwest of Lac du Bonnet, the terminus of a short branch of that railway. Access to this township is by no means easy, not on account of its remoteness, but on account of it being almost completely hemmed in by wide expanses of muskeg, too soft, unless frozen, to admit of being crossed by wagons or pack horses. It can be reached from Fort Alexander, twelve miles northwest by what is known as

TOWNSHIPS EAST OF THE PRINCIPAL MERIDIAN.

Range 10—Continued.

Fort Alexander trail, which traverses sections 35, 36, 25, 24 and 13, but I found it more convenient to reach the township from Lac du Bonnet, and in doing so had to cut a bush road along the bank of Winnipeg river as far as section 9, township 17, range 11., where we struck the winter road to Fort Alexander and followed it to the east boundary of the township, though this road had also to be recut to admit of the passage of the wagons. Although two weeks were spent in cutting this road, there is still no through summer highway from Lac du Bonnet, as in many places we followed the shore of the river or lake, which would be under water during the earlier part of the summer. The south and west sections of this township may be described generally as swampy, and the soil varying from a half decomposed moss to a rich black muck. The northeast portion of this township, however, is somewhat higher and the soil is composed chiefly of a light sandy clay of fairly good quality. A large portion of this township being composed of muskeg is very flat, but the northeast sections toward Winnipeg river are more rolling, with enormous rock exposures and are generally heavily timbered with white poplar, spruce, balsam, tamarack, ash and birch, while the southwest sections are wooded chiefly with tamarack, black spruce, willow and alder scrub. There is a considerable amount of good spruce and tamarack timber found throughout the eastern half of the township except in sections 2 and 3. The spruce varies in size from about eight to twenty-four inches in diameter while tamarack is found as large as twenty inches in diameter. Though of less value white poplar predominates and is occasionally found as large as twenty inches in diameter. There is very little hay land in this township, as it is mostly heavily timbered. A considerable amount of hay and long coarse grass occur in many of the western sections of this township, but the land is entirely too wet to admit of hay being cut. Winnipeg river is the chief water supply of this township. It flows through sections 25 and 26, and is a very large stream. The greater part of the township is very wet which is a great drawback towards its occupation. No water-power exists in this township. There are several falls along Winnipeg river but none within this township. As the city of Winnipeg is only a short distance from this township the climate is very similar in both localities being comparatively dry with occasional extremes both of heat and cold. This does not, however, prevent the successful growing of all the ordinary Canadian cereals. The township is abundantly supplied with fuel from the forest. Coal is not known to exist in the locality but there is abundance of wood in all parts of the township. Enormous exposures of granite occur in some of the northeast sections of this township and although no quarries have yet been opened up it seems quite probable that a fine quality of building stone might be available. No minerals of economic value are known to exist in this township. Several species of large game are very numerous in this township and surrounding district, particularly moose, many fine specimens of which were observed during our survey. A smaller variety of deer, commonly known as jumping deer are also plentiful, and black bear are occasionally met with. Ruffed grouse and spruce partridge are comparatively common, but few other birds of any description were observed.—*J. W. Tyrrell, D.L.S., 1906.*

Range 13.

6.—All the land in this township ranks as third class. The soil is mostly black loam with a sandy subsoil, but the township is made up mostly of spruce and tamarack swamps covered with heavy bush and these, if cleared and drained, would make good land for farming purposes. The surface is nearly all level and covered with spruce and tamarack, but along Whitemouth river, which runs through the south half

Range 13—Continued.

of the township, there is considerable poplar and thick willow. The spruce, tamarack and poplar range in size from four to ten inches in diameter. The spruce and tamarack is equally distributed throughout the whole township, but the poplar is found only along Whitemouth river. Hay can be cut all along the banks of the river. The water is all of first class quality and is very plentiful. If not found on the surface it can easily be had by digging a few feet. The water in Whitemouth river is first class. There are no water-powers available. The climate is the general Manitoba climate, with no indication of summer frosts. Fuel is very plentiful and can be had all through this district, consisting of spruce, tamarack, poplar and jackpine. There are no coal or lignite veins, stone quarries or minerals of any kind. The only game to be found is moose and bear, which are very plentiful. There are no trails running through the township, but the Daw on road is a few miles to the north of the township, running to Ste. Anne, a town on the Canadian Northern railway, where there are stores, schools, post office, &c.—*John Molloy, D.L.S., 1906.*

12.—*(Base line)*—Starting from Whitemouth we crossed Whitemouth river by a bridge about one-half mile south of the village, and followed a good road east and north till we reached a Swede's house at the north boundary of township 11, range 12. Here the good road ended and from this point we followed the north boundary of the township through one and one-half miles of muskeg, where we had to put brush across the trail. We crossed Bog river by means of a bridge which we built, and from there we turned northeast following a trail which struck the east boundary of township 12, range 12, just south of the northeast corner of section 12. We followed this east boundary north to within three-quarters of a mile of where our survey began, which was as near as we could get to it with horses on account of muskeg. The land all along this base line is entirely unfit for agriculture. Moose, rabbits and prairie chickens were plentiful. No minerals of economic value were found. The climate is similar to that of other parts of Manitoba. The country along the north boundary of this township is muskeg, broken by numerous rocky ridges from twenty to sixty feet high. It has been swept by fire and is now covered by dead pitchpine and poplar, heavy windfall and small green poplar, willow and pitchpine. Little Rennie river crosses the north boundary of section 31, flowing northwest. There are no water-powers. Some hay could be cut near the river.—*B. J. Saunders, D.L.S., 1906.*

13.—The township may be reached by a sleigh road from Whitemouth in winter, or in summer by boat or canoe on Winnipeg, Shell and Little Rennie rivers. Large areas of good soil are not to be found. The surface of the southern two-thirds of the township is, generally speaking, rough and rugged, with bare granite hills or knolls protruding from the muskeg. The slopes of the rocky ridges are timbered with second growth spruce, poplar and jackpine, all standing in a mass of deadfall and upturned roots. In the northern part of the township there are some large muskegs with practically no valuable timber. On the higher ground a few spruce may be found scattered through the woods, which are mostly poplar with everywhere a tangled mass of maple, hazel and birch undergrowth. Along Little Rennie river in the east half of the township there are good hay meadows, some of which are liable to be flooded when Winnipeg river rises in the late summer. Fresh water is everywhere plentiful. The Little Rennie is navigable for boats drawing three feet of water for about ten miles in this township, where two falls occur, one six and the other about fourteen feet high. The river is from sixty to two hundred feet wide and has little current. There is very little difference between the level of Winnipeg river and that of this

river where it crosses section 8, that is, in ordinary late summer levels. Rock exposed is everywhere the pink granite of northern and Western Ontario. No minerals were seen. Bear, moose, caribou and deer are plentiful; also pike and pickerel in the river, and countless numbers of ducks in the fall of the year.—*Geo. H. Watt, D.L.S., 1907.*

14.—This township may be reached by canoe on Winnipeg river either from Kenora or Lac du Bonnet. The only soil of any value is in small strips or areas along the riverside. The surface is everywhere timbered, but some has been overrun by fire and brulé, and deadfall in the northern part of the township is most difficult to travel over. The timber is principally poplar and jackpine, with thick growth of underbrush everywhere. There is no hay in this township. The water is everywhere good especially in Winnipeg river, which is a beautiful stream. There are no water-powers, stone quarries or minerals. The climate seems to be good, no summer frosts being experienced. Game is plentiful, moose, caribou, deer and bear having at different times been seen by my party. Small game and wildfowl are also to be found in season.—*Geo. H. Watt, D.L.S., 1907.*

15.—The township is crossed by the tramway being built by the city of Winnipeg, which crosses the township from west to east along the north interior chord. The northerly third of the township is mostly burned over but the remainder is timbered with fair sized poplar, spruce, birch and jackpine of fair size. The surface is everywhere broken by rock ridges covered with jackpine, some of them burned over. Between the ridges where there is no muskeg there is mostly clay soil supporting a heavy growth of poplar and birch, with dense underbrush. The soil is good but areas of it are so much broken by ridges of rock that for farming purposes the township is of very little value. There is little hay though water everywhere in creeks and in Rice lake is fresh, and good to drink. I know of no minerals, stone quarries or water-powers. Moose, deer, caribou, bear, lynx and wolves are numerous.—*Geo. H. Watt, D.L.S., 1907.*

16.—From Whitemouth we proceeded by a good winter road to the village of Lac du Bonnet. Thence we followed a well travelled road, north, along the west bank of Lac du Bonnet, for about five miles. From this point we travelled across Lac du Bonnet to the northeast corner of the lake, where our survey began. On account of the great depth of snow it was impossible to judge as to the mineral resources of the country. A few moose were seen and many fresh tracks were noticed. Coyotes, rabbits and porcupines were also seen. The climate is similar to that of other parts of Manitoba. The country along the north boundary of township 16, range 13 is mostly rock with some low ground and muskeg and is totally unfit for agriculture. The surface is rolling and is heavily timbered with good spruce and poplar averaging about ten inches in diameter. Lac du Bonnet extends into the northwest corner of the township and Pinawa channel of Winnipeg river flows up the west side. The water is fresh and good and free from alkaline substances. Eight or ten miles to the south of Pinawa channel, are rapids and falls which are suitable for the development of power.—*B. J. Saunders, D.L.S., 1906.*

16.—This township is broken by Lac du Bonnet and may be reached by boat or canoe from the lake, or the northern part of the township may be reached by Oiseau river route and the southern part by canoe on the creek that flows out of Rice lake and empties into Lee river. There is very little soil of any value as such. There is a strip of poplar country bordering on the lake which might be tilled if the woods

Range 13—Continued.

were cleared off. The surface is rough—much broken by granite ridges—some of them very abrupt and steep. The timber is mostly poplar, jackpine and spruce generally small sized, with occasional heavy woods. The southern part of the township has been burned bare and is covered with second growth timber and scrub. I do not think there is any timber large enough for ties. There is little or no hay to be found. The water is everywhere good and fresh. There are no water-powers. I have seen no stone quarries or minerals of any kind. Game abounds, moose, deer, caribou, bears, lynx, &c., and are often seen in season. Wolves are plentiful this winter.—*Geo. H. Watt, D.L.S., 1907.*

17.—The township may be reached by boat or canoe from Lac du Bonnet which encroaches on the southwest corner of the township and Bird or Oiseau river, crosses it from east to west in the southern third of the township. A small quantity of hay may be cut at the mouth of the river. The surface of the country is rough, broken by rocky ridges. Between these in the northwestern part of the township there are spruce and tamarack muskegs. In other parts of the township the wood is mostly poplar and birch. There is everywhere dense scrub of maple, hazel and willow, and along the creeks, which are very small, alder swamps. There might be some homesteads located here, but none would be very large on account of the rocky ridges. The water is everywhere fresh and the climate good. About ten years ago there was a rush of gold seekers to this part of the country, and there is much evidence of the claims which were staked out there still to be found. Game consists of moose, deer, bear and furbearing animals. Geese and ducks are plentiful in season. Wolves, large and small are also found.—*Geo. H. Watt, D.L.S., 1907.*

Range 14.

6.—The soil in this township is mostly black loam, but as the township is nearly all spruce and tamarack swamps, the soil is only fourth class. The whole of the township is covered with bush consisting principally of spruce and tamarack from three to nine inches in diameter, equally distributed throughout the township. There is very little hay to be found and no water-powers, stone quarries, coal or lignite veins. The water is all of first class quality and can be had in any quantity all over the township at any time of the year. There are two small lakes on the north boundary of section 20 and one large lake on the north boundary entering into township 7. Fuel is very plentiful and either spruce or tamarack can be had in all parts of the township. Moose and black bear are very plentiful all through this section of country. The Dawson road leading to Ste. Anne, a station on the Canadian Northern railway, passes through the southern portion of township 7, range 14, in a northerly direction.—*John Molloy, D.L.S., 1906.*

7.—The soil in this township is mostly black loam or clay, but on account of its being nearly all a spruce and tamarack swamp, the greater part of which is covered with water, the land is useless for farming purposes. The whole of the township is covered with heavy bush, mostly spruce and tamarack, equally distributed, and averaging about seven inches in diameter. There is little or no hay to be found except along Birch river, which flows through the western part of the township in a northerly direction. All the water throughout the township is of first class quality, and can be had in any part at any time of the year without digging. There are no water powers, stone quarries, coal or lignite veins to be found. Wood is very plentiful, and can be had in large quantities all through the district. Moose and black bear

are about the only game found. The Dawson road passes through the southern part of the township and runs to Ste. Anne, a station on the Canadian Northern railway, where there are churches, stores, a post office, schools, &c.—*John Molloy, D.L.S., 1906.*

8. There is very little land in this township fit for farming or grazing purposes, as it consists principally of spruce and tamarack swamp, and parts of it are very stony. The soil in the swamps is nearly all black or sandy loam. Nearly all of the township is thickly timbered, with principally spruce and tamarack, with some cedar and poplar about equally distributed, and ranging in diameter from four to ten inches. All the water to be found is of first class quality, and can be had in almost any part of the township at any time of the year without digging. Birch river, a stream about fifty feet wide, enters the township in section 1, and runs in a westerly direction through sections 1, 2, 3 and 4. Fuel is very plentiful all through this section of country, consisting chiefly of spruce and tamarack. There are no stone quarries, coal or lignite veins to be found. The climate is the general Manitoba climate, without any indication of summer frosts. Moose, caribou and black bear are very plentiful. There are no trails of any kind leading through the township, but the Dawson road running from the village of Ste. Anne, passes about four miles to the south, running to the eastern boundary of the province.—*John Molloy, D.L.S., 1907.*

12.—*(Base line).*—All the north boundary of this township is rough, rocky country, interspersed with muskegs. The surface has been swept by fire and is now covered with dead, standing and fallen timber and small green pitch pine. Whiteshell river crosses the north boundary of section 36. South of the line it expands into a lake about two miles wide, which extends into range 15. There are no water-powers in this township.—*B. J. Saunders, D.L.S., 1906.*

13.—This township may be reached by canoe from Lac du Bonnet via (1) Winnipeg river, (2) Whiteshell river and little Rennie river. The township is, as a whole, unfit for settlement, as the greater part has been burned over, and only remnants of the timbered area remain in isolated places. The surface is a succession of rocky ridges up to one hundred feet in height, some rising perpendicularly for fifty feet. Along the northern boundary there is some fairly level land heavily timbered with poplar, jackpine and spruce. Along both Whiteshell and Little Rennie rivers considerable areas of hay lands exist, but I believe in years of high water on Winnipeg river a certain amount is inundated. In the rivers are found jackfish, whitefish, sturgeon and pickerel, all of which are plentiful. Water is everywhere and fresh. There are no economic minerals, stone quarries of valuable water-powers that I know of. Moose, deer, bear, caribou, lynx and wolves are found.—*Geo. H. Watt, D.L.S., 1907.*

15.—This township was reached from township 15, range 15, by travelling over the ice of lake No. 3 and across Winnipeg river immediately above Pointe du Bois falls. The only good soil in this township occurs in small patches between the rocky ridges in the north half of the township, and this is not suited for agricultural purposes. A great deal of the west half of the township is swamp and muskeg. The surface is covered with jackpine, spruce, tamarack, poplar, birch and balsam. The swamps are wooded with spruce and tamarack from one to eight inches in diameter, and the ridges with jackpine, spruce, poplar, birch and balsam from three to twelve inches, but no timber suitable for lumbering purposes is found. No hay is found. Fresh water is abundant in the marshes, lakes and swamps. Winnipeg river runs southerly through the eastern tier of sections, the shores are high and rocky, and the land is not liable to be flooded. Pointe du Bois falls are in the centre of section

TOWNSHIPS EAST OF THE PRINCIPAL MERIDIAN.

Range 14—Continued.

36. Here the corporation of the city of Winnipeg is developing power. By using the rapids below the falls and by the construction of a dam, the effective head will be forty-five feet and the proposed development is 40,000 horsepower. At the time of survey (March), a small camp had been erected at the site and a portion of the land cleared. Slave falls are situated in the southwest corner of section 12. Here the river passes between two rocks, and is less than 300 feet wide. A considerable amount of power could easily be developed here by the construction of a dam. The climate at the time of the survey was the ordinary winter weather of Manitoba. Fuel is everywhere abundant. No stone quarries nor minerals were found. Game consists of moose and caribou.—*J. L. R. Parsons, 1907.*

16.—The north boundary of township 16, range 14, runs through rock, broken by muskeg. The surface is rolling and is covered chiefly with poplar, spruce and pitch-pine, averaging about eight inches in diameter. The country is entirely unfitted for agriculture. Winnipeg river flows through the southeast corner of the township. This part of the river is a succession of falls and rapids, rendering it particularly suited for the development of power.—*B. J. Saunders, D.L.S., 1906.*

16. This township was reached from Lac du Bonnet station on the Canadian Pacific railway by travelling on the ice across Lac du Bonnet to the mouth of Oiseau river, thence up the river for two miles; from there by my own trail eastward to the northwest corner of the township. It is a good winter trail. Practically no soil occurs in the township. The swamps and muskegs being rock-bound, cannot be drained, and therefore are not suitable for agricultural purposes. The greater part of the township is composed of rocky ridges. The surface is covered with jackpine, spruce, tamarack, poplar and birch. The swamps are wooded with spruce and tamarack from one to eight inches in diameter, the ridges with jackpine of a similar size, and scattered clumps of poplar and birch from three to ten inches in diameter. Much windfall and fire-killed timber occurs, but none suitable for lumbering purposes. No hay is found. Fresh water is abundant in the marshes, lakes and swamps. The Winnipeg river crosses the corner of the township in sections 12, 1 and 2. This part of the river is in the form of a lake-like expansion, with numerous islands and high rocky shores. The land is not liable to flooding to any extent. Contours have been taken, however, to determine the flooding areas by the corporation of the city of Winnipeg, in connection with the power development at Pointe du Bois falls in section 36, township 15, range 14. The weather during the survey (January) was the usual winter weather of Manitoba, the lowest point reached by the thermometer being 53 degrees. Fuel is everywhere available in the form of windfall, dead and fire-killed trees. No coal was found. Rock 'in place' is everywhere to be found, but no quarry stone nor minerals were observed. Moose, lynx and mink are the only game.—*J. L. R. Parsons, D.L.S., 1907.*

Range 15.

1. The soil in this township would nearly all rank as second class, being a black or sandy loam of good depth. The whole of the township is heavily timbered, with the exception of parts of sections 29, 30, 31 and 32. There is a large, open muskeg in these sections running in a northeasterly direction, with an average depth of water of about two feet. The soil would all be suitable for farming purposes when cleared of the timber. The timber is about equally distributed throughout the township, and is of all sizes, from five to fifteen inches in diameter. Poplar, spruce and tamarack are about the only kinds of timber to be found, although there is some small birch.

Range 15—Continued.

All the water is of first class quality, and can be had in almost any part of the township by digging a few feet. There are no creeks or streams to be found. The land is not liable to be flooded. The climate is the general Manitoba climate, with no indication of summer frosts. Fuel is very plentiful all through this section of country, consisting principally of spruce, tamarack and poplar. There are no coal or lignite veins, stone quarries or minerals. Moose and jumping deer are about the only kinds of game to be found, and are pentiful. The main line of the Canadian Northern railway crosses the township in a straight line from the northeast corner of section 7 to the northeast corner of section 1. The railway siding, Gravel Pit spur, is just on the east boundary of section 12, where there is a section house. The town of Sprague, where there is a station, store, postoffice, school, &c., is about three miles west of this township.—*John Molloy, D.L.S., 1907.*

12. *(Base line.)*—The north boundary of this township is rough, rocky country, interspersed with muskeg. The surface is covered, for the most part, with small pitchpine, poplar, willow, spruce and tamarack, but near the lake there is some poplar eight to fourteen inches in diameter. There are two lakes in the northwest corner of the township, which are expansions of Whiteshell river, flowing northwesterly through this township. Between these two lakes are two falls about five feet in height, and north of the base line there are rapids.—*B. J. Saunders, D.L.S., 1906.*

15. This township was reached by my own trail southerly through the centre of township 16, range 15. There is very little good soil in the township, the greater part being composed of rocky ridges. Between these ridges are swamps and muskegs in which the soil is chiefly black loam on a clay subsoil. There is no farm land. The surface is well wooded, being covered with jackpine, spruce, tamarack, poplar and birch. The swamps are wooded with spruce and tamarack from one to eight inches in diameter; the ridges with jackpine and scattered poplar, birch and balsam from three to ten inches in diameter. The shores of the neighbouring lakes usually support timber of larger and better quality, but no timber suitable for lumbering purposes is found. There is no hay in this locality. Fresh water is everywhere obtainable in the swamps, muskegs and numerous lakes. Winnipeg river flows through the west sides of sections 31, 30 and 19. The west boundary of section 19 crosses Eightfoot falls. Here the river passes between two high rocks, and a considerable amount of power could be easily developed by a dam which would increase the head to fifteen or twenty feet. The climate is the ordinary weather of Manitoba. Fuel is abundant in the form of windfall, dead and fire-killed trees, but no coal was found. Neither stone quarries nor minerals were observed. Moose, caribou, lynx, mink and fisher are the only game.—*J. L. R. Parsons, D.L.S., 1907.*

16. This township was reached by way of Mr. B. J. Saunders' trail along the north boundary of township 16, range 14, thence over the ice of lake Saunders. This is a good winter trail. There is only a small proportion of soil in the township, the greater part being composed of rocky ridges. Between these ridges are swamps and muskegs in which the soil is chiefly black loam on a clay subsoil. The surface is covered with jackpine, spruce, tamarack, poplar and birch. The swamps are wooded with spruce and tamarack from one to eight inches in diameter. The ridges with jackpine of similar dimensions, and with scattered clumps of poplar and birch from three to ten inches in diameter. The land along the right bank of Winnipeg river supports a good growth of poplar, spruce and birch from four to twelve inches in diameter, but no timber suitable for lumbering purposes occurs. No hay is found

TOWNSHIPS EAST OF THE PRINCIPAL MERIDIAN.

Range 15—Continued.

in this township. Fresh water is abundant in the marshes, swamps and creeks. Winnipeg river crosses the township almost diagonally from northeast to southwest, where it takes the form of several lake-like expansions containing a number of islands. Lamprey falls occurs in section 23. The descent is about twelve, feet but it is not well suited for the development of power, since there are only short rapids above and below the falls, and the present head may be decreased when the dam at Pointe du Bois is completed. No other water-powers occur. The weather during the survey (February) was the usual winter weather of Manitoba. Fuel is everywhere available in the form of windfall, dead and fire-killed trees. No coal was found. Rock in place is everywhere exposed on the surface, but no quarry stone nor minerals were found. Moose, caribou, lynx and mink are the only game.—*J. L. R. Parsons, D.L.S., 1907.*

16. The country along the north boundary of township 16, range 15, is mostly rock, broken by some muskeg and low ground, and is quite unsuitable for agriculture. The surface is rolling and is covered chiefly with poplar, pitch pine, spruce and birch, averaging from six to eight inches in diameter. There is a lake in the northwest corner of the township. Winnipeg river enters at the east of the township, about one and one-half miles south of the north boundary, and flowing southwest leaves the township at the southwest corner. There is a large fall about the centre of the township, from which considerable power could be developed.—*B. J. Saunders, D.L.S., 1906.*

Range 16.

16. The country along the north boundary of township 16, range 16, is rock, broken by muskeg and lakes, and is not suitable for agriculture. The surface is rolling, and is covered with small pitchpine, spruce, poplar and balsam of no marketable value. Winnipeg river flows across the township from east to west, leaving the township about one and one-half miles south of the north boundary. It is not so suitable here for the development of power as it is farther west.—*B. J. Saunders, D.L.S., 1907.*

Range 17.

16. The country along the north boundary of township 16, range 17, is mostly rock, broken by numerous lakes, and is totally unfit for agriculture. The surface is hilly and rises in places seventy-five feet above the lakes. The north boundary of sections 33, 24, 35 and 36 crosses five lakes, a large lake being situated in the northeast corner. The timber is mostly small, but there is some poplar, birch, tamarack, spruce and pitchpine, averaging nine inches in diameter. Winnipeg river flows across the southwest corner of the township. A few miles farther southeast along the river, there are some rapids from which power could be developed.—*B. J. Saunders, D.L.S., 1906.*

TOWNSHIPS WEST OF THE PRINCIPAL MERIDIAN.

Range 1.

26. On the east boundary of sections 1, 12, 13, 25 and 36 of this township the line passes through small poplar and jackpine bush. The east boundary of section 24 falls in a tamarack swamp, which extends for a considerable distance to the west of the line, but only about half a mile to the east of the line. The soil is a shallow layer of clay and gravel on limestone, except in the swamp mentioned above, where black loam occurs.—*Wm. Christie, D.L.S., 1907.*

Range 1—Continued.

27. On the east boundary of section 12 and the south of section 13 of this township the line continues through small poplar and jackpine. The soil in these sections is black loam about two inches deep on limestone. In the north half of section 13, sections 24, 25 and 36 the line passes through a large muskeg and tamarack swamp, which extends on the west to Fisher river a distance of about three and one-half miles. To the east of the line it extends in a southeasterly direction for several miles. When we came to the muskeg (on November 9) it was too soft for a man to walk across. It took the whole party a little more than a week to cut a road and move camp around it. Fortunately by the time we got the camp around to the north side the muskeg was frozen sufficiently hard to allow a man to walk over it, and we were able to get the line across without difficulty.—*Wm. Christie, D.L.S., 1907.*

28. The muskeg mentioned in township 27 extends into section 1 of this township. Fisher river crosses the line on the east boundary of section 24. The portion of the township south of the river is covered with small poplar, willow and spruce with some swamps and hay marshes. North of the river the timber is larger, poplar up to ten inches in diameter occurring. Some large marshes are also crossed north of the river in sections 24, 25 and 36. In this township the line also crosses Fisher river, Indian reserve (No. 44). I connected my survey with that of the reserve. The country here appears well adapted to stock raising as abundance of hay can usually be obtained from the marshes. Last year, however, most of the hay land was under water. It would be an easy matter, however, to drain these swamps into Fisher river.—*Wm. Christie, D.L.S., 1907.*

28. *(North outline.)*—In this township the land is gently undulating, consisting of low ridges covered with poplar up to six inches in diameter, alternating with tamarack swamps, muskegs and hay marshes. A small lake occurs in section 5, township 29, range 1. The soil is chiefly black loam on clay subsoil, but gravel occurs on the north boundary of section 35.—*Wm. Christie, D.L.S., 1907.*

Range 2.

28. This township consists of a series of low, flat ridges, covered with poplar and spruce, with here and there a few birch and jackpine, alternating with tamarack swamps, marshes and hay lands. A small lake, which I named Colonsay, occurs in sections 33 and 32. The soil is chiefly black loam on clay subsoil, but limestone occurs on the north boundary of section 34, and drift boulders are quite plentiful on all the dry land.—*Wm. Christie, D.L.S., 1907.*

Range 3.

28. The general character of this township is similar to that in range 2, consisting of flat ridges timbered with poplar, spruce and tamarack up to eight inches in diameter, separated by tamarack swamps, marshes and hay lands. A small lake occurs in sections 36 and 35. Mantagao river crosses the line in section 34, flowing almost due north. This stream is about thirty feet wide at the line. On either side of this stream is a strip of marsh and hay meadow from a quarter to half a mile in width and close to the river banks are tall reeds. The soil is chiefly black loam on clay subsoil. —*Wm. Christie, D.L.S., 1907.*

TOWNSHIPS WEST OF THE PRINCIPAL MERIDIAN.

Range 4.

18. As Oak Point, a station on the Canadian Northern railway, is situated in this township, we travelled over this country by fair wagon roads during nearly all season. All homesteads are taken by Icelanders, an intelligent and industrious people. The soil is of good quality being generally of black loam with a stone and gravel subsoil. Although this township is settled for twenty years, the owners of lands do not seem to appreciate the quality of the soil for farming. In its present condition, the land is better suited for cattle raising and dairying. The surface is level and is covered with scrub, patches of poplar, a few oak, sloughs, hay marshes and prairie where they have always plenty of good hay, even in wet seasons. All valuable timber has been cut for building and fencing. Poplar, the average of which is of poor quality, is the only fuel. Good water is plentiful and can be obtained easily by digging wells without great expense. Prairie chicken is the only game in this township, but ducks are plentiful around lake Manitoba. No mineral or waterpower was found.—*C. E. Bourgault, D.L.S., 1907.* . .

22. The general aspect of this township is swampy and at the time of survey (September) nearly all covered with water. In wet seasons settlers cannot depend on the swamps to obtain a supply of hay to feed their cattle during the winter. There are some high ridges where the soil is composed of a few inches of black loam with sand and gravel subsoil, but they are covered with poplar and windfall. Moose and deer are quite numerous.—*C. E. Bourgault, D.L.S., 1907.*

28. *(North outline).*—This township is similar to those in ranges 2 and 3, consisting of low ridges, covered with poplar, spruce and tamarack, alternating with tamarack swamps, muskegs and hay marshes. The proportion of dry land is somewhat greater, however, and the timber somewhat larger than in range 3, spruce and poplar twelve inches in diameter occurring. A small lake occurs in section 32. The soil is chiefly black loam on clay subsoil but gravel occurs in places.—*Wm. Christie, D.L.S., 1907.*

Range 5.

14. *(West part.)*—The fractional township is all flooded with water and covered with reeds. However, in dry seasons hay can be cut in sections 6, 7, 16 and 17. The northwest part is covered with reeds and open spaces of water. Ducks, geese and muskrats are numerous.—*C. E. Bourgault, D.L.S., 1907.*

15. *(Fractional.)*—This fractional township can be best reached by a good graded wagon road from Poplar Point, a station on the Canadian Pacific railway. The land is mostly stony and the soil is not of much depth, with generally a gravel subsoil. The removal of the stones will be expensive; the township at present is better suited for cattle raising than for any other purpose. However, the settlers who have cleared a piece of land have always a good crop of vegetables. As the hay is plentiful and of superior quality, the attention of the settlers is devoted to cattle and horse raising. There is no timber in this township; the only place where the farmers obtain their wood is at St. Laurent, situated twenty miles east. The water when found was fairly good. The settlers, however, now depend on wells or lake Manitoba during the winter for their supply. As there are no streams there can be no water powers. No stone quarries, nor minerals of value were noticed. Game, consisting of ducks and geese, is plentiful.—*C. E. Bourgault, D.L.S., 1907.*

21. Access to this township is very easy by wagon roads from Oak Point. In wet seasons these roads are nearly impassable, as no improvements have been made

Range 5—Continued.

on them. The soil is of good quality, but is generally covered with marsh or timber, so that it is not very suitable for grain growing. Cattle raising is followed exclusively by the settlers, and for this the township is well adapted, though grain could be grown in some sections. The woods are poplar of fair size and distributed over each section. Swan creek enters the township in section 6, running southeasterly. The climate is similar to that of central Manitoba. Good water is usually found in the swamps, and is generally easily obtained by digging wells. No stone quarries, coal or minerals were observed. Game of all kinds is scarce.—*C. E. Bourgault, D.L.S., 1907.*

22. The general aspect of this township is swampy and at the time of survey (September) nearly all covered with water. In wet seasons settlers cannot depend on the swamps to obtain a supply of hay to feed their cattle during the winter. There are some high ridges where the soil is composed of a few inches of black loam with sand and gravel subsoil, but they are covered with poplar and windfall. Moose and deer are quite numerous.—*C. E. Bourgault, D.L.S., 1907.*

28. (*North outline*).—This township is gently undulating, consisting of low ridges, timbered with poplar, spruce, tamrack and jackpine, separated by tamrack swamps, muskegs and hay marshes. The greater part of the timber has been killed by fires. The soil is chiefly a shallow layer of black loam on sand or gravel. I had to open the line twice across this range to connect with the northeast corner of township 28, range 6.—*Wm. Christie, D.L.S., 1907.*

Range 6.

14. Access to this township is easy by roads from High Bluff, a station on the Canadian Pacific railway. The north part is watered by lake Manitoba, while the south part is covered with long reeds and open spaces of water, so the land may be classified as swamp land, unfit for agricultural purpose. I must mention that hay is not plentiful, but in dry seasons sections 3, 2 and parts of sections 10, 11, 12 and 1, may be classified as hay land. There is only one farmer in section 6, where there is some cultivated land. Sometimes in the spring,, the water of lake Manitoba rushes over the sandy beach and spreads over this township and on the north part of township 13, range 6. It is for that reason that the timber, like oak and cottonwood which are growing on this beach, should not be cut. I remark that where the timber has been cut, the sand on the beach is washed out by the waves of lake Manitoba during a great northwest wind storm, and water and ice come in and spread over township 13, where there is first class farming land, and this makes very great damage. This sandy ridge is about four chains wide, from four to eight feet high and contains the best and finest sand for masonry and cement brick. No fuel occurs in this township. Game is plentiful, consisting of ducks and geese.—*C. E. Bourgault, D.L.S., 1907.*

22. From Oak Point ,a station on the Canadian Northern railway, there is a good wagon road to Deerhorne. From there I cut a trail to section 28, township 22, range 6. Access to this township is also easy by another road cut by settlers, last summer in sections 3, 4, 9, 16, 21, and 28. The surface is generally timbered with poplar of eight to eighteen inches in diameter and scattered big spruce and willow, interspersed with hay marshes and lakes. Hay can be procured in many of the marshes, but in a wet season like last summer few if any of the marshes can be entered. Settlers had a very hard time to cut hay for their own cattle, some of them were

Range 6—Continued.

obliged to cut hay in water, and haul it with a sleigh and a pair of oxen on a high place to dry. Some of them were forced to sell their cows or send them away for winter. July, August and September were very wet. The soil is of good quality, black loam, clay and sand subsoil, but the expenses incurred in clearing the land from green and dry wood will be too expensive now for farming. For this reason this township is better suited for stock raising than for anything else. The water is fresh and during all summer about half of the surface is flooded to the depth of from four inches to two feet. The surface is level. There are no streams and no water-powers. A few jumping deer were noticed. No minerals of any value were found.—*C. E. Bourgault, D.L.S., 1907.*

Range 7.

22. Coming into the township by the colonization road to Scotch Bay from Oak Point on the Canadian Northern railway I was able to get into the south part by settlers' trails and those of the Indians, none of which were in good condition. To get farther north I was forced to make a trail for myself. The whole country is gently rolling, wooded with poplar, chiefly, on the ridges and having hay meadows or sloughs in the depressions.. There was some spruce also, but no marketable timber. To the north the country had been more burned in places and was slightly more rolling though by no means hilly. Game was abundant. No minerals of economic value were seen, nor is there any water-power in the township. Though many of the quarter sections are taken up only a few were occupied at the time of survey (August) as nearly everyone was waiting till the township would be subdivided. This township has long formed a hunting ground for the Indians of the adjacent reserve and many of their old camps were seen. An old telegraph line runs diagonally across the township from northwest to southeast. In some places it can scarcely be seen. I think the township will make an excellent mixed farming country.—*Geo. A. Grover, D.L.S., 1906.*

Range 8.

22. I think most of the marshes in this township will in time dry up, if not altogether, at least to a considerable extent. At present they are difficult to survey owing to the lack of well defined shores. The township has good soil. The surface is rolling, covered in the northern part by poplar bush with considerable spruce in some places. Near the Indian reserve the country is much broken by immense hay meadows and marshes, on the higher places only scrub is growing, brulé and deadfall showing the work of fires. Settlers seem to be coming into this country rapidly. *Geo. A. Grover, D.L.S., 1906.*

Range 10.

21. Along lake Manitoba this township is open and marshy and more remote from the lake it is densely timbered with poplar and willow. The chief industries are stock raising and fishing. Much hay can be procured in the sloughs and marshes. Moose and deer are abundant. Only a small percentage of the land is yet broken, barely enough to produce vegetables.—*Geo. McMillan, D.L.S., 1907.*

25. (*Fractional.*)—This township consists of a small strip of land in the west part of sections 6, 19, 30 and 31 and Richard point which occupies part of sections 1, 2 and 12. There is a small area of good land in sections 30 and 31 and also on Richard point. There is one settler at each of these places. Reed island is only a group of low sand bars covered along the edges with long reeds and small willows.

Range 10—Continued.

As there was no definite shore I did not traverse them. There are no water-powers, no quarries and no minerals of any description.—*Paul T. C. Dumais, D.L.S., 1906.*

26. (*Fractional.*)—This township is only a strip of land composed of the west parts of sections 6, 7, 18 and 19. There are some good patches of land in sections 6 and 7, but the balance is all swampy and is covered with long reeds and small willows. There is a bluff of poplar on section 7 averaging twelve inches in diameter, some patches of prairie on section 6, and a few hay sloughs. There are no water-powers, no quarries and no minerals of any description.—*Paul T. C. Dumais, D.L.S., 1906.*

28 & 29. These townships were reached from Oak Point by the winter trail to Fairford postoffice. The soil is a black loam from one to five inches deep on a clay subsoil. The land is covered with small poplar, willow and a little spruce and oak all under ten inches in diameter, but no timber suitable for lumbering purposes is found. A large quantity of hay grows in the marshes. Water is abundant in lake Manitoba and in the marshes but no water-powers occur. The climate is moderate. Fire-killed trees furnish a good supply of fuel. Limestone is found close to the surface and there is said to be a large deposit of good quality adjoining the shore of lake Manitoba. No minerals were found. Moose and elk were the only game seen. —*J. L. R. Parsons, D.L.S., 1907.*

32. Across this township the line passes mostly through dry country covered with woods of a varied character, consisting of small poplar, alternating with patches of spruce, tamarack or jackpine. In the west half of the range much of the woods have been destroyed by fire, and a growth of small scrub has sprung up. The land is about level, and the soil in the eastern portion of the range is black loam from four to twelve inches in depth on clay subsoil. On the north boundaries of sections 32 and 31 it is mostly gravel.—*Wm. Christie, D.L.S., 1907.*

25. From Makinak station on the Canadian Northern railway, the shortest route to reach this township is by the graded road going east as far as Ste. Amélie, a distance of fifteen miles, and thence by the old trail to Ebb-and-Flow Lake Indian reserve. From the reserve there is a cart trail going north on the west side of Ebb-and-Flow lake as far as Crane bay on lake Manitoba in section 21 of this township, and at a distance of about twenty-eight miles from the east end of the graded road mentioned above. This township could also be reached in summer by boats that generally run from Oak Point which is on lake Manitoba, and which is the terminus of the Canadian Northern railway branch from Winnipeg. This township is broken on the northwest by Crane bay of lake Manitoba ,which partly covers sections 21, 22, 27, 28, 31, 32, 33 and 34. On the east side, sections 12, 13 and 24 are partly covered by lake Manitoba, and on the southwest, Ebb-and-Flow lake with an area of over two square miles extends over parts of sections 5, 6, 7, 8 and 18. The soil is mostly sandy loam with a subsoil of clay, but in some places sand and gravel is found. There are ten Icelandic settlers squatted along Crane bay and lake Manitoba. They cultivate no grain but grow potatoes and all sorts of vegetables. They have good herds of cattle, the country being well adapted for stock raising. The land is good for farming, but where the settlers are located it is so flat that it is liable to be flooded in the rainy seasons. Along the lake and bays are large muskegs covered by reeds eight to ten feet long. There are numerous hay sloughs which grow quantities of good hay. The south part of this township is heavily timbered in places with poplar up to fifteen inches in diameter. There is also some scattered spruce and small oak which may be used for building and fencing. A large part of this township has been fire swept and the fire-killed poplar will furnish any quantity of fuel. The country is very level all over

TOWNSHIPS WEST OF THE PRINCIPAL MERIDIAN.

Range 10—Continued.

this township. There are no water-powers, no quarries and no minerals of any description in this township. Moose, elk and jumping deer are numerous. There are also great numbers of rabbits and a few partridges. Pike and whitefish are caught in great numbers in lake Manitoba.—*Paul T. C. Dumais, 1906.*

26. This fractional township consists of sections 1, 2, 12 and part of sections 3, 4, 6, 11, 13 and 14. It is broken by lake Manitoba and by five other lakes, sections 1 and 12 being the only ones which are unbroken. There are some good patches of land in sections 1, 2, 3, 4 and 12, but the remainder is all swamp and muskeg covered with long reeds and small willows. The soil is mostly sand, clay and gravel covered with four to six inches of black loam. Parts of sections 1, 2 and 12 are well timbered with poplar up to twelve inches in diameter. There is also some small oak and birch and a great deal of willow scrub. Cherry island on the north boundary of this township, is only a swamp sand bar covered with long reeds and willows along the shore. There are no water powers, no quarries and no minerals of any description.—*Paul T. C. Dumais, D.L.S., 1906.*

28. In this township the line crosses Peonan point, a long narrow peninsula extending from the north end of lake Manitoba to about nine miles south of this line. It has a width on the line of about three miles, the east shore being reached in section 35, and the west shore in section 32. Along each shore is a strip, about half a mile in width, of wet, marshy land, part of which is hay land, but the greater part of which is covered with tall reeds and rushes. The interior of the point is mostly wooded with poplar; but many marshes and muskegs occur. The soil is chiefly black loam on clay subsoil. The south end of this point is very low and marshy.—*Wm. Christie, D.L.S., 1907.*

32. The eastern half of this township is similar to range 10, being covered with poplar and spruce, much of which has been destroyed by fire, and having numerous sloughs and marshes. A small creek, known as Powderhorn creek, crosses the line in section 34. In the west half of the range the line crosses extensive muskegs with bluffs of tamarack and willow. A very reedy lake, known as Basket lake, lies about half a mile to the south of the line, partly in range 11 and partly in range 12. This lake is about three miles in length from east to west and from two to three miles in width. Basket creek flows from this lake to lake Manitoba. This creek has a fairly rapid current, which would appear to indicate that Basket lake is at a considerably higher level than lake Manitoba, and points to the possibility of much of the swamp land being drained. The soil is black loam on clay subsoil.—*Wm. Christie, D.L.S., 1907.*

Range 12.

26. The centre of this township is situated at a distance of twenty-seven miles east of East Bay postoffice, near lake Dauphin, and is about forty-nine miles from Makinak station on the Canadian Northern railway From this last place to East Bay there is a well graded road. To go farther east there is a wood trail for four miles, and from there I opened a winter trail through townships 26, ranges 15, 14, 13 and 12 as far as lake Manitoba. The soil in this township consists of a black loam four to ten inches in depth, with a subsoil composed chiefly of clay, with some gravel and sand in places, especially on the west half. A large part of the east half of the township is covered by lake Manitoba. Large muskegs border the lake extending in some places for over half a mile from the shore. Long reeds and small willows grow in these muskegs and in most of the large sloughs which are numerous

Range 12—Continued.

all over this township. There are also many hay sloughs where large quantities of good hay can be made in dry seasons, but this country being very flat there would be some difficulty in making hay in a wet season. There is no valuable timber in this township. The best of what there is, is good only for small buildings, fencing and fuel. There are no water-powers, quarries or minerals, but it is a good country for game. Moose, elk and jumping deer were numerous at the time of the survey. Rabbits are in abundance and there are plenty of pike and whitefish in lake Manitoba.—*Paul T. C. Dumais, D.L.S., 1906.*

28. The greater part of the township falls in lake Manitoba, the west shore of the lake being reached in section 32. In section 31 the line passes through country similar to that in range 13. Along the shore of the lake is a strip of low marshy land of varying width. The soil is black loam on clay subsoil.—*Wm. Christie, D.L.S., 1907.*

32. In this township the line crosses a series of large muskegs and swamps with low ridges covered with small poplar and willow. The soil is black loam on clay subsoil.—*Wm. Christie, D.L.S., 1907.*

Range 13.

26. From Makinak station on the Canadian Northern railway, there is a good road to East Bay and lake Dauphin, a distance of twenty-two miles. From there, for about four miles due east, is a bush trail but for the remaining ten miles to the centre of this township, we had to go through bush, slough and muskeg. The surface is covered with poplar, willow and a few scattered spruce, the poplar measuring up to twelve inches in diameter. The soil is similar to that in township 26, range 14, a mixture of clay, sand and gravel covered by four to six inches of black loam. The country is very level, with many sloughs and muskegs. Green and dry poplar, for fuel and fencing purposes, is plentiful. Tamarack lake (so called by Indians) is over three miles long and extends north and south, partly covering sections 3, 10, 15 and 22. There is no water-power, no quarries and no minerals. Moose, elk and jumping deer are numerous, and the country seems to be overrun with rabbits.—*Paul T. C. Dumais, D.L.S., 1906.*

28. In this township the line crosses much marsh and muskeg but there is a larger proportion of bush than in range 14 and the timber is also larger, poplar up to eight inches in diameter being found. Crane river crosses the line in section 31 flowing north into Crane bay. On both sides of the river is a strip of marshy land and close to the river banks are tall reeds. A lake half a mile in width and surrounded by a reedy marsh is also crossed in section 31. The soil in this range is chiefly black loam on a subsoil of clay.—*Wm. Christie, D.L.S., 1907.*

32. In this township the line passes through low country consisting of low ridges covered with poplar and willow, separating large muskegs and hay sloughs. In sections 36 and 35 the line crosses a bay of lake Manitoba. Boggy creek flows into lake Manitoba from the north in section 35. In section 34 and 33 the line crosses Proulx lake. This lake is about four miles in length from north to south and the greater part of it lies in township 33. The soil in this range is chiefly black loam on clay subsoil.—*Wm. Christie, D.L.S., 1907.*

23. (*Fractional.*)—From Makinak, on the Canadian Northern railway, there is a good road to this township. The soil, which is similar to that in the neighbouring townships, is fairly fit for cultivation, being clay, sand and gravel, covered with

Range 13—Continued.

three to six inches of loam. The timber is chiefly fire-killed and standing poplar, with some green bluffs here and there and a second growth of poplar and willows. There are a few hay sloughs throughout the township. There are no water-powers, no quarries and no minerals of any description. Moose, elk and jumping deer are numerous. There are also great numbers of rabbits and a few partridges. Pike and whitefish are very plentiful in lake Manitoba.—*Paul T. C. Dumais, D.L.S., 1906.*

26. From Makinak station on the Canadian Northern railway, there is a good road to East Bay postoffice situated on section 1, township 26, range 16. Thence going east there is a bush trail for about three miles, but from there I had to cut a road as far as range 13. The soil in this township is a mixture of clay, sand and gravel, with four to six inches of black loam on top. There is no prairie, but there are many hay sloughs and muskegs and much swampy land. The remainder of the township is covered with poplar running up to ten inches in diameter, and willow scrub. There is also some small scattered spruce in the north sections. The country is very level, except in the north, where it is gently undulating. Good hay can be made in the numerous sloughs, but it can be cut only in dry seasons. The surface water is generally a little alkaline, but we found good fresh water by digging four or five feet. There were no indications of summer frosts. Green and dry poplar is plentiful all over the township and could be used for fuel, for small buildings and for fencing. There are no water-powers, no quarries and no minerals in this township. Moose, elk and jumping deer were frequently seen during the survey. Rabbits are very numerous.—*Paul T. C. Dumais, D.L.S., 1906.*

28. In this township the line crosses low swampy land partly covered with poplar and willow scrub but chiefly open swamps and patches of prairie. At the time the survey was made (June) owing to the late spring and unusual depth of snow during the previous winter, the land was much wetter than it would be in an ordinary season and much of the land which at that time was under water would on an ordinary year be excellent hay or grazing land. The soil is principally black loam to a depth of from eight to twelve inches on a clay subsoil. In a few places however the subsoil is gravel. This should be an excellent place for stock raising as there is sufficient pasture land and also a supply of hay can be obtained.—*Wm. Christie, D.L.S., 1907.*

32. In this township the line crosses a series of low ridges covered with poplar and willow, separated by large muskegs, swamps and hay marshes. Some brulé is met with on the north boundary of section 33. On the north boundary of section 31 the east shore of lake Manitoba is reached. The north end of the lake extends about a mile north of the line. The soil is black loam on clay subsoil.—*Wm. Christie, D.L.S., 1907.*

Range 15.

10. (*North outline.*)—Spruce Woods timber reserve occupies a part of this township. A great amount of marketable timber has been cut and the township has been overrun by fire, but there is still much timber remaining which will furnish fuel for many years. Transportation of this fuel will be comparatively easy as the Canadian Pacific and Canadian Northern railways pass through this township. The country along the north boundary is wholly unfit for farming. The soil is a poor quality of light sand, where there was not sufficient grass growing to feed my horses. Some fair sized tamarack, mostly dry, was noticed, while scattered spruce and poor poplar extend through the east part. Water is scarce and except what is found in the muskegs,

Range 15—Continued.

must be obtained by digging wells. A few jumping deer were the only game seen.—*C. E. Bourgault, D.L.S., 1907.*

32. In this township the western shore of lake Manitoba is crossed on the north boundary of section 35, and Waterhen river is crossed on the north boundaries of sections 33 and 32. Between lake Manitoba and Waterhen river are bluffs of small poplar by patches of prairie and hay marshes. Two small creeks cross the line in section 34. West of Waterhen river are low ridges, covered with brulé, small poplar and willow, separated by tamarack swamps. The soil is black loam on clay subsoil.—*Wm. Christie, D.L.S., 1907.*

Range 16.

10. *(North outline.)*—Spruce Woods timber reserve occupies a part of this township. A great amount of marketable timber has been cut and the township has been overrun by fire, but there is still much timber remaining which will furnish fuel for many years. Transportation of this fuel will be comparatively easy as the Canadian Pacific and the Canadian Northern railways pass through this township. The country along the north boundary is wholly unfit for farming. The west part of the township is covered with muskeg, thick willow and scrub. The east part is also covered by spruce on sand hills separated by small marshes where there is no hay. The soil is a poor quality of light sand, where there was not sufficient grass growing to feed my horses. Some fair sized tamarack mostly dry was noticed, while scattered spruce and poor poplar extend through the east part. Water is scarce and except what we found in the muskegs, must be obtained by digging wells. A few jumping deer were the only game seen.—*C. E. Bourgault, D.L.S., 1907.*

32. In this township the greater part of the line falls in a bay of lake Winnipegosis, the eastern shore of which crosses in section 34 and the western shore in section 31. The shores of lake Winnipegosis are here very low and marshy, tall reeds growing in the water along the shore. On the north boundary of sections 36 and part of 35 the line passes through brulé with small poplar and jackpine, and tamarack swamps. The soil is black loam on clay subsoil. Some settlers have already located along the shore of the lake in townships 31 and 32. They engage in ranching and fishing.—*Wm. Christie, D.L.S., 1907.*

51. The trail from Battleford to Birch lake passes through section 25 and 35 of this township and forms the best route for reaching it, as it is generally in good condition. There are some hills to be crossed, but they present no special difficulty. One creek, which has to be crossed, might cause trouble in a wet season. The soil of this township consists of a thin layer of black mould with a sub-soil generally of clay loam or sandy clay. In many places stones occur but not so thickly as to interfere with agricultural operations. About half of the township has first class soil, the remainder being second class. Practically the whole is covered with either light or heavy scrub poplar and willow. A great many small open spaces occur especially in the northwest portion of the township, and also near the shores of MacLeod lake. About eighteen per cent of the surface is water, ten per cent open, and the remainder scrub poplar and willow interspersed with scattered poplar and balm of Gilead, averaging eight inches in diameter. Sections 2, 3, 4, 5 and 6 are rolling while the remainder is gently rolling country. Poplar and balm of Gilead averaging about eight inches are scattered all over the township. A small amount of spruce is found near the small lakes in sections 5 and 6. These trees average about eight or nine

Range 16—Continued.

inches in diameter, the largest being about fourteen inches. Altogether about one hundred thousand feet of lumber could be cut. Grass grows luxuriantly in all the open places throughout the township. Scattered over the township are a few very small hay meadows. The upland grass should also make good hay. This township is well supplied with water. Birch lake occupies about half of sections 25 and 36, and along the south outline of the township is a string of lakes connected by small creeks. Several sloughs are to be found throughout the township all of which contain good drinking water. MacLeod lake, a rather shallow lake of 2,000 acres area, occupies parts of sections 10, 11, 14, 15, 16, 22 and 23. The water is slightly brackish and the supply is sufficient and permanent. No land is liable to be flooded to any serious extent. The small streams along the south outline average about eight feet wide and six inches deep with an average current of three miles an hour. No water-power could be generated. The climate was cool, the days being moderately warm. Considerable rain was experienced, but no summer frosts occurred. Fuel in the shape of poplar can readily be procured throughout the township. No coal or lignite veins were seen. No stone in place was observed, although loose stones for building purposes are abundant. No minerals of economic value were found. Game seemed to be rather scarce as the Indians have for a long time made this district their hunting ground. An occasional prairie chicken or partridge was seen, while duck of various kinds were very plentiful. Trails of red deer and moose were noticed. Rabbits and other small game did not appear to exist. Elk had evidently lived here formerly but no recent traces of them were noticed. Birch lake and the series of small lakes mentioned contain an enormous quantity of fish, those noticed being jackfish, whitefish, sucker and pickerel.—*H. S. Holcroft, D.L.S., 1907.*

Range 17.

32. In this township the line passes over a series of low flat ridges, covered with brulé, a growth of small poplar and a few jackpine, separated by muskegs and hay marshes. The eastern shore of lake Winnipegosis proper is reached in section 33. A small lake is also crossed in section 36. The soil is black loam on clay subsoil. —*Wm. Christie, D.L.S., 1907.*

Range 18.

32. In this township the line crosses Red Deer point, a long narrow peninsula extending about eighteen miles north of the line into lake Winnipegosis. On this point the line passes through poplar and spruce up to fourteen inches in diameter. Most of the spruce of any value however has already been removed. There are also many hay marshes, and a small lake is crossed in section 32. The line crosses Fuller's bay on the north boundary of sections 33 and 34 and reaches the western shore of lake Winnipegosis proper on the north boundary of section 35. The soil is black loam on clay subsoil.—*Wm. Christie, D.L.S., 1907.*

Range 19.

36. The greater part of the line in this township falls in Sagenace bay, a portion of lake Winnipegosis separated from the main lake by Red Deer point. Along the shore of the bay is a strip of hay marsh. Back of this is a narrow strip of heavy poplar bush and back of this again is small poplar and willow with hay meadows and sloughs.—*Wm. Christie, D.L.S., 1907.*

TOWNSHIPS WEST OF THE PRINCIPAL MERIDIAN.

Range 25.

41. The soil in the southwest corner is good and suitable for farming but the greater part of the rest is muskeg or swamp and very wet and is of very little use. The surface is level and covered with thick woods. The only timber of any value is at the southwest corner. It is chiefly poplar and spruce from eight to sixteen inches in diameter. Spruce, tamarack and willow are found in the muskegs. Some balsam and birch were also seen. Hay is very scarce. The water is fresh and very plentiful and the supply is permanent. Only small streams are found. The land is flooded to a great extent now (May), a foot or more deep. There are no water-powers. The climate was very disagreeable. Cold cloudy weather with alternate snow, sleet and rain storms occurred in the latter half of May with as much as five feet of snow on the ground in places in the hills, while two feet was common on the level in the big timber. Frosts were experienced. Wood is the only fuel but it is plentiful almost everywhere. No coal, stone quarries or minerals were found. Moose was the only game seen, but they are plentiful.—*W. G. McFarlane, D.L.S., 1907.*

Range 26.

41. The soil is good for farming in the southerly part but is more sandy and very stony towards the north. There is also considerable muskeg towards the northeast. The surface is all heavily wooded, poplar and spruce to the south and some small poplar, birch and jackpine towards the north, with spruce and tamarack in muskeg on the east. The only timber of any value is in the southerly part or on the hills to the west. It is chiefly poplar and spruce from eighteen to twenty-four inches in diameter with some balsam and birch from six to twelve inches. There is a fair amount of it but it will be hard to get out as no waterways are available and the surface is very hilly. Some birch, balsam and alder were also found. Hay is very scarce. The water supply is very abundant and fresh, no alkali being found. The streams are small but there are quite a number of them. The land is not liable to be flooded except in the muskeg at the easterly side. There are no water-powers. The climate was very disagreeable. Cold cloudy weather with alternate snow, sleet and rain storms occurred in the latter half of May with as much as five feet of snow on the ground in places in the hills, while two feet was common on the level in the big timber. Frosts were experienced. Wood is the only fuel but it is plentiful almost everywhere. No coal, stone quarries or minerals of any kind were found. The only game seen was moose. The westerly part of the township is up in the Porcupine Hills and is very high and rough.—*W. G. McFarlane, D.L.S., 1907.*

42. The route followed is a trail which crosses the railway north of Novra and runs north along the foot of the hills. It was in general good but very stony in places. The soil at the south and north sides of the township is a black loam and clay, is very good for farming and is well watered, but in the centre it is sandy on the ridges and there is considerable swamp and muskeg. The surface is rolling at the south and north sides, hilly at the west and flat at the centre of the east side. It is almost all thickly wooded. A little brulé is found just south of Bell river and also some at the north side of the township. The only timber of value is found on the hills to the west and across the centre of the township. It is chiefly poplar and spruce eight to twenty-four inches in diameter. Jackpine birch and poplar are found at the south and north sides and some tamarack at the east. Hay is very scarce. The water is fresh and abundant and the supply is permanent. Bell river at the south side of the township is a fine stream, especially in the spring when we had great difficulty in crossing it, as the snow was just melting in the hills to the west. It was about five feet deep and running about eight to ten miles an hour carrying down large

Range 26—Continued.

trees and roaring like distant thunder. The only part of the township liable to be flooded is the muskeg near the centre of the east side but quite a number of streams run out of it to the railway ditches. Water-power might be developed farther to the west on Bell river but there are no rapids or falls of any height in the part surveyed. The climate was very damp and cool. Considerable rain fell. Frosts were noticed. The only fuel is wood but it is plentiful almost everywhere. No coal, stone quarries or minerals were found. The only game seen was moose, jumping deer and bear.—*W. G. McFarlane, D.L.S., 1907.*

43. The trail runs along the foot of Porcupine hills, west of the Canadian Northern railway. It is good in general but very soft in a few places. The soil is good for farming at the south side, being a good loam and clay subsoil but gets sandy towards the north and is very sandy in some places along jackpine ridges. There is also some muskeg and swamp near Mafeking. The surface is rolling, timbered and scrubby, with some brulé at the south side. Timber has been large and plentiful to the west of Mafeking and north to Steeprock river but it is mostly cut over now. Some poplar six to eighteen inches and spruce six to thirty inches is still found, but the timber is mostly second growth poplar, jackpine one to twelve inches, birch, willow and alder. Some tamarack is found in the muskeg. Hay is very scarce. The water is fresh and very plentiful in streams and Steeprock river. This river is a fine stream about one and one-half chains wide four feet deep and has a current of four or five miles an hour. The land is not likely to be flooded. There are no water-powers. The weather was damp and cloudy with considerable rain. Ice was still to be found along some creeks in the middle of June. No hard frosts were noticed. The only fuel is wood, but there is plenty of it everywhere. No coal, stone quarries or minerals were found. Moose and bear were seen.—*W. G. McFarlane, D.L.S., 1907.*

44. The trail runs on at some distance west of the Canadian Northern railway until close to the south boundary, where it goes along the right-of-way through muskeg and is very bad until within about a mile of Rice creek, where it again skirts the hills and is drier and better. The soil at the south side of the township is light at the west, and muskeg and swamp near the railway but it is better towards the north and would make fair farm land. The surface is rather flat and thickly wooded. Some scattered timber is found but in no large blocks. It is spruce six to twenty inches, poplar two to twelve inches, birch, tamarack, willow and alder scrub with considerable jackpine to the southwest. Hay is scarce. Water is fresh and plentiful. Only small streams are found. The land is liable to be flooded several inches deep in places. There are no water-powers. The weather was damp and cloudy with some rain, but was fine and hot at times. No frosts were noticed. The only fuel is wood but it is plentiful everywhere. No coal, stone quarries or minerals were found. No game was seen.—*W. G. McFarlane, D.L.S., 1907.*

Range 27.

44. The trail followed runs along the foot of Porcupine hills and crosses the railway four times. It was fairly good but had a number of soft holes on it, and many creeks some of which had to be bridged. The soil is of all classes. On the north side of the railway and east of the centre it is mostly muskeg, but there is some good land along the railway in the west half. The southeast corner runs up on the hills and in some places the soil is sandy, while in others it is very heavy clay. The surface north of the railway and for about half a mile south of it, is level or

Range 27—Continued.

gently rolling. The southeast part is very hilly and rough, being cut up by deep ravines, down one of which Rice creek flows. It is mostly timbered east of the centre. The west part along the Canadian Northern railway has about a section of prairie, and the rest is chiefly scrubby land with considerable windfall to the northeast. The timber is six to ten-inch tamarack and spruce to the north of the railway chiefly, but some six to eight-inch popular and balsam and a few birch are found. On the south side of the railway there is some jackpine to the east, some six to sixteen-inch spruce and poplar along the face of the hills up to Rice creek. A few eight to twelve-inch birch are also found. Hay is very scarce. The water is all fresh and very plentiful in creeks and muskegs. This creek is a fine stream about one chain wide and from one to two feet deep at low water. The current is about four or five miles an hour. The land to the northeast is liable to be flooded several inches deep in wet seasons. Rice creek is quite rapid up in the hills and small water-power might be developed by dams. The climate was fine and hot with some rain. No frosts were noticed. The only fuel is wood but it is very plentiful everywhere. No coal, stone quarries or minerals were found. Moose and bear were the only game seen.—*W. G. McFarlane, D.L.S., 1907.*

Range 28.

44. The trail follows along the railway for some distance and then leads off towards the hills somewhat. It is fairly good but has some soft places, and several creeks had to be bridged. The soil is a loam with clay subsoil and would be nearly all good farm land. The surface is level north of the railway and rises towards the south and is slightly rolling. It is all covered with heavy bush. There is considerable green timber in this township, six-inch to fourteen-inch jackpine at the south and east, and six-inch to twenty-five-inch spruce, four-inch to ten-inch birch, ten-inch to fourteen-inch black poplar, six-inch to ten-inch balsam, scattered nearly all over the north third of the township. Hay is very scarce. Water is fresh and plentiful in numerous streams and some muskegs. In some places the land is liable to be flooded on the north side of the railway. There are no water-powers. The weather was warm but often cloudy with several showers of rain and one very heavy rain. No frosts were noticed. The mosquitoes and sandflies were very bad. The only fuel is wood but it is quite plentiful almost anywhere. No coal, stone quarries or minerals were found. The only game seen was moose.—*W. G. McFarlane, D.L.S., 1907.*

Range 29.

44. The trail follows along near the railway, crossing four times and crossing numerous creeks which we had to bridge. It was very soft in many places and crosses some muskeg which had to be corduroyed. The soil is good throughout a good part of the north third of this township, but there is also considerable muskeg. Much of the good land was nearly covered with water, as this was a good season. The surface is level to the north of the railway, but rises some toward the south on the south side. It is all heavily wooded. There is considerable timber scattered through the township but the best of it has been cut off. Poplar six to fifteen inches and spruce from six to twenty-four inches are the chief kinds. A few twelve-inch birch and balsam are also found with six-inch tamarack in muskegs. Hay is more plentiful here than to the east. Several good hay sloughs are found along the north chord. It is all slough hay. The water is all fresh and very plentiful. One or two branches of Armit river run north to the main river. One is about a chain wide and from three

Range 29—Continued.

to four feet deep with a current of three or four miles an hour. A considerable part of the land here is swampy and might be flooded at times, as it was this year, several inches deep. There are no water-powers. The weather was warm but often cloudy with some rain. No frosts were noticed. The only fuel is wood, but it is plentiful everywhere. No coal, stone quarries or minerals were found. Moose was the only game seen.—*W. G. McFarlane, D.L.S., 1907.*

Range 30.

24. This township is easily reached by numerous trails and roads running out of Langenburg, a station on the northwestern branch of the Canadian Pacific railway. The roads are all in good condition for a new country. The soil throughout the township is a black loam with clay subsoil and is well adapted for wheat which seems to be the principal grain grown by the settlers. The surface is gently rolling with scattered willow scrub and poplar bluffs in the northerly part. The poplar is small and suitable only for fencing or fuel. There is no timber of any size in the township. There is hay sufficient for the requirements of the settlers, in the sloughs, which are scattered throughout the township. The water in the sloughs is good enough for cattle but not desirable for domestic purposes. There are, however, many good wells in which the water cannot be excelled and generally it is in unlimited quantities. There are no streams of any account. A stream about five links wide crosses the east boundary of section 24 and runs easterly. This stream appears to lose itself in sloughs in many places. There are no water-powers, stone quarries or minerals of any description in the township. The climate is good and generally free from summer frosts. Fuel is scarce and the settlers have to go some ten miles for wood. Game such as wild duck is plentiful. The township is well settled with Canadians from the eastern provinces, Germans and Galicians, all appearing to be in a prosperous condition. It is expected that a branch of the Canadian Pacific railway will be constructed through this township in 1908.—*W. J. Deans, D.L.S., 1907.*

44. The trail runs back to the south of the railway in range 29, about two miles along higher ground until it is about a mile past Westgate when it turns back towards the railway and crosses another branch of Armit river. It then follows along the railway through corduroyed muskeg for about three miles when it comes out into drier bluffy poplar country. It was very soft in places and several places were flooded. The ford at the river was good. The soil is chiefly muskeg in the easterly half but the west part is excellent and quite open in places and would make excellent farm land. It is a good loam and clay. The surface is level and almost flat. The easterly half is all covered with small timber and the west side with small timber and scrub, but the intervening part, about 600 acres of prairie, is bluffy. There is no timber of any value. It is chiefly small tamarack, spruce and poplar, with considerable alder and willow. Scattered six to twelve-inch spruce and poplar are found. Hay is plentiful on the prairie and is of excellent quality. There are several hay sloughs to the west of the prairie. The water is all fresh and very plentiful in streams and muskeg. Only small streams are found, but they are good ones. The land was partly flooded this summer on account of the wet season, but not deep. There are no water-powers. The climate was fine and warm in general but we had several showers and some cloudy weather, but no frosts. The only fuel is wood but it is plentiful everywhere. No stone quarries, coal or minerals were found. No game was seen.—*W. G. McFarlane, D.L.S., 1907.*

TOWNSHIPS WEST OF THE PRINCIPAL MERIDIAN.

Range 31.

44. The route followed in reaching this township runs along near the railway crossing it four times and goes up south of Roscoe. Numerous creeks had to be bridged, and some muskegs corduroyed and soft places brushed as the country is so flat. The water lying on it makes the ground very soft. The soil is excellent with the exception of some muskeg west of Roscoe and a sandy ridge at Roscoe. Along a branch of Armit river, about a mile east of Roscoe, the land is excellent for farming. The surface is almost level. It is almost all covered with small timber. There is no timber of much value although scattered six to fourteen-inch spruce and poplar are found. Tamarack, balsam and birch are also found. Hay is scarce. The water is fresh and very plentiful. Armit river is a good stream about half a chain wide and four to five feet deep with a current of about three miles an hour. This drains a considerable part of the land, but there is some so level that it was almost flooded. There are no water-powers. The weather was usually bright and warm but we had some rain. No frosts were noticed. The only fuel is wood but it is plentiful. No coal, stone quarries or minerals were found and no game was seen.—*W. G. McFarlane, D.L.S., 1907.*

Range 32.

30. This township can be reached by a good trail running from Kamsack, a station on the Canadian Northern railway. The soil in the part of the township lying west of Whitesand river is a black loam with clay and sand subsoil and is well adapted for grain growing. The portion lying between Whitesand and Assiniboine rivers is largely alkaline flats covered with short grass. The surface of the township west of the Whitesand is rolling, while that between the two rivers is level. There is some willow and poplar scrub between the two rivers and some small poplar and willow along the Whitesand near its mouth. There is sufficient hay in the sloughs for the requirements of the settlers. Whitesand river, a stream averaging a chain in width and from two to six feet in depth enters the township on the west boundary of section 31, and running southeasterly joins the Assiniboine on section 4. The water of the Whitesand is fresh and of excellent quality. Assiniboine river forms the easterly boundary of this township. Water-power could easily be developed on Whitesand river by the construction of dams but the amount of energy which could be developed would be small and uncertain. Fuel is scarce throughout the township. The settlers obtain their supplies of wood from Duck mountain. There are no minerals or stone quarries in the township. There is a good market for farm produce at Kamsack, a divisional point on the Canadian Northern railway. The climate is good and generally free from severe summer frosts. Wild duck and prairie chicken are plentiful. Jackfish and goldeye are plentiful in Whitesand and Assiniboine rivers. Small wild fruits grow in great profusion in the sheltered spots along the river banks.—*W. J. Deans, D.L.S., 1907.*

44. This is a fractional township. It is nearly all muskeg and would be very hard to cross with teams. The poplar bush in the west side of range 31 was broken down flat and it would require weeks to cut a road through. The soil is nearly all muskeg and is of little use. The surface is flat and quite a lot of it covered with small spruce and tamrack but there is some open floating muskeg. There is no timber of any value. Hay is very scarce. Water is fresh and very plentiful, especially in the muskeg. Some small streams are found at the south. There are no water-powers. The weather was usually bright and warm but we had some rain. No frosts were noticed. The only fuel is wood, but it is plentiful. No coal, stone quarries, or minerals were found, and no game was seen.—*W. G. McFarlane, D.L.S., 1907.*

TOWNSHIPS WEST OF THE PRINCIPAL MERIDIAN.

Range 32—Continued.

45. This is a fractional township. The soil is mostly muskeg. There are some stretches of land with poplar, but they are scattered and flat. The surface is flat and thickly wooded except in the muskeg, some of which is open and floating. There is no timber of any value. Hay is not plentiful, but there is some in sloughs towards the north. The water is fresh and very plentiful in muskegs and sloughs. The land was partly flooded several inches deep on account of the wet season and no streams to drain it off. There are no water-powers. The weather was usually bright and warm with some showers of rain, but no frosts. Wood is the only fuel but it is plentiful. No coal, stone quarries or minerals were found and no game was seen.—*W. G. McFarlane, D.L.S., 1907.*

TOWNSHIPS WEST OF THE SECOND MERIDIAN.

Range 1.

37. Access to this township is, at present, by way of a wagon road from sections 6 and 5 southeast to Swan river and connecting there with existing roads. An alternative road crosses Swan river near the southwest corner of the township and connects with a road to Fort Pelly. The surface varies from narly level land in the west and southwest, to rolling land in the northeast parts, except those parts of sections 19, 18, 7 and 6 on the easterly bank of Swan river and are therefore rough and hilly. The land is generally covered with scrub with scattered bluffs of poplar or spruce. Woods of poplar cover the eastern bank of Swan river in this township and poplar woods were found in sections 25, 26 and 27. In other sections the timbered land is of small area and of no importance except to settlers. Land producing hay is scare though probably a limited quantity will be found on each section. A number of streams flow through this township, all of which contain excellent water, but in ordinary years these streams would probably become dry. No doubt good water can be obtained by digging wells, as the settlers in the adjoining township to the south have been successful in that way. There are no streams which could be used for water-power. Last season there were no summer frosts and the indications are that in an ordinary year good crops of grain might be grown. The only fuel available is wood of poplar and spruce and it is only in quantities sufficient for the use of settlers. No stone quarries or minerals of value were seen. Moose and deer were occasionally seen, but other game is scarce.—*Edgar Bray, D.L.S., 1907.*

38. Access to this township may be had by wagon trail passing through the easterly sections of township 38, range 2 and from there south and southeasterly to settlements south of Swan river, or by a branch road running along or near the second meridian. Either road is bad in wet weather, but the first is preferable although it is the longer. The land lying west of an imaginary line drawn through the middle of the southeast quarter of section 6 to the northeasterly corner of section 21 is a swamp of spruce and tamarack not suitable for farming. The timber varies in size from mere scrub to large trees up to eighteen inches in diameter though generally the timber is small. East of that imaginary line the surface varies from slightly rolling to rough lands and is suitable for agricultural purposes. It is covered with woods and scrub, in probably equal proportions. The timber is composed of poplar and birch with some spruce and jackpine. Land producing good hay is confined to a few small swamps scattered over the township. A few streams were found in which the water was fresh and good but generally the main supply is found in small ponds of rather inferior quality. There are no water-powers. The climate is practically

Range 1—Continued.

the same as that of the country to the south, and no doubt successful farming may be carried on where the land is suitable. The only fuel available at present is wood and it is in considerable quantities and fairly distributed. No stone quarries or minerals of any value were noticed. We found traces of moose and deer but small game appears to have almost disappeared.—*Edgar Bray, D.L.S., 1907.*

45. The soil is usually very good, being a black loam with clay subsoil in general and would make good farm land. The surface is level and mostly covered with heavy timber. The timber is chiefly six to ten-inch poplar but there is also some six to twelve-inch spruce. It is scattered over nearly all this part of the township and is not of great value. Hay is very scarce only a small slough here and there. The water is fresh and very plentiful in streams and over a large part of the surface. The streams are all small with the exception of Smoking Tent creek which is forty feet wide and two feet deep with a current of about four miles an hour. The land is liable to be partly flooded but not to any great depth. There are no water-powers. The weather was usually cool and cloudy with considerable heavy rains. No frosts were noticed. The only fuel is wood but it is plentiful everywhere. No coal, stone quarries or minerals were found. The only game seen was bear.—*W. G. McFarlane, D.L.S., 1907.*

37. The route to and from this township is by a road from Fort Pelly by way of Swan river and also by a road cut by me through township 36, range 2 to section 5, township 37, range 2, and thence northerly. This road connects with existing roads in township 35, range 2. The first mentioned road is rough and hilly while the second in wet and sometimes impassable. The soil where it is dry is mostly a good clay loam and will be found suitable for grain growing or mixed farming. Swan river flows through the easterly part of this township. On each side of this river for a width of three-quarters of a mile the land is rough with frequent bare knolls. In other sections the country is nearly level and, except on the marshes, is covered with either woods of poplar or scrub in about equal proportions with the timber fairly distributed. Very large marshes are a prominent feature in the westerly two rows of sections. These marshes had the appearance of lakes last summer, but in a normal year they would shrink to much smaller size and would generally have much more margin than ten chains between high and low water. Hay in any quantity could not have been cut last year on account of the water, but in a year of ordinary rainfall large supplies of excellent hay may be procured in these marshes. Between these large marshes and the banks of the Swan river we found numerous small marshes producing hay of good quality in a dry season. Swan river and its branches will give an abundant and permanent supply of good fresh water. It is the only stream large enough to be considered as a source of power. In places dams might be built, but as the river is usually very low all winter, and also in dry summer weather, its value for that purpose is not of much account. Last summer was too rainy and cold for successful farming, but as grain growing was a failure in most places in that vicinity last year, this particular tract has not been shown to have an extreme climate. The indications are that growing grain here is as likely to be successful as it is in the partly settled country lying to the south. The first frost in the fall was September 14, which compares very favourably with localities where good crops were harvested. The only available fuel at present is wood. It is fairly plentiful and can probably be procured on every section in the township. No minerals of any value or stone for quarrying were noticed and probably none exist. As tracks of moose and deer were often noticed, it is probably that these animals are here in considerable numbers.

Range 1—Continued.

However, small game such as ducks and chickens were scarcely ever seen.—*Edgar Bray, D.L.S., 1907.*

45. The soil is very good in most places, being loam and clay subsoil, but stretches of muskeg run here and there through it. It would make fairly good farm land. The surface is level except where Red Deer river runs through it. Here the banks are quite high and steep. It is mostly covered with timber but there are some large hay sloughs at the east side and a little clearing west of the river beside the railway as well as a few open muskegs. The timber is chiefly six to twelve-inch poplar, but there is some scattered spruce. Small tamarack, balsam and birch are also found. The best timber is near the river. Hay is fairly plentiful in large hay sloughs east of Erwood and close to the railway. It is all slough hay. There is also a little in some of the muskegs farther west but it is too wet to cut much this year. The water is usually fresh and very plentiful in the river, streams, sloughs and muskeg, but there is bad water at Erwood. Red Deer river is about three chains wide and eight feet deep at Erwood with a current of about five or six miles an hour. As this is a very wet season a good deal of the land is practically flooded. There are no water-powers. The weather was rather cool and cloudy with considerable rain but no frosts. The only fuel is wood but it is plentiful. No coal, stone-quarries or minerals were found. The only game seen was bear.—*W. G. McFarlane, D.L.S., 1907.*

Range 3.

37. (*North and east outlines.*)—This township can be reached by a road cut out by me through township 36, range 2, connecting with an existing road leading to Fort Pelly. The soil is mostly a clay loam and is suitable for agricultural purposes. The surface is generally slightly rolling. Sections 36, 32 and 31 are covered with willow and poplar scrub while all the other sections surveyed are timbered with poplar from three to fourteen inches in diameter with occasional clumps of spruce or tamarack. Along and near both the east and north boundaries of this township numerous marshes were found where good hay in considerable quantities might be cut in a year of ordinary rainfall. As all the hay swamps and other depressions were flooded last year water was found almost anywhere. In addition there are a number of streams crossing the lines in which the water is good and the supply probably permanent in most cases. There are no water-powers. The climate is similar to that of partly settled districts a short distance south where good crops of grain have been grown. Poplar wood with a limited supply of spruce is the only available fuel. No stone for quarrying or minerals of any value were found. Small game such as ducks and chickens is scarce. However, numerous traces of moose, deer and bear were noticed.—*Edgar Bray, D.L.S., 1907.*

38. This township can be reached from a road from Fort Pelly to and along Swan river and thence by a road along or near the north boundary of township 37, range 2, to section 1 of this township, or by a road cut out by myself through townships 37, and 36, range 2, to a road now used leading to Fort Pelly. The first mentioned road is rather hilly along Swan river, while the last is level but last season it was sometimes almost impassable. The soil is generally a clay loam and should be suitable for raising grain or for mixed farming. Hay swamps were seen but they are not of much importance. The surface of the part surveyed is mostly slightly rolling and is covered with poplar woods and scrub in about equal proportions. The timber is from three to twelve inches diameter and appears to be fairly distributed. Streams of good fresh water from five to fourteen feet in width will insure an abundant and permanent supply for all pur-

Range 3—Continued.

poses. These streams, however, are too small for water-power. During last season the weather was too cold and rainy for successful farming, but in a normal year it would seem that the conditions would be suitable for agriculture. Poplar wood is the only fuel available and it can be found on any of the surveyed quarter sections. No stone fit for quarries was found nor were any minerals of value noticed. Game appears to be scarce though indications of deer, moose and bear were noticed.—*Edgar Bray, D.L.S., 1907.*

45. The country east of Etoimami in this range is mostly muskeg. There are some stretches of poplar where the soil is good but they are scattered. The soil is Etoimami is sandy but west of it there is good loam with clay subsoil, very good for farm land. The surface is flat at the east but is more rolling towards the west especially along Fir river. It is all covered with small timber, six to twelve inch poplar, four to ten-inch spruce and some tamarack to the east, and mostly six to fourteen-inch poplar to the west near the river. Hay is not plentiful except in open muskes or sloughs which were very wet. The water is fresh and very plentiful in streams, sloughs, muskegs and Fir river. The river is a fine stream, about thirty feet wide and three feet deep with a current of about four miles an hour. Much of the eastern part of this township is liable to be flooded several inches deep as it was this year. There are no water-powers. The weather was somewhat cloudy and cold with some rain. No frosts were noticed. The only fuel is wood and it is plentiful. No coal, stone quarries or minerals were found. The only game seen was bear. A few settlers are going into the west and south of Etoimami.—*W. G. McFarlane, D.L.S., 1907.*

Range 4.

38. The route to this township begins at Canora, on the Canadian Northern and runs in a northwesterly direction, passing by Astwood postoffice along a good trail to Fulton's mill in township 38, range 5 and thence easterly along a new trail not very passable in wet weather. In section 1 to 6, the soil is generally good, though the land is rather low. North of these sections, the township is almost entirely muskeg,and only suitable for a cranberry marsh. The surface is timbered and scrubby, covered with poplar, tamarack scattered spruce and willow scrub. This timber will be very useful for homesteaders, but is not in large enough quantities for lumbering. There are about one hundred and thirty-five acres of bush in section 19, consisting of poplar, two to twenty-four inches and spruce two to sixteen inches in diameter. There is approximately thirty-five acres of spruce and tamarack, two to twelve inches, in section 30, about eight acres each in sections 20 and 29 of scattered spruce, two to fifteen inches and popar, two to ten inches, twenty acres in section 18, and fifteen acres in section 17 of poplar, two to fourteen inches and spruce four to twenty inches. In sections 14 and 15, there is six acres in each of scattered spruce and tamarack, six to ten inches in diameter. There are approximately eighty acres of poplar, spruce and tamarack, six to twelve inches in section 22. In section 27 there is about fifteen acres of poplar, spruce and tamarack, six to twelve inches. In section 23 fifty or sixty acres of poplar, tamarack and spruce, four to twelve inches occur, and in section 24, twelve acres of the same kind. In section 26 there is roughly about forty acres of tamarack, spruce and poplar, six to twelve inches and in section 8, thirty acres of scattered spruce, two to eight inches and poplar two to ten inches, and about twenty acres of the same in section 9, and ten acres in section 17. In section 10 there is about ten acres of scattered spruce two to eight inches and about five acres in section 15. In sections 1 to 6 there is a fair amount of hay spread over these sections, but north of this there is no hay. There is an abundance of fresh water, but in a dry year, the swamps would likely dry up.

Range 4—Continued.

As there are no large streams, the land is not liable to be flooded. There are no water-powers. There was frost during every month and ice in August. The rainfall was abundant in 1907. There is plenty of wood for fuel scattered all over the township. There are no stone quarries nor minerals. There were indications that moose were plentiful.—*C.A. Chilver, D.L.S., 1907.*

39 and **40.** The only route for reaching these townships is from Wadena on the Canadian Northern railway along a trail runniug in a northeasterly direction to Kelvington postoffice, thence north to Little Nut lake, thence east over a poor trail, impassable in summer, crossing the north of townships 40, ranges 4, 5 and 6. There is no trail to townships 39, ranges 4, 5 and 6 and a summer trail is not possible and a winter trail very difficult to make on account of the great amount of fallen timber. The soil in these townships is all clay, but at present it is too swampy to be suitable for farming. A very good timber belt of spruce and white poplar lies across the north of this group of townships on the east of range 7. It extends from the north boundary half a mile south. On the east of range 6 it extends from the north boundary two miles south, and on the east of range 4 it extends from the north boundary two and one-half miles south. It is part of the Red Deer Lumber Company's timber limit. The rest of the group is scrubby with small patches of scattered spruce. Hay sloughs are very numerous all through this group. There is an abundant supply of good fresh water. The Piwei flows across the north of range 6 and into the North Etoimami in range 5. It has an average width of fifty feet, a depth of four feet and carries a large volume of water. The North Etoimami flows north through range 5. Before the Piwei joins it has an average width of fifteen feet and a depth of two feet. Its current is slow till the Piwei joins it and then it is swift, having a number of swift rapids, an average width of sixty feet and a depth of four feet. A good deal of the land in these townships is always flooded and impassable in the summer. There are rapids on the North Etoimami, but these have not sufficient fall to be used to develop power. On account of the extensive swamps the climate is cool in the summer, but no summer frosts occurred during the survey. The only fuel available is wood and there is a great supply of dry wood all over this part of the country. There are no stone quarries or minerals of any kind in this group. Moose are very plentiful in this district.—*C. A. Chilver, D.L.S., 1907.*

45. The soil is good in most places, being a black loam with clay subsoil. There is some muskeg but not very much. The surface is level and thickly wooded with the exception of sections 5 and 8, which are scrubby and open. It is mostly timber to the east. Part of section 9 is also open. The chief timber is six to twelve-inch poplar and spruce with some eight-inch tamarack, but the timber is all scattered. Hay is fairly plentiful in sloughs scattered all over. The water is fresh and there is plenty of it in streams, sloughs and muskeg. The streams are all small. The land is not liable to be flooded much, but was a little in some places this summer. There are no water-powers. The weather was usually fine and bright, but we had occasional showers. We had a heavy frost which froze the potato tops. The only kind of fuel is wood, but it is very plentiful. No coal, stone quarries or minerals were found. The only game seen was bear.—*W. G. McFarlane, D.L.S., 1907.*

38. The route to this township begins at Canora on the Canadian Northern railway and follows a good trail running in a northwesterly direction by Astwood post office to Fulton's mill in section 16. The soil is clay with loam in some parts but on account of the extensive muskegs it is not suitable for farming with the exception of sections 1 to 6, which are very good. The south half of section 3 is prairie and a

Range 4—Continued.

small part of sections 16 and 21 along the North Etoimami are also prairie. The north half of section 10, south half of section 16, the east quarter of section 21 and west quarter of section 22 are timbered with spruce and poplar six to fifteen inches in diameter. The east half of section 32 and the southwest quarter of section 33 are timbered with spruce and tamarack six to eighteen inches in diameter. The east half of section 28 and the west half of section 27 are timbered with poplar and spruce eight to twelve inches in diameter. The east half of section 24 is timbered with poplar two to twenty-four inches in diameter and the southeast quarter of section 36 is timbered with spruce two to twelve inches in diameter. In all of this township the spruce is too scattered to be valuable for lumbering but will be of great value to homesteaders. The remainder of the township is scrubby. The only hay in this township is a small quantity along the Etoimami valley. There is an abundant supply of good fresh water and the supply is permanent. The only stream of importance is the North Etoimami which begins in section 10 and flows north through the centre of the township. It has an average width of twenty links and depth of eighteen inches; it has a fair current. Back from the river valleys the lands are flooded the year round. There are no water-falls. The climate is a little cooler than the country to the south on account of extensive muskegs, and summer frosts are common. Wood is the only available fuel but the supply is very extensive. There are no stone quarries or minerals in this township. Moose, jumping deer and bear were the only game seen in this township.—*C. A. Chilver, D.L.S., 1907.*

39 & 40. The only route for reaching these townships is from Wadena, on the Canadian Northern railway, along a trail running in a northeasterly direction to Kelvington postoffice, thence north to Little Nut lake, thence east over a poor trail, impassable in summer, crossing the north of township 40, ranges 4, 5 and 6. There is no trail to township 39, ranges 4, 5 and 6, and a summer trail is not possible, and a winter trail very difficult to make on account of the great amount of fallen timber. The soil in these townships is all clay, but at present it is too swampy to be suitable for farming. A very good timber belt of spruce and white poplar lies across the north of this group of townships on the east of range 7. It extends from the north boundary half a mile south. On the east of range 6 it extends from the north boundary two miles south and on the east of range 4 it extends from the north boundary two and one-half miles south. It is part of the Red Deer Lumber company's timber limit. The rest of the group is scrubby with small patches of scattered spruce. Hay sloughs are very numerous all through this group. There is an abundant supply of good fresh water. The Piwei flows across the north of range 6 and into the North Etoimami in range 5. It has an average width of fifty feet, a depth of four feet and carries a large volume of water. The North Etoimami flows north through range 5. Before the Piwei joins it it has an average width of fifteen feet and a depth of two feet. Its current is slow till the Piwei joins and then it is swift, having a number of swift rapids, an average width of sixty feet and a depth of four feet. A good deal of the land in these townships is always flooded and impassable in the summer. There are rapids on the North Etoimami, but these have not sufficient fall to be used to develop power. On account of the extensive swamps the climate is cool in summer, but no summer frosts occurred during the survey. The only fuel available is wood and there is a great supply of dry wood all over this part of the country. There are no stone quarries or minerals of any kind in this group. Moose are very plentiful in this district.—*C. A. Chilver, D.L.S., 1907.*

45. The soil in the south and east parts of this township is of little use for farming, as it is chiefly muskeg. A sandy ridge also runs north in sections 5 and

Range 4—Continued.

8, but sections 6, 7, 9, 10 and 11 would make fairly good farm land. The soil in these is loam and clay. The surface is all covered with bush, but the greater part of it is scrubby. Some poplar and spruce are found at the west side of the range, but not in any quantity. Hay is plentiful only in the southwest corner of the township. It is all slough hay but of fairly good quality. The water is all fresh and very plentiful. Greenwood river runs through the west side of the range. It is about fifty feet wide, four feet deep and runs about four miles an hour. The southeast part of the township and a little at the southwest corner was flooded this summer on an average of eight inches deep. Small water-power might be developed on Greenwood river, but it would not amount to much. The weather was warm and usually bright. We had occasional showers of rain and a little frost. Wood is the only fuel, but it is plentiful everywhere. No stone quarries, coal or minerals were found. Bears were the only game seen.—*W. G. McFarlane, D.L.S., 1907.*

Range 6.

37. The route to this township begins at Canora on the Canadian Northern railway and runs in a northwesterly direction passing by Astwood postoffice along a good trail to Fulton's mill in township 38, range 5 to township 37, range 5 and then along a new trail west to township 37, range 6. The soil in sections 1 to 12 is very good and is suitable for farming lands but north of this the swamps are so numerous as to render the country of little use for farming and it is suitable only for a timber reserve. About six hundred acres of section 6 and the easterly half of section 1 are covered with poplar varying from two to ten inches in diameter. The remainder of the township is scrubby with a few small patches of fair timber. Hay is very abundant in this township, all of the creeks and streams having hay meadows along their banks growing firstclass blue-joint hay. The water supply is abundant and permanent and all fresh. One stream varying from twenty to fifty feet wide, and two feet deep, flows from the northwest to the southeast of the township. Its current is generally slow. Another stream on an average of eight feet wide and two feet deep flows across sections 7 and 5. It has a fair current. Most of the northern part of the township is flooded during a wet season and is almost impassible for wagons. There are no waterfalls in this township. On account of the swamps the climate is cooler than in the surrounding country and summer frosts were very frequent, ice being formed in August. The only fuel available is wood, white poplar fit for fuel being spread over the township. There are no stone quarries or minerals of any kind in this township. Moose and bear are the only game in this township.—*C. A. Chilver, D.L.S.—1907.*

38. The route to this township begins at Canora on the Canadian Northern railway and follows a good trail running in a north westerly direction to Astwood postoffice thence northerly along a good trail to township 37, range 5, thence westerly along a new trail to township 37, range 6 thence north along new trail to township 38, range 6. The new trail is very poor on account of the water. The soil is mostly clay with black loam but the swamps are so numerous as to render the soil useless for farming. The westerly half of section 18, section 19, section 20, section 29 and section 30, section 31 and westerly half of section 32 are timbered with spruce and poplar varying from six to eighteen inches in diameter. The spruce is not thick enough to be valuable for lumbering purposes but is very valuable for homesteaders. There is also a quantity of timber around Mann lake, spruce and poplar six to eighteen inches in diameter. The easterly half of section 36 is timbered with spruce six to eighteen inches (Fulton's limit.) The remainder of the township is scrubby

Range 6—Continued.

There is not much hay in this township as all of the low lands are muskegs, and hay sloughs are very scarce. There is an abundant supply of good fresh water. Though there are no creeks of any size small creeks are numerous. A large portion of the township is flooded the year round. There are no waterfalls. On account of the great extent of swamps the weather is cooler in the summer than in places of similar latitude, and summer frosts occurred during every month of the summer. The only available fuel is wood but this is very abundant all over the township. There are no stone quarries or minerals of any kind in this township. Moose and bear are plentiful.—*C. A. Chilver, D.L.S., 1907.*

39 & 40. The only route for reaching these townships is from Wadena on the Canadian Northern railway along a trail running in a northeasterly direction to Kelvington postoffice, thence north to Little Nut lake, thence east over a poor trail impassable in summer, crossing the north of townships 40, ranges 4, 5 and 6. There is no trail to townships 39, ranges 4, 5 and 6 and a summer trail is not possible and a winter trail very difficult to make on account of the great amount of fallen timber. The soil in these townships is all clay but at present it is too swampy to be suitable for farming. A very good timber belt of spruce and white poplar lies across the north of this group of townships on the east of range 7. It extends from the north boundary half a mile south. On the east of range 6 it extends from the north boundary two miles south, and on the east of range 4 it extends from the north boundary two and one-half miles south. It is part of the Red Deer Lumber company's timber limit. The rest of the group is scrubby with small patches of scattered spruce. Hay sloughs are very numerous all through this group. There is an abundant supply of good fresh water. The Piwei flows across the north of range 6 and into the North Etoimami in range 5. It has an average width of fifty feet, a depth of four feet and carries a large volume of water. The North Etoimami flows north through range 5. Before the Piwei joins it has an average width of fifteen feet and a depth of two feet. Its current is slow till the Piwei joins it and then it is swift, having a number of swift rapids an average width of sixty feet and a depth of four feet. A good deal of the land in these townships is always flooded and impassable in the summer. There are rapids on the North Etoimami but these have not sufficient fall to be used to develop power. On account of the extensive swamps the climate is cool in the summer but no summer frosts occurred during the survey. The only fuel available is wood and there is a great supply of dry wood all over this part of the country. There are no stone quarries or minerals of any kind in this group. Moose are very plentiful in this district.—*C. A. Chilver, D.L.S., 1907.*

45. The soil in this township is in general loam and clay much of it would make good farm land if cleared. Some parts of it however are flooded this season but not very badly. The surface is almost level and all wooded. The east half had some fine timber on it but it is pretty well cut over now. It is mostly spruce. There is still some good eight to twenty-inch spruce and poplar in the west part of the township, and scattered trees on the east part. Hay is rather scarce but there are a few scattered hay sloughs. The water is fresh and very plentiful. Little Greenwood river runs down the east side of the range. It is about thirty feet wide, three feet deep and runs about two and one-half miles an hour. The land is flooded this summer in places but not to any depth. There are no water-powers. The weather was fine and bright with a few showers of rain and a light frost or two. The only kind of fuel is wood but it is plentiful everywhere. No coal, stone quarries or minerals were found. Bear was the only game seen.—*W. G. McFarlane, D.L.S., 1907.*

TOWNSHIPS WEST OF THE SECOND MERIDIAN.

Range 7.

39 & 40. The only route for reaching these townships is from Wadena on the Canadian Northern railway along a trail running in a northeasterly direction to Kelvington postoffice, thence north to Little Nut lake, thence east over a poor trail, impassable in summer—crossing the north of townships 40, ranges 4, 5 and 6. There is no trail to townships 39, ranges 4, 5 and 6, and a summer trail is not possible and a winter trail very difficult to make on account of the great amount of fallen timber. The soil in these townships is all clay but at present it is too swampy to be suitable for farming. A very good timber belt of spruce and white poplar lies across the north of this group of townships on the east of range 7. It extends from the north boundary half a mile south. On the east of range 6 it extends from the north boundary two miles south, and on the east of range 4 it extends from the north boundary two and one-half miles south. It is part of the Red Deer Lumber company's timber limit. The rest of the group is scrubby with small patches of scattered spruce. Hay sloughs are very numerous all through this group. There is an abundant supply of good fresh water. The Piwei flows across the north of range 6 and into the north Etoimami, in range 5. It has an average width of fifty feet, a depth of four feet and carries a large volume of water. The North Etoimami flows north through range 5. Before the Piwei joins it it has an average width of fifteen feet and a depth of two feet. Its current is slow till the Piwei joins and then it is swift, having a number of swift rapids, an average width of sixty feet and a depth of four feet. A good deal of the land in these townships is always flooded and impassible in the summer. There are rapids on the North Etoimami but these have not sufficient fall to be used to develop power. On account of the extensive swamps the climate is cool in summer but no summer frosts occurred during the survey. The only fuel available is wood and there is a great supply of dry wood all over this part of the country. There are no stone quarries or minerals of any kind in this group. Moose are very plentiful in this district.—*C. A. Chilver, D.L.S., 1907.*

45. The soil is loam and clay in general but there is also some muskeg scattered here and there. The eastern part of the range is rather flat and quite wet this season, but the west side is drained by Prairie river. The surface is rather flat to the east but gently rolling towards the west. It is all thickly wooded. There is still considerable timber in the west part but a good deal has been cut out near Prairie river. It is spruce and poplar from six to twenty-four inches in diameter. The best of it is already taken up in timber limits. Hay is rather scarce but numerous hay sloughs are found here and there through the range. The water is fresh and plentiful. The only large stream is Prairie river. It is about sixty feet wide, three feet deep and has a current of about four miles per hour. There are no water-powers. The weather was cool and damp and we had about two inches of snow on September 13, and several hard frosts. The only fuel is wood but it is plentiful everywhere. No coal, stone quarries or minerals were found and no game was seen.—*W. G. McFarlane, D.L.S., 1907.*

Range 8.

45. The soil in the eastern half of this township is loam and clay in general and would make good farm land. Quite a large stretch of muskeg runs up through the west half but at the west side there is some more good farm land. The surface is rather flat and all thickly wooded. It is gently rolling to the northeast. There is some fine timber at the northeast corner of the part surveyed. Spruce from eight to thirty-six inches is found. There are also some scattered bluffs of spruce and poplar in the east half and also some at the west side of the township. Hay is scarce, but a

Range 8—Continued.

few hay sloughs are found. They were mostly too wet to cut this summer. The water is fresh and very plentiful in the muskegs, sloughs and small streams. There are no large streams. The land is in general rather flat and some of it especially in the muskeg is liable to be flooded a foot deep. There are no water-powers. The weather was bright and warm with occasional frost and some rain. The only fuel is wood but it is plentiful everywhere. No stone quarries, minerals, coal or game were seen. *W. G. McFarlane, D.L.S., 1907.*

Range 9.

45. The route followed was by trail along the Canadian Northern railway east from Mistatim. The trail crosses the railway several times and would be very rough for wagons. The ground was frozen and had five or six inches of snow so that it was good sleighing. The soil is mostly loam and clay but there are stretches of muskeg running here and there through the whole township. Some of it would make good farm land. The surface is gently rolling and all thickly wooded. A considerable quantity of timber is found at the west side and the southeast corner. It is pretty well cut over at the southeast corner now and the best of it has been taken off the west side. A lot of ties have been taken out and piled along the railway. There are still some scattered spruce from eight to thirty inches. Hay is not very plentiful but some long hay meadows are found along a creek in sections 23, 14 and 11. It is chiefly slough grass. The water is all fresh and very plentiful in small streams, muskegs and lakes. The land is only liable to be flooded slightly in the muskegs but not to any depth. There are no water-powers. The climate was fine and frosty. There was about six inches of snow on the ground and the trees were covered with it. We had occasional snow flurries. The only fuel is wood but it is very plentiful everywhere. No coal, stone quarries or minerals were found and the only game seen was lynx. There are some railway tie camps and mills near Bannock but they are not large ones.—*W. G. McFarlane, D.L.S., 1907.*

Range 10

38. The route to this township begins at Wadena on the Canadian Northern railway and runs in a northeasterly direction along a well beaten trail to Kilvington postoffice and thence north and northeasterly on a fair trail to township 37, range 10, thence north along a new trail to this township. The soil, generally is first class but sloughs and swamps are numerous and extensive. The soil is suitable for raising wheat and oats. The surface is covered with scrubby poplar and willow with the exception of sections 6 and 7, which are well timbered with white poplar varying from four to twenty-four inches in diameter. On an average year there would be an abundance of marsh hay, scattered all over the township, also a good growth of upland grass and peavine where the scrub is not too dense. In this township, there is a large and permanent supply of good water. One stream fifteen links wide and two feet deep begins in a lake in section 2 and flows westward across the township. It has a strong current and good water. Very little of the land, except that around the larger lakes, is liable to be flooded and that to no great depth. There is no water-power in this township. Though not there in summer, I heard reports of summer frosts in this township. The rainfall was abundant during summer months. Wood is the only available fuel. White poplar is scattered all over the township. There are no stone quarries or minerals in this township. Game is rather scarce on account of the closeness of the Indian reserve. There are a few jumping deer, mink and fox.—*C. A. Chilver, D.L.S., 1907.*

TOWNSHIPS WEST OF THE SECOND MERIDIAN.

Range 10—Continued.

40. There are no good trails into this township, but by following the old Nut lake trail from Wadena to where it crosses the Indian reserve boundary and from there taking an old Indian trail, leading to Greenwater lake, to the north side of section 21, township 40, range 11 and thence along a trail which we cut, entrance can be gained by fairly dry trail. There is another entrance possible by an old Indian pack trail running north from Little Nut lake, using the Etoimami trail as far as the lake. This trail is very poor in summer time. The soil is a strong heavy one of black loam with clay subsoil and would seem suitable for all kinds of agriculture. The country is rolling and covered with second growth poplar with here and there bunches of larger poplar and spruce, especially to the north end of the township. There is no timber suitable for limits but there is enough for settlers' buildings distributed over the township in small clumps. Nearly all the lakes and marshes have hay along their borders and in the central part of the township there are some good patches of upland hay. There is a plentiful supply of fresh water of good quality in the numerous sloughs and creeks but I would not consider the land liable to be flooded. No water-powers, active or latent, were seen. The survey was made in the fall of the year and the climate seemed like that of Manitoba. For fuel settlers would have to rely on wood which is plentiful all through the township. No minerals of economic importance, stone quarries or game were seen. There were no settlers in the township at the time of survey but doubtless there soon will be. Railways are distant, clearing is fairly heavy and the land hilly and heavy but none of these features is sufficiently emphasized to deter settlers. I would consider this and the adjoining townships as attractive as any I know of for homesteaders, but at present only stock raising could be gone in for at a profit owing to the distance from market. There are numerous small lakes that look as though duck would be plentiful in a good year but this year we saw none.—*Geo. A. Grover, D.L.S., 1907.*

45. The route followed was by trail along the Canadian Northern railway and part of the time on the track. The trail crosses the railway several times and is very rough. The ground was frozen a little on top but would not carry in the swamps or muskegs. However corduroy across the muskeg kept the wagons up. The soil to the north of the railway is in general loam and clay and would make good farm land. There are a few stretches of muskeg running through it. To the south of the railway the west part is almost all muskeg but there is some fair land towards the east. The surface is all heavily timbered. The timber is chiefly spruce eight to thirty inches over almost the whole township with the exception of the southwest corner. A great part of it has been cut out for ties and lumber at Mistatim, but there is a considerable quantity left. The best has all been cut south of the railway. It is flat to the south and gently rolling to the north. Hay is rather scarce but there are quite a number of small hay sloughs here and there. The water is all fresh and plentiful in small streams and lakes. The only part of the township liable to be flooded is the southwest corner in the muskeg and it is flooded now (November) a few inches deep. There are no water-powers. The weather was fine, generally bright and frosty, but with several snow flurries and one heavy snow storm with high winds. We had from two to six inches of snow and zero temperature at times. The only fuel is wood but it is plentiful everywhere. No coal, stone quarries or minerals were found and no game was seen.—*W. G. McFarlane, D.L.S., 1907.*

Range 11.

38. The route to this township begins at Wadena on the Canadian Northern railway and runs in a northeasterly direction along a well beaten trail to Kelvington

Range 11—Continued.

postoffice, and thence north along a fair trail to the township continuing through it.

The soil is a good black loam with clay subsoil and is very suitable for farming. Sections 21, 22, 23, 26, 27 and 28, are mixed prairie and scrub. Sections 1 and 12 are timbered with poplar varying from four to sixteen inches in diameter, and the remainder of the township is scrubby. The only timber is on sections 1 and 12, being white poplar four to sixteen inches, and is suitable only for building logs.

There are one thousand acres or more of firstclass hay land lying around Little Nut lake and a number of smaller meadows scattered about the township. There is a large permanent supply of good fresh water. The only large stream of water enters the township in section 18 and flows northwest to Little Nut lake. It is on an average twenty links wide and two feet deep. It has a strong current and carries a large volume of good water. There are no water-powers in this township. The climate is generally good but summer frosts were reported during last season. The rainfall was abundant. The only available fuel is wood, white poplar being spread over the township. The hay lands around Little Nut lake are generally flooded in the spring, but just enough to give a good hay crop. There are no stone quarries or minerals in this township. Jumping deer, fox, wolves, beaver, mink, ducks and partridge are found but are not plentiful.—*C. A. Chilver, D.L.S., 1907.*

39. The only trail into this township is an old Indian pack trail, which can be used for wagons by cutting in some places. The Nut Lake trail to the Hudson's Bay company's post and from there trails running north and south of Little Nut lake, (the former almost impassable in summer), lead into this township. The pack trail mentioned runs from the north side of Little Nut lake diagonally across the township and can be reached by following either of the trails mentioned to the lake and thence along the bank of the lake. The soil is a rich loam on clay subsoil and should be suitable for all kinds of agriculture. The surface of the township is rolling and covered with second growth poplar and scrub with here and there a spruce swamp. There is no timber of value, though there would be enough for the settlers first buildings. Hay, both upland and marsh, is plentiful all through the township. There is a plentiful supply of water, in fact the great number of lakes and marshes is one of the chief drawbacks to the country. There is no natural water-power but a small dam would serve to develop one of some value along the creek, which flows in a deep valley joining Round lake with Little Nut lake. This creek is locally known as Little Red Deer river, forming as it does part of Red Deer river system. The survey was made in December but the climate seemed very mild and equable. The only fuel available is wood, which can be procured any place in this township. No stone quarries, economic minerals or game were noticed.—*Geo. A. Grover, D.L.S., 1907.*

40. We reached the township by a fair trail from Wadena, Sask., to the Nut Lake Indian reserve, where we used an Indian trail running to Greenwater lake, crossing the west side of the township, and from there cut a trail running nearly due east along the north side of sections 21, 22, 23 and 24; this is the only trail in the township. The soil is a rich loam on clay and well suited for all kinds of agriculture. The country is covered by small poplar, with here and there larger poplar and bunches of spruce, particularly towards the north end. This end of the township is much broken by the Greenwater hills, but the south half is only gently rolling. The only timber of any size is in the above mentioned clumps of spruce scattered through the township, but more particularly towards the northeast corner. Good hay is plentiful throughout the township, both the marsh and upland varieties.

Range 11—Continued.

There is an abundance of water in the sloughs and creeks of the township and it is fairly good though rather alkaline. No water-powers, economic minerals, stone quarries or game were seen. The climate seemed very similar to Manitoba, but of course the survey was made in the fall of the year and frosts were frequent. Fuel is plentiful, wood being well distributed over the township. On the whole, I would consider this a first class township for settlers; at present it is chiefly suited for cattle, there being abundance of feed, water and shelter, but it should grow excellent crops when a railway gets near enough to povide a market for grain. The nearest railway at present is the Canadian Northern at Wadena, some fifty miles away. There are no settlers in the township at present, but the tide of immigration is gradually pressing this way. Some twelve miles south in similar country good crops are grown.—*Geo. A. Grover, D.L.S., 1907.*

45. The soil to the north of the Canadian Northern railway is generally clay and loam and would make good farm land, except near the west side, where it is nearly all muskeg. To the south of the railway it is nearly all muskeg except around section 8, which is more clay and loam. The surface is all thickly wooded. South of the railway it is mostly flat muskeg with small spruce and tamarack, but there is some scattered spruce and poplar from six to twenty inches in diameter. To the north it is rolling and there is also some scattered timber here and there over the whole township but not to any extent. Hay is very scarce. The water is all fresh and fairly plentiful. There is plenty of it in the muskegs, but not so much to the north except in lakes.There are no water powers. The weather was quite changeable, rather frosty at times and then mild again. We had about two inches of snow in November. The only fuel is wood, but it is plentiful everywhere. No coal, stone quarries or minerals were found and no game was seen.—*W. G. McFarlane, D.L.S. 1907.*

Range 12.

41 and 42. *(East boundary)*—The east boundary of township 41, range 12, starts in a hilly country at the base line. It is all very thickly wooded with small poplar and willow scrub, and descends somewhat rapidly towards the north. The soil here is good, but a large lake runs along the east side of the line for a mile and a half. Farther down the slope the soil is still good and the timber becomes larger. Spruce from six to thirty inches and poplar from six to ten inches are found in scattered clumps. All along there grows a dense underbrush of hazel and alder scrub, and this with windfall would make it very hard to cut a road through. A short distance to the west is Red Deer river running through a deep ravine. Numerous hay sloughs are also found. As we got nearer the north side of the township the line came out into smaller scrubby poplar with small openings of prairie. Here the soil is very good but a little farther north it crosses another muskeg or two and then runs into thick poplar, scattered six-inch spruce and tamarack and a few twelve-inch jackpine. The line crosses Red Deer river on the east boundary of section 25 and runs on through rolling scrubby country to the north boundary of the township. The country to the west is more open and would make fair ranching or farm land, while to the east there are some timber limits. The country is well watered with fresh water and the climate in the fall is bright and clear, but early frosts have been experienced. There are no houses except Indian shacks, and these are vacant.—*W. G. McFarlane, D.L.S., 1907.*

42. The route followed was by trail along the prairie in the valley of Crooked river down to the east boundary thence south and west along a good trail through small

Range 12—Continued.

poplar and willow until we came to some more prairie in section 35. The trail then follows south along a stretch of prairie down to the south chord, where it strikes Red Deer river. It is all good with the exception of three short soft holes. The soil here is more sandy than in township 43. It is generally a black sandy loam except near the south boundary west of Red Deer river, wher it is very sandy. The northern part of the township would make very fair farm land, in fact some of it is exceptionally good to the north. The subsoil, however, is usually a little sandy. The surface is genty rolling. A stretch of prairie about thirty chains wide runs north and south along near the centre of the township and the rest is mostly covered with willow and poplar scrub. To the south there are several jackpine ridges and to the east some spruce and poplar two to ten inches in diameter. There is no timber of any value but a little poplar and spruce, six to ten inches in diameter is found near the east boundary, and a little jackpine of the same dimensions near the south boundary. Hay is fairly plentiful on the prairie and is of good quality. There is also some slough hay along near Red Deer river. The water is fresh and very plentiful in Red Deer and Barrier rivers, streams, muskegs and lakes. Red Deer river is a fine one. It is from fifty to one hundred feet wide, from three to eight feet deep, and has a current of about three miles an hour. It is very winding. It comes in at the south side of the township near the southeast corner and flows northwest until joined by the Barrier, and then northerly until it crosses the north chord, when it turns easterly and crosses the east boundary of section 25. The Barrier is fully larger than the Red Deer but is sluggish. It comes in near the centre of the south boundary and joins the Red Deer about one and a half miles up. They are both full of pike. The northwest corner of the township is muskeg and is flooded about a foot deep now (October). There are no water-powers. The weather was very fine and bright with frosty nights and clear bright days without rain or snow. Wood is the only fuel, but it is fairly plentiful everywhere. No coal, stone quarries or minerals were found, and jumping deer was the only game seen.—*W. G. Farlane, D.L.S., 1907.*

43. The route followed to this township was by the Canadian Northern railway to Crooked river, then by wagons on a trail running south. The trail follows along the foot of a hill for about ten miles and is very wet and muddy from springs and streams along the hillside for the first five miles. After we got five miles out we found the trail much better and only occasional soft holes. The soil in this township is generally very good with the exception of the southwest corner which is nearly all muskeg. It is a good sandy black loam usually with a clay subsoil, which would make very good farm lands. The surface is slightly rolling but is broken by the valley of Crooked river which takes its rise in this township and runs up through the centre of it. The valley is over one hundred feet deep at the north boundary. There is a strip of prairie in the valley and also some in sections 29 and 32. The greater part of the rest is covered with scrub but there are a few small clumps of timber. There is very little timber in this township. Only a few small clumps of poplar and spruce from six to twelve inches in diameter to the south and a little from six to fifteen inches near the north boundary. Hay is fairly plentiful on the prairie, and is of excellent quality. The water is fresh and very plentiful in streams, muskegs and swamps. The streams are all very small. The only part of the land liable to be flooded is the northwest and southwest corner, which are flooded now (November) from six inches to two feet deep. There are no water-powers. The weather was fine and bright. We had one snowfall of about an inch. It was frosty at nights and bright and warm in the day. The only fuel is wood, but it is quite plentiful almost everywhere. No coal, stone quarries or minerals were found. Moose and bear were

Range 12—Continued.

the only game seen. Settlers are coming into the township and a great part of it should soon be taken up. There is a cattle ranch just east of the boundary line.—*W. G. McFarlane, D.L.S., 1907.*

Range 15.

30. The south half of this township is rolling, broken in some places with dense growth of willow scrub and underbush interspersed with numerous hay sloughs, which are covered with good patches of prairie hay making very good pasture. The north half is more timbered with poplar suitable for building, most of it being ten to twelve inches in diameter. Black willow and clumps of dry poplar occur, the latter being good for fuel. The centre of this township is too low and swampy for cultivation at present. The soil is first class, being composed of black loam with clay loam subsoil. There are no creeks worth mentioning, although the township is very well watered by different lakelets and sloughs.—*A. Bourgeault, D.L.S., 1906.*

31. This township is generally undulating but becomes rolling towards the south boundary, the timber also becomes denser. The hollows or low places in the south part are generally covered with marshes or swamps, having a luxuriant growth of hay, surrounded by extensive belts of tall dry willow. This part is more or less timbered with medium sized poplar and some scattered white birch, both being suitable for building purposes. Large quantities of small willow also occur. The north half of the township is covered with scattered bluffs of poplar interspersed with patches of prairie. The soil ranks as first class all over the township, being composed of rich black loam and clay loam subsoil. There are some reddish coloured boulders and some fragments of limestone in large quantities on sections 33, 34, 35 and 36. This township is crossed by the branch of the Canadian Pacific railway, now under construction, running west from Yorkton. It crosses sections 36, 35 and will be of great advantage to this vicinity.—*A. Bourgeault, D.L.S., 1906.*

50. Lost River postoffice is situated on the northwest corner of section 6 of this township. It can also be reached by a trail crossing Saskatchewan river at Fort à la Corne and running north to township 50, range 16, thence easterly to this township, entering it on section 30, a distance of about fifty miles. This trail is in fair condition. The soil is sandy loam and should be suitable for mixed farming. The surface is wooded, covered with poplar and balm of Gilead, from two to ten inches in diameter, some spruce and tamarack, interspersed with large patches of poplar and willow scrub. Spruce up to fourten inches can be found scattered over the township, but of no practical value for lumbering with the exception of a small grove of spruce running from twelve to thirty-six inches on the east boundary of section 10. A small portable mill might be used a season here to advantage. There are small hay sloughs all over the township from which a quantity of second quality hay could be obtained. There are a number of small creeks of good water running into Saskatchewan river. Red Deer creek touches the northeast corner of the township. It is a stream of good water about six or eight feet wide and three feet deep. There is no liability of flooding. Water-power could be developed from the Cadotte and Nipawin rapids on Saskatchewan river, but only at a great cost, as the banks are very high and but a few feet of head. The climate this fall was very mild, and open with very little snow. Large portions of Saskatchewan river remained unfrozen at the time of leaving this district (December). Deadwood in abundance can be obtained for fuel. No stone, coal or mineral were found. Moose, jumping deer and partridge were seen.—*R. H. Montgomery, D.L.S., 1907.*

TOWNSHIPS WEST OF THE SECOND MERIDIAN.

Range 15—Continued.

51. The soil in this township consists of clay, sandy and black loam, with clay subsoil. On sections 1, 25 and 36, the land is suitable for mixed farming. The township is wooded, covered with small poplar, tamarack and spruce, not exceeding eight inches. No hay sloughs were seen. A large muskeg runs south from section 24, to the middle of section 12 extending in places about one and one-half miles east and west. Two small creeks traverse the township, and with the muskeg afford an ample supply of good water and no scarcity is feared.—*R. H. Montgomery, D.L.S., 1907.*

52. The soil in this township consists of sand and black loam. The southern portion contains black loam averaging six inches with clay subsoil suitable for mixed farming. The township is entirely wooded, covered with poplar, balm of Gilead, jackpine, spruce and tamarack. The timber seen is a poor sample. A few second grade hay sloughs were seen. Torch river is a stream one hundred and thirty feet wide, six feet deep with a current of three miles an hour, which crosses the township in section 36. Whitefox river is a stream sixty feet wide four feet deep, with a current of three miles an hour and crosses the township in section 25. Both the rivers contain excellent water and no scarcity is feared.—*R. H. Montgomery, D.L.S., 1907.*

Range 16.

30. This township is generally rolling and undulating country except the west part of sections 18 and 19 which are hilly; more or less covered with dense poplar bluffs scattered all over the township: outside the bluffs it is small poplar and willow. There are a few sections which would have been worth mentioning as a timber reserve, but owing to the numerous settlers who hauled timber last winter for building, I do not think any reservation advisable. I have seen during the progress of survey a good many teams making one trip every day and lots of piles of timber all over the township. There are principally in the west parts many lakes which seem to increase yearly. The soil is first class being a good depth of black loam with a clay subsoil. There are also numerous sloughs and swamps surronded by black willow. This township lies at the east end of Touchwood hills. It will not be fit for farming before a good fire has cleaned it.—*A. Bourgeault, D.L.S., 1907.*

31. This township is for the most part rolling and undulating country, interspersed with small poplar suitable for fencing, willow and underbrush. It has the advantage of being close to the branch of the Canadian Pacific railway running west from Yorkton, as this line, now under construction, runs close to the north boundary of sections 36 and 35. The south half of this township is very well timbered, especially the south half of sections 15 and 16, and east half of section 17 which is densely timbered with large poplar suitable for building. There are also numerous clumps of willow. A great many people came over thirty miles to cut logs here. The soil is good black loam with clay subsoil and ranks as first class all over the township. However, owing to the dense bush and windfall on the south half, it is not fit for immediate cultivation. I presume that before long, fire will burn up the brush and windfall. Hay is abundant in the sloughs and marshes. The water is, generally, good, but there is only one creek worth mentioning which runs in a northerly direction. There are many large boulders of reddish coloured granite, and a large quantity of limestone.—*A. Bourgeault, D.L.S., 1906.*

50. At the southeast corner of this township is Lost River postoffice. It can also be reached by trail, about forty-two miles from Fort à la Corne. This trail runs due north from the river to township 50, range 20 thence easterly entering this township in section 19. The condition is fair, but rather hilly near the river. The soil is

Range 16—Continued.

principally sand with belts of black loam and clay, only a small portion being suitable for mixed farming. The surface is entirely wooded, consisting of jackpine, poplar, spruce and tamarack bush, with poplar, jackpine, birch and willow scrub. Jackpine up to sixteen inches and poplar to fourteen inches can be found all over the township but not in sufficient quantities for lumbering purposes. No large hay sloughs were found. There are plenty of muskegs in this township and a few small creeks, affording an ample supply of good water. There is no danger of floods. No water-power is available. The climate last fall was warm and clear with little rain. The first frost was noticed on August 20th. Deadwood in abundance can be obtained for fuel. No coal, stone or minerals were found. Moose, jumping deer and partridges were seen.—*R. H. Montgomery, D.L.S., 1907.*

51. The soil in this township consists principally of clay, with a little sandy loam, and clay subsoil. It is suitable for mixed farming. The surface is entirely wooded, covered with small poplar, and balm of Gilead, not exceeding ten inches, No hay sloughs were seen. Whitefox river is a stream ninty-three feet wide, four deep, with a current of three miles an hour, which enters in section 19, and leaves in section 25. This river with several small creeks, afford an ample supply of good water and no scarcity is feared.—*R. H. Montgomery, D.L.S., 1907.*

52. The soil in this township is clay and black loam; a few belts of black loam averaging twelve inches with clay subsoil is to be found. The land is, generally speaking, low and only on sections 12 and 1 can be found land suitable for mixed farming. The township is entirely wooded, covered with spruce, poplar, balm of Gilead, balsam and birch. Some very good spruce up to thirty inches, and poplar up to twenty inches can be found through the township. No hay sloughs were seen. Fern creek, twenty-five feet wide, three feet deep with a current of one and one-half miles an hour, crosses the township in section 36. This creek with other small ones, afford ample supply of good water and no scarcity is to be feared.—*R. H. Montgomery, D.L.S., 1907.*

Range 17.

1. This township was reached from Weyburn by following the settlers' and ranchers' trail to Sandoff's ranch in township 3, range 16, then westward to the northeast corner of township 2, range 17, and from there southward along the east outline of township 2, range 17. The soil in this township is good and well suited for agricultural purposes, although the northeast part of the township is rather hilly. The surface is everywhere prairie with no timber. Redtop and marsh grass of good quality abound in the hay marshes. Good fresh water was easily obtainable in the marshes and sloughs at the time of survey (June) and snow-water was still to be had. No streams nor water-powers occur and the land is not liable to flooding. The climate at the time of survey was cool with light frosts. No fuel, stone quarries nor minerals were found. Duck was the only game seen.—*J. L. R. Parsons, D.L.S, 1907.*

2. This township was reached from township 1, range 17, by travelling northward along the central meridian. The soil is light but of fair quality; the south two-thirds of the township being well suited for agricultural purposes while the remainder is very rough and broken. The surface is everywhere prairie with no timber. Marsh grass and redtop of good quality are to be had in the small hay marshes which abound throughout the township. Good fresh water was readily found at the time of survey (June) in the numerous sloughs and marshes. No streams nor water-powers occur, nor is the land liable to be flooded. The climate was cool and wet at the time of sur-

Range 17—Continued.

vey. No fuel, stone quarries nor minerals were found. Duck was the only game.—*J. L. R. Parsons, D.L.S., 1907.*

30. (Part.) This survey included fractional sections 25, 36, 28 and 33 and sections 26, 27, 34 and 35, township 30, range 17. This part is rolling, hilly and broken, no wood worth mentioning, being more or less covered with small poplar and poplar and willow scrub and some scattered dry stumps of poplar. The soil is somewhat gravelly especially on the hillocks and it seems that all the alluvial soil had been burnt. It might rank first class. On account of lower spots where the soil is good black loam, it offers good pasture with abundant grass and peavine. The water is also plentiful and well distributed.—*A. Bourgeault, D.L.S., 1906.*

51. The soil in this township consists of clay, black and sandy loam. The northern portion has black loam averaging six inches with clay subsoil, and clay suitable for mixed farming. The township is wooded, covered with small poplar, balm of Gilead, jackpine, spruce and tamarack, not any exceeding ten inches. No hay sloughs were seen. Between sections 7 and 12 is a lake extending fifty-one chains south, about thirty chains east and about one and one-half miles west. Whitefox river is a stream fifty-five feet wide, three feet deep with a current of three miles an hour. It enters in section 19, and crosses in section 24. This river, with other small creeks and the lake, afford an ample supply of good water, and no scarcity is feared. —*R. H. Monlgomery, D.L.S., 1907.*

52. The soil in this township is principally clay, the land is low, and soil too sticky for farming. The township is entirely wooded, covered with poplar, balm of Gilead, spruce and birch. Some good poplar up to thirty inches and spruce up to sixteen inches, can be found in the northern sections. A few small second grade hay sloughs were seen. Small muskegs and creeks traverse the township and no scarcity of good water is to be feared.—*R. H. Montgomery, D.L.S., 1907.*

Range 18.

1. This township was reached from township 1, range 17, by following the north boundary westward. It is very hilly. The soil is good, but owing to the north half of the township being very hilly, only the south half is suited for agricultural purposes. The surface is everywhere prairie, rolling in the south half, and very hilly in the north half. No timber is found. Good marsh hay is abundant in the numerous small hay marshes. Fresh water was readily obtainable in the numerous small sloughs and marshes at the time of survey (June). There are no streams and consequently no water-powers. The climate was warm and fine at the time of the survey with no frosts. There are no minerals, stone quarries nor fuel. The only game noticed was duck.—*J. L. R. Parsons, D.L.S., 1907.*

2. This township was reached from township 1, range 18, by a trail northward along the central meridian. This trail was very hilly in its southern part. The soil is light but of good quality. On account of the hilly nature of the two north tiers of sections and also of the two south tiers, only the centre is suited for agricultural purposes, the remainder being excellent grazing land. The surface is everywhere prairie with no timber. Abundance of good marsh grass and bluejoint are obtainable in the numerous small hay marshes throughout the township. Fresh water was plentiful at the time of survey (June) throughout the township, in the small sloughs and marshes. No streams nor water-powers occur and the land is not liable to be

Range 18—Continued.

flooded. The climate is moderate, with no frosts at the time of survey. No fuel, stone quarries nor minerals were found. Duck was the only game.—*J. L. R. Parsons, D.L.S., 1907.*

51. The soil in this township is principally black loam and clay. The land is, generally speaking, 'low,' and of very little use for farming. The timber in this township consists of poplar, balm of Gilead, spruce, and tamarack, from two to fourteen inches, a poor sample and useless. A large second grade hay slough is found on section 13, running south to the centre of section 12. There it develops into a muskeg which continues south to the centre of section 1, extending east and west as far as can be seen. Whitefox river is a stream seventy feet wide four feet deep with a current of four miles an hour, which enters in section 19, and leaves in section 24. This river, with a creek and several muskegs afford an ample supply of good water and scarcity is not feared.—*R. H. Montgomery, D.L.S., 1907.*

52. The soil in this township consists of gravel, clay and black loam. The southern portion has black loam averaging five inches with clay subsoil suitable for mixed farming. The township is entirely wooded, covered with poplar, balm of Gilead, spruce and tamarack. Spruce up to thirty-six inches and poplar up to twenty-four inches can be found scattered throughout the township. No hay sloughs were seen. Small muskegs and creeks are to be found. No scarcity of good water is to be feared.—*R. H. Montgomery, D.L.S., 1907.*

Range 19.

49. The township is reached by a trail running northwesterly from Fort à la Corne, centering on the west boundary of section 31. This trail is in a fair condition but rather hilly, near Saskatchewan river. The soil is chiefly sand with an occasional belt of black loam. The surface is covered with jackpine from two to ten inches in diameter with a few patches of poplar and jackpine scrub. Jackpine, spruce, poplar and tamarack are found in this township, but of no practical value for timber, owing to small size. There are no hay sloughs. English creek enters from the north crossing section 34, it is about ten feet wide, two feet deep and flows three miles an hour. There are also several other small creeks draining this township. The water is excellent but there is no water-power. The climate this summer was cool and damp, the first frost being noticed on August 20. Deadwood in abundance can be obtained for fuel. No coal, mineral or stone is to be found. No game was seen except partridges.—*R. H. Montgomery, D.L.S., 1907.*

51. This township lies about seventeen miles by trail north from Fort à la Corne. This trail runs due north from Saskatchewan river, entering this township on section 6. It is in fair condition but is inclined to be hilly near the river. The soil north of Whitefox river is black loam six inches deep with a clay subsoil, and is suitable for mixed farming. South of this river it is generally sand. The surface is entirely wooded. A few large patches of scrub can be found. Poplar, balm of Gilead, jackpine, spruce, tamarack and birch are here, while the scrub consists of poplar, jackpine and willow. On sections 22, 23, 26, 27, 34 and 35 some very good spruce is to be found, averaging from four to thirty inches, very suitable for lumbering purposes. Poplar up to fourteen inches and jackpine up to twelve inches can be found but of no practical use for lumbering. There are a few small hay sloughs scattered over the township producing a second grade of hay. Whitefox river cuts across the township entering on section 18, and leaving from section 24. It is a stream of good water fifty feet wide, six feet deep and has a current of about three miles an hour. There is a large

Range 19—Continued.

muskeg south of this river and could, if occasion demands it, be easily drained by this river. There is no water power. The climate this summer was cool and damp, and flies were numerous. The first summer frost was noticed on August 20th. Deadwood in abundance can be obtained for fuel. Coal, stone or mineral were not found. Moose, and partridge were to be seen.—*R. H. Montgomery, D.L.S., 1907.*

52. The soil in this township consists of black loam, and sand, the majority is black loam averaging five inches with a subsoil of clay suitable for mixed farming. The township is entirely wooded covered with spruce, tamarack, poplar, jackpine and balm of Gilead. Spruce and poplar up to sixteen inches can be found in the northern portion. A few hay meadows with firstclass hay were seen. There is a large muskeg in the northern portion of this township and a creek, so no scarcity of good water is to be feared.—*R. H. Montgomery, D.L.S., 1907.*

Range 20.

50. This township lies ten miles from Fort à la Corne by trail. It can be reached by a wagon trail straight north of Saskatchewan river. This trail is in fair condition, but rather hilly. The soil is principally sand, with a few patches of black loam and clay. The surface is wooded, covered principally with jackpine. There is also spruce, tamarack and poplar, with poplar, jackpine and willow scrub. The jackpine averaging from 2 to 10 inches in diameter is the only timber to be found. There is one lake on section 18 in this township, while large muskegs are found scattered all over it, but no creeks are to be found. There is no danger of drought or flood. No water-power is available. No hay sloughs are to be found. The climate this year has been damp and cool, the first frost being noticed on August 20th. Deadwood in abundance can be obtained for fuel, but no coal, stone or mineral are to be found. Moose and jumping deer are plentiful.—*R. H. Montgomery, D.L.S., 1907.*

51. This township lies about seventeen miles by trail from Fort à la Corne. This wagon trail runs northerly from Saskatchewan river, and is in good condition, but is inclined to be hilly near the river. It enters on section 5, north of Whitefox river, the soil is black loam, averaging sixteen inches, with clay subsoil, and the land should be suitable for mixed faming. South of Whitefox river the soil is principally sand. The surface is wooded with large patches of scrub, poplar and Balm of Gilead, with poplar and willow scrub north of the river, and jackpine, spruce and tamarack south of it. The timber consists of jackpine , poplar , balm of Gilead, spruce and tamarack, but it is too small for any lumbering purposes. Whitefox river has a width of forty feet, a depth varying from two to ten feet and a current of two and one-half miles per hour. The water is excellent. It enters the township in section 18, and leaves from section 13. Large muskegs lie to the south of Whitefox river. There is no water-power available. There are no hay sloughs. The climate this summer has been cool and damp, the first frost being noticed on August 20th. Deadwood in abundance can be found for fuel. No stone, coal or mineral can be found. Moose and jumping deer were seen.—*R. H. Montgomery, D.L.S., 1907.*

52. The soil in this township consists of sand, clay, black and sandy loam. The southern portion has a belt of sandy and black loam, averaging six inches, with clay subsoil suitable for mixed farming. The township is entirely wooded, covered with spruce, tamarack, jackpine and poplar, but a poor sample, too small for lumbering purposes. No hay sloughs were seen. Several small creeks and muskegs are to be found through the township and no scarcity of good water is to be feared.—*R. H. Montgomery, D.L.S., 1907.*

TOWNSHIPS WEST OF THE SECOND MERIDIAN.

Range 21.

50. This township lies about fourteen miles by trail from Fort à la Corne. It can be reached by a wagon trail running north from Fort à la Corne to the south boundary of township 50, range 20, thence running northwesterly entering this township in section 13. This trail is in fair condition but is hilly near Saskachewan river. The soil is mostly sand with occasional belts of black loam and clay. The surface is wooded, covered principally with jackpine. There is also spruce, tamarack and poplar with willow scrub. The timber on this township consists of jackpine averaging from eight to twelve inches and could be used for ties. There are no large hay sloughs to be found. Plenty of small hay sloughs covered with scattered willow are present. There are no large creeks but large muskegs are found all over the township in which the water is fresh. There is no danger of flooding. There are two lakes in the township, lake No. 1 in section 7 and 18 and lake No. 2 in section 13. There is no available water-power. The climate this year has been damp and cool, the first frost being noticed on August 20. Deadwood in abundance can be found for fuel, but no coal, stone or minerals are to be found. Moose, jumping deer, duck and sand-hill crane are plentiful.—*R. H. Montgomery, D.L.S., 1907.*

52. The soil in this township is principally sand and black loam. A belt of black loam averaging twelve inches, with a clay subsoil runs across the southern portion. This township is suitable for mixed farming. It is entirely wooded, covered by spruce, jackpine, tamarack and poplar, and some good spruce up to thirty-six inches in the northwest corner of this township around Birchbark lake. Poplar up to twenty-four inches can be found in the western portion. No hay sloughs were seen. Birchbark lake lies in the northwest corner, several small creeks traverse the township, also large tamarack and spruce muskegs are to be found. No scarcity of water is to be feared.—*R. H. Montgomery, D.L.S., 1907.*

Range 22.

44. We entered this township by a good trail from Kinistino. The northern part of this township is fairly level, the southern part rolling and hilly, while the whole is covered with thick poplar and willow, except a few places which have scattered bluffs of poplar and willow. About one-half the township is covered with sloughs, swamps and deep muskegs; so much so that we were unable to complete the northeast portion which will have to be done in the winter or when the lakes are frozen over. For this reason we had great difficulty in doing as much of the survey as we did. The soil throughout is first class, the alluvial soil being black loam varying in depth from five to twelve inches, with a clay subsoil. Hay is obtained in abundance from the many marshes. The water in the many sloughs, lakes, &c., is sweet and good, while the supply is unlimited. In the spring the water around these lakes and marshes is considerably higher than during the summer. There are no water-powers, indications of coal, minerals or stone quarries. There are only three or four settlers in this township. A surveyed trail runs into this township from the north for a few miles. A deep creek running across this township is crossed by a fairly good bridge on the surveyed trail. By far the greatest portion of this township is unfit for cultivation. We did not have, nor did we hear of, summer frosts. Very little game was seen, except ducks, geese and pelicans, which were quite numerous.—*E. W. Hubbell, D.L.S., 1907.*

51. This township is situated about thirty-five miles by road northeast of Prince Albert. A trail leading into it leaves the Candle lake trail about thirty miles from Prince Albert. Both trails are in poor condition. The soil consists of a heavy black

Range 22—Continued.

loam sixteen inches in depth with a clay subsoil, and the land generally speaking would be excellent for mixed farming. The surface is well wooded, but hay sloughs and meadows are numerous. Poplar averaging from two to six inches in diameter is generally found with poplar and willow scrub. There is little timber. Spruce averaging from four to thirty inches is found on sections 11, 12, 31 and 32, and poplar on the eastern portions of sections 7 and 31. There are numerous hay sloughs of second class quality all over the township. They are generally found adjoining Whitefox river. This river enters the township on the west boundary of section 30 and leaves on the east boundary of section 1. Where it enters the township it is about thirty feet wide and two feet deep with a current of two miles per hour. But from the northeast corner of section 10 to where it leaves the township it is one hundred feet wide, two feet deep and has a very sluggish current. A large tamarack muskeg at the south covers about one-third of the township. This could be easily drained into the river and a tract of very rich land could be secured. There is no water-power. The climate is very mild in summer, the first frost being noticed on the twenty-second of August, while open water was not frozen over till the fifteenth of November. There is no scarcity of deadwood for fuel, but no coal or minerals are to be found. There are stones and boulders along the river. Moose, deer and duck were the only game seen. —*R. H. Montgomery, D.L.S., 1906.*

52. This township lies about forty miles by trail from Prince Albert. It can be reached by following the Candle lake trail to township 52, range 23, thence easterly to the township by a pack trail. The northeast portion of the townsip is sandy and the remainder is black loam sixteen inches deep with a clay subsoil. The surface is entirely wooded, being covered with spruce, jackpine, poplar, birch and large patches of poplar and willow scrub. Birchbark lake cuts off the northeast corner of the township. It is a large pear-shaped body of water, with the apex to the south. It is about four miles long and four miles wide and extends south along the east boundary of this township for two miles. The main portion of the lake, however, is in township 53. Loon lake lies in sections 6 and 7. It is about one and a half miles long by one-half mile wide. The surface of this township is somewhat hilly. Large muskegs are found adjoining Birchbark lake on the southwest shore. Hay sloughs are found scattered throughout the township and should render the land suitable for mixed farming.—*R. H. Montgomery, D.L.S., 1906.*

Range 23.

4. This township was reached from township 4, range 18, by following the second base line westward. The soil is good, supporting a luxuriant growth of upland grass. The southern part of the township is too hilly and broken to be of use for agricultural purposes, but the northern part is good agricultural land. The surface is prairie with no timber, except a small amount of poplar scrub in the ravines in the southern part. A considerable amount of hay is found in the numerous small hay marshes throughout the township. Fresh water is everywhere to be found in the marshes and sloughs, but no water-powers occur and the land is not liable to be flooded. The climate is moderate with no summer frosts. A small amount of deadwood is found in the ravines in the southern part of the township. Coal occurs on the south shore of Coalmine lake. It is a low grade lignite, but burns readily in an ordinary cookstove. A considerable amount has already been taken out by the settlers from the adjacent country. No stone quarries nor minerals were found. Duck was the only game.—*J. L. R. Parsons, D.L.S., 1907.*

Range 23—Continued.

46. This township is partially covered with poplar and willow of small dimensions, there being some poplar in the southwest portion suitable for building and fencing. The surface is generally undulating, becoming more hilly towards the west. The alluvial soil is black loam varying in depth from two to eight inches with a clay subsoil suitable for the production of all kinds of grain and vegetables. A permanent supply of fresh water is obtained from wells, numerous small lakes and several creeks. Plenty of hay is procurable from the many marshes and meadows. There are no water-powers, nor did we perceive traces or indications of coal or minerals. The Canadian Northern railway passes through this township and the station of Brancepeth is situated in section 34. There is also a church, postoffice and two schoolhouses. This township is well settled, having considerable land under cultivation. Farm produce is hauled to Birch Hills and Kinistino, two small towns situated on the Canadian Northern railway, distant eight and fifteen miles respectively. A fair amount of statute labour has been accomplished on the road allowances, and several bridges built. There are good trails branching in every direction, the main one (surveyed) leads to Prince Albert, distant forty miles. Some jumping deer, coyotes, foxes and muskrat are found, whilst geese and ducks are most plentiful in the autumn.—*E. W. Hubbell, D.L.S., 1907.*

50. This township lies about twenty-five miles from Prince Albert. It can be reached in two ways; first, by following the Fort à la Corne trail south of Saskatchewan river to range 22, thence north by trail crossing the Saskatchewan and entering the southeast corner of this township. The condition of this trail is excellent and since a ferry is to be established next summer where this trail crosses the Saskatchewan, it will be the better route. The second route follows the Candle lake trail about twenty-five miles and then follows another trail running southeast through township 51, range 23 to the north boundary of this township. It is in very poor condition. The soil is variable, the northwestern portion being composed of a heavy black loam, averaging fourteen inches deep with a clay subsoil, while the southeastern portion consists of a sandy loam. Generally speaking, this township should make an excellent mixed farming district. The surface is wooded, with poplar from two to eight inches in diameter, and poplar and willow scrub. The southeastern portion of the township is somewhat scrubby. Numerous hay sloughs are found all over the township, producing hay of excellent quality. Spruce timber suitable for building purposes is found on sections 3, 13, 24 and 34, and poplar on sections 5, 6, 9, 15, 19, 23, 31 and 33. Garden river enters the west boundary of section 6, flows southeast and leaves on the south boundary of section 5. It is seventy-five feet wide, three feet deep and has a current of about one mile per hour. It contains excellent water. A chain of muskegs extends across the northern portion of the township. There is no water-power available. The climate is mild in summer, the first frost being noticed on the twenty-second of August, while open water was not frozen over until the fifteenth of November. Deadwood in abundance is the only fuel procurable. There is no stone, mineral or coal in the township. Deer, moose, and prairie chickens were seen. A large colony of Galicians was situated on section 1 of this township, but as they were unable to speak English, no declarations were taken.—*R. H. Montgomery, D.L.S., 1906.*

52. This township lies about thirty miles by trail from Prince Albert. It is reached by the Candle lake trail, which enters it at section 5 and leaves it at section 32. This trail is in poor condition. The soil is generally a black or sandy loam about sixteen inches deep with a clay subsoil. There are several large patches of prairie

Range 23—Continued.

along Candle lake trail, such as 'Fox plain,' in sections 29 and 32. The northeast, northwest and southeast corners of the township are heavily timbered with spruce and poplar, the remainder being covered with poplar and willow scrub interspersed with large hay sloughs. Several small streams were found crossing the township. Whitefox river flows out from a muskeg on the south boundary. The land appears to be suitable for mixed farming.—*R. H. Montgomery, D.L.S., 1906.*

52. This township is forty miles from Prince Albert, near Candle Lake trail, which is usually in bad condition for travel. The soil is from two to eighteen inches of black loam and is suitable for mixed farming. The surface is slightly rolling, covered with poplar and hazel, with a few scattered spruce and large clusters of spruce in sections 4, 9, 2, 11, and 12. Whitefox river is the source of water supply which is sufficient and permanent. A very few hay sloughs and with the exception of a little feed along the river and around a few small sloughs there is no hay. The land is not liable to be flooded. The climate is wet and cool at night with summer frosts. Poplar is the fuel, and is available any place. There are no stone quarries, or minerals of any kind. There are numerous deer and bear with a few partridges and ducks. Beaver are scarce, but there are still a few in Whitefox river. Fox plain is a large opening in section 29 west of the river. The surface is covered with scattered willow and swampy grass.—*A. L. MacLennan, D.L.S., 1907.*

Range 24.

4. This township was reached from township 4, range 23, by travelling westward along the second base line. The soil is of fair quality but the country is so broken in the south part that only the north two-thirds is suited for agricultural purposes. The surface is everywhere prairie with no timber. Fresh water of good quality is readily found in the numerous sloughs and marshes. Big Muddy creek crosses the southwest corner of section 6. At this point it is twelve links wide, eighteen inches deep and, at the time of survey (June) was flowing at about one mile per hour in well defined banks. There is no likelihood of flooding. There are no water-powers. The climate is moderate with no frosts at the time of survey. A little deadwood is found along the south boundary in the ravines which lead into Big Muddy bottom. No stone quarries nor minerals were found. Duck was the only game.—*J. L. R. Parsons, D.L.S., 1907.*

51. I reached this township via Candle Lake trail to 'Fox plain.' The roads are very bad. The soil consists of from twelve to eighteen inches of black loam and is eminently adapted for mixed farming. The surface is slightly rolling, timbered with poplar to ten inches in thickness. There are several small hay sloughs, the water is slightly alkaline, and the supply is neither sufficient nor permanent. The land is not liable to be flooded. The climate is wet and cool at night with frosts during the summer months. Poplar is the available fuel and can be procured in any part of the township. There are no stone quarries, or minerals of any kind. There a few deer, bear, partridge and duck.—*A. L. MacLennan, D.L.S., 1907.*

52. I reached this township via Candle Lake trail to 'Fox plain.' The roads are very bad. The soil consists of from twelve to eighteen inches of black loam, and is eminently adapted for mixed farming. The surface is slightly rolling timbered with poplar to ten inches in thickness. There is a large muskeg in the southwest corner of the township. There are several small sloughs which yield a quantity of good hay. The water in the sloughs is slightly alkaline. The supply is neither sufficient nor per-

Range 24—Continued.

manent, and there is no land liable to be flooded except that part already under muskeg. The climate is wet and cool at night with frosts during the summer months. Poplar is the available fuel and can be procured in any part of the township. There are no stone quarries nor minerals of any kind. There are a few deer, bear, partridge and duck.—*A. L. MacLennan, D.L.S., 1907.*

Range 25.

9. This township was reached from township 9, range 26, by travelling along the base line. The soil is of poor quality, being chiefly sand and gravel, and is unfit for agricultural purposes. The township is suited only for grazing. The surface is rolling and hilly prairie with no timber. Marsh grass and redtop are abundant in the numerous small hay marshes. Fresh water is easily found in the hay marshes and sloughs. No streams or water-powers are found, and the land is not liable to be flooded. At the time of survey (July) there was a violent storm with rain and hail but no frosts. No fuel, stone quarries nor minerals were found. Duck was the only game.—*J. L. R. Parsons, D.L.S., 1907.*

51. This township can be reached from the Egg lake trail or the Candle lake trail, the latter is considerably shorter but in much poorer condition. The soil is suitable for mixed farming. The township is timbered with poplar, hazel, and mixed scrub with a few odd spruce. The shores of Egg lake are bordered with a hay meadow, which produces probably 1,000 tons of good hay each year. The water in Garden river is sufficient and permanent. This river is twenty-five feet wide and two feet deep. It runs over a gravel bottom at the rate of two to four miles an hour. The land is not liable to be flooded to any extent. There are several rapids in the stream but it is not practicable to develop any water-power. The climate is very wet and cool at night with frosts during the the summer months. The fuel is poplar, which can be procured any place. There is no coal, lignite, stone quarries nor minerals. There are a few moose, deer, bear, foxes, and lynx, while ducks are numerous. In sections 3, 10, 15, 22, a few hundred feet back from Garden river, is a high rolling surface covered with a light poplar scrub, the most suitable place for agricultural purposes in the township.—*A. L. MacLennan, D.L.S., 1907.*

52. I took the Candle lake trail from Prince Albert to 'Fox plain,' which is in township 52, range 23, and came west from that place. It is possible to reach this township from the Egg lake trail, both roads are very bad in the wet season; the latter is more preferable. The soil is suitable for mixed farming. The township is timbered with poplar, hazel and willow scrub. With the exception of the hay, which is of good quality in sections 5 and 6, there is very little pasture of any kind. The water in Garden river, which is the main source of supply, is sufficient and permanent. This river is twenty-five feet wide and two feet deep running over a gravel bottom, with a few large limestone boulders, at the rate of two miles an hour. The land is liable to be flooded in the vicinity of Garden river to the depth of two feet. There are a few rapids in the stream but the water-power available is practically nil. The climate is very wet and cool at night, with frosts all the summer months. The fuel is poplar, which can be procured any place. There is no coal, lignite, stone quarries nor minerals in the township. There are a few moose, deer, fox and lynx, while ducks are numerous.—*A. L. MacLennan, D.L.S., 1907.*

TOWNSHIPS WEST OF THE SECOND MERIDIAN.

Range 26.

9. This township was reached from township 9, range 27, by travelling eastward along the third base line. The soil is light, but would make fair farming land. The surface is everywhere prairie with no timber. A considerable quantity of marsh grass and redtop occurs in the numerous small hay marshes. Fresh water is found in the sloughs and marshes, and is easily obtainable. No streams nor water-powers occur and the land is not liable to flooding. The climate is moderate with no summer frosts. No fuel, stone quarries nor minerals were found. Duck was the only game seen.—*J. L. R. Parsons, D.L.S., 1907.*

45. This township is partly covered with small poplar and willow. The soil generally is sandy loam suitable for the production of wheat, oats and vegetables. There is no water-power, or minerals of economic value. Very little hay is in this township. There is a lake of about eighty acres in lots Nos. 11, 12, 13 and 14.—*E. W. Hubbell, D.L.S., 1907.*

49. We entered this township by crossing the ferry at Prince Albert and then followed a trail which leads to Candle lake. The soil except in one or two places is pure sand and not fit for agricultural purposes. The surface is rolling, hilly in places and nearly all covered with thick timber, principally jackpine varying in diameter from four to fourteen inches. There are several large clumps of poplar, but most of the good timber has been cut. Considerable timber is cut in this township to supply fuel for the city of Prince Albert and the district surrounding it. There is little or no hay in the township except in the northern portion along the north boundary. A good supply of water is obtainable from several sloughs, from a few creeks and from Little Red river, which is about sixty or seventy links wide, three to eight feet deep and flows at the rate of four or five miles an hour. This river is of immense value for lumbering, rising as it does many miles north of this township, flowing through it and emptying into Saskatchewan river in section 10. Great quantities of sawlogs were coming down at the time of survey (August) and several lumber camps were stationed along its banks. We did not perceive any falls or rapids, but doubtless considerable horsepower could be developed by the construction of dams. The water is fresh, but brackish. We had a little frost on August 24, and again on September 14. We did not notice any indications of coal, minerals or stone of importance. Saskatchewan river cuts off a portion of the southern part of the township, and a forest reserve embraces about nine square miles in the southwest corner. There are very few settlers in this township, mostly half breeds, who have small shacks situated along the banks of the Saskatchewan. We did not see any game, or hear of any, except a few beaver in Little Red river. All kinds of berries were plentiful. A good iron bridge crosses Little Red river in section 14.—*E. W. Hubbell, D.L.S., 1907.*

52. The route to the township is by the Egg Lake trail. The soil is from two to eighteen inches of black loam, suitable for mixed farming. The surface is gently rolling except in the northwest part of the township which is inclined to be hilly and is timbered with eight-inch poplar, a few twelve-inch Banksian pine and a few eight-inch spruce in the valley of Bittern creek in the northwest part of the township. Hay can be procured on the shores of Murray and Mertock lakes, but it is not of the best quality. Bittern creek is about fifteen feet wide and two feet deep. The water is sufficient, fresh and permanent. It runs over a gravel bottom at the rate of two miles an hour. The land is not liable to be flooded and there is no water-power. The climate is wet and cool at night with summer frosts. The fuel is poplar and is available any place. There are no stone quarries nor minerals of any description. There

Range 26—Continued.

are a few moose, deer, bear, lynx, and muskrats, also a few partridge and numerous duck.—*A. L. MacLennan, D.L.S., 1907.*

Range 27.

9. This township was reached from township 6, range 30, by following the Moosejaw-Wood mountain trail to the third base line and thence easterly. The soil is light but of fair quality, and is suited for agricultural purposes. The surface is everywhere prairie. No timber is found. Marsh grass and redtop of good quality are to be found in the numerous small hay marshes throughout the township. Fresh water was easily obtainable at the time of survey (July) in the sloughs and marshes which abound in the township. No streams occur and the land is not liable to be flooded. There are no water-powers. The climate is moderate with no summer frosts at the time of survey. No fuel, stone quarries nor minerals were found. Duck was the only game.—*J. L. R. Parsons, D.L.S., 1907.*

41. The surface of this township is mostly rolling or hilly, being very hilly in the northwest corner, rolling in the north half of the northeast quarter, rolling along the south and west boundaries, and rolling to hilly in the interior and in sections 13, 14, 23 and 24. The greater part of the surface is covered or dotted with poplar bluffs, with large prairie openings. Nearly every section has timber in bluffs large enough for rough buildings, fencing and fuel. The heaviest belt is in sections 12 and 13, where the north half of section 12 and the south half of section 13 is almost one solid tract of poplar, mostly fine growing timber from four inches to twelve inches in diameter, which if it can be kept from destruction by fire, will furnish an immense amount of building material. This timber would be of great use and value to settlers in the townships to the south that have no timber. There is a large lake (water slightly alkaline) in sections 16, 17, 20 and 21 and one on the east side of sections 13 and 24. The water is fresh. Many sloughs are found all over the township, the greatest number being in the east half. The water is fresh in the majority of these sloughs. These water areas furnish the only natural drainage, there being no streams or hardly any other outlets. There is very little of the ground that is not good for cultivation or grazing. The soil is mostly a good sand loam on sandy and clayey subsoils. It will produce good wheat and other cereals. From the more or less broken surface of the ground it is not adapted to exclusive grain growing. Hay of good quality is to be had from around nearly all sloughs and on the low ground. No large quantity can be cut in one place, but there is sufficient to supply the needs of intending homesteaders. No water-power, stone quarries or minerals of economic value were found. Settlement is gradually decreasing game. Coyotes, skunks, muskrats and gophers are still plentiful. Traces of foxes, badgers, and jumping deer were seen. Duck and prairie chicken are plentiful in their season. Geese and sandhill crane were scarce. —*Wm. R. Reilly, D.L.S., 1906.*

42. The west half of this township is hilly. Through these hills, a comparatively level pass extends westerly in the south through sections 16, 17 and 18, westerly in the north through sections 21, 29, and 30 and northerly through the east half of section 33. The old Hudson's Bay Company's trail to Prince Albert runs through here. Through the other passes are farm trails. The southeast quarter is mostly rolling, the northeast quarter undulating to rolling. The west half and southeast quarter is thickly dotted or partially covered with heavy poplar bluffs and thick willow clumps and underbrush. The poplar is large enough for rough building purposes, fences, &c. The northeast quarter is mostly open country, with odd poplar bluffs and clumps of willow.

Range 27—Continued.

The soil is generally a good sand loam from four to ten inches deep on a sandy subsoil. Some patches of clay loam were found along the north boundary and in other odd places. There are several large lakes in the township in the following sections: one in sections 12 and 13, one in section 6, one in section 7, one in sections 19 and 30, and one cutting the northwest quarter of section 31. The water in all these lakes is strongly alkaline. A number of small sloughs is scattered all over the township with water mostly alkaline. The original survey shows a large lake in the flat in section 28. This has dried up and is now a hay meadow. Hay of good quality can be cut in small quantities around nearly all sloughs and on the low ground. A large quantity can be cut south of the lake in section 12 and an immense quantity in the flats on sections 21, 22, 23, 26, 27 and 28. From these flats water seems to drain westward into the lake in sections 19 and 20 and eastward to Carrot river and, I believe, forms the source of that river. An old Hudson's Bay Company's trail to Prince Albert passes through sections 13, 24, 25, 26, 35, 34 and 33. It is not used to any great extent at present and is entirely obliterated in places. No water-powers, stone quarries or minerals of economic value were found. Coyotes, muskrats, skunks, gophers, ducks and prairie chickens were frequently seen while other game was scarce.—*Wm. R. Reilly, D.L.S., 1906.*

Range 28.

41. This is a fractional township adjoining the third meridian. The surface is rolling to hilly land, partially covered with clumps or large stretches of poplar. The northwest quarter of the township is comparatively open. In most cases the hills are not abrupt but rise with gradual slopes, and can be readily cultivated. Sloughs are not numerous but some are found on every section, the water being mostly alkaline. A lake was traversed in section 18. It is wooded on the south and west sides. A small creek from the hills on the south runs into the south end of this lake. The ground is rough around this end, while the water, except where the creek enters is strongly alkaline and not fit for stock. The soil is sand and clay loam, not class one but yet good farm land. The township is settled almost entirely by Galicians, nearly every homestead being taken up. These people are putting up good warm farm buildings. They are almost all built of logs plastered both inside and outside with mud, and whitewashed. The roofs are thatched with straw and some of them are exceedingly well done, making picturesque looking buildings. In a number of cases a large amount of land has been broken, but in the majority of cases a settler has only a small area under crop. The farm work is done mostly by cattle, the finest work cattle I have seen in the country. Threshing was in progress during the time of survey, (November). The grain was of good quality and the crops an average one. The season was favourable for farming, with frequent rains in July and June, very little summer frost and an exceptionally fine fall. A light snowfall, the first of the season, occurred on November 1, but it disappeared in a couple of days. A considerable quantity of hay can be cut around sloughs and on low ground. The district is best suited for mixed farming. An old cart trail to Prince Albert passes diagonally northwest through the township, but it is destroyed in places and very little used. Farm trails run in all directions, but as they have no particular beginning or ending they have not been noted. Poplar is found large enough for log building, fencing and fuel, and its value to the settler can hardly be estimated.—*Wm. R. Reilly, D.L.S., 1906.*

42. This, like township 41, is a fractional township adjoining the third meridian. It is very much like 41. The west half is rolling and the northeast quarter hilly. It is dotted with clumps and stretches of poplar with large prairie openings. The

Range 28—Continued.

heaviest clumps are along the north and east boundaries. The southwest portion is comparatively open. There are very few sloughs on the greater part of the township. Sections 13, 24, 25, 26, 35 and 36, are much broken by sloughs and lakes. The soil is clay or sandy loam not of the best kind but good farming land. This township, like 41, is settled almost entirely by Galicians. The majority of homesteads have been taken up and in a number of cases a large amount of breaking has been done. The buildings put up by these people in townships 41 and 42, ranges 27 and 28, are similar, being built of logs, plastered inside and outside with mud, and whitewashed, the roofs being thatched with straw. They prove very warm substantial buildings. Seeding started early in the spring with fine weather. Frequent showers in June and July, good harvest weather and an exceptionally fine fall made it a good season for farming.—*Wm. R. Reilly, D.L.S., 1906.*

Range 29.

6. This township was reached from township 9, range 25, by following the trail from Regina to Wood mountain to the northeast corner of township 6, range 27, thence westerly. This trail was in excellent condition. The soil in the two north tiers of sections of the township is good and well-suited for agricultural purposes. The soil surrounding Montague lake is alkaline and stony and fit only for grazing. South of the lake the land is very hilly and broken and is also grazing land. The surface is prairie except a little scrub and small poplar which occur in the ravines along the south side of the lake. No timber is found. Fresh water was found at the time of survey (July) in the marshes and sloughs. A creek drains Montague lake to the southeast; it is twenty links wide and two feet deep near the lake, and at the time of survey was flowing very sluggishly between well defined banks. The land is not liable to flooding. No water-powers are found. The climate is moderate with no summer frosts. A small amount of firewood is obtained in the ravines along the south side of Montague lake. No stone quarries nor minerals were found. Duck was the only game seen.—*J. L. R. Parsons, D.L.S., 1907.*

20, 21 and **22.** The western meridian through townships 20, 21 and 22, range 29, passes over a dry country without bush of any description, the surface of which is generally level to undulating. The soil is sandy loam, suitable for producing wheat, oats, barley, flax and vegetables. We passed through several immense areas of wheat fields in this district. The Canadian Pacific Railway Company have under construction a railway from Moosejaw to The Elbow, on the south branch of Saskatchewan river. It passes through section 30, township 20, range 29. When finished it will be undoubtedly of immense advantage to the surrounding settlers. We did not perceive many hay meadows. The sloughs passed contained surface water, generally, and later in the season became dry. We did not hear of summer frosts, nor did we notice indications of coal, stone quarries or minerals. There is no water-power, and no game except the feathered kind.—*E. W. Hubbell, D.L.S., 1907.*

Range 30.

4. This township was reached from township 5, range 1, by travelling southeast to Spring Creek ranch in section 13, township 5; thence by the ranchers' trail to telegraph line trail which crosses the south part of township 5, range 30. The soil is light and gravelly in many places and is best suited for grazing purposes. The surface is everywhere prairie. The east two-thirds of the township is hilly and rough

TOWNSHIPS WEST OF THE SECOND MERIDIAN.

Range 30—Continued.

while the west one-third is rolling. There is no timber. Good marsh hay is abundant in the numerous small hay marshes throughout the township and in the valley of Haymeadow creek, which flows easterly through the south tier of sections. Fresh water was easily obtained at the time of survey (August) in the marshes and sloughs and in Haymeadow creek. No water-powers exist nor is the land liable to be flooded. The climate is moderate, with no frosts at the time of survey. No fuel occurs in the township, but a limited amount exists in the township immediately north. No stone quarries nor minerals were found. Duck was the only game.—*J. L. R. Parsons, D.L.S., 1907.*

5. This township was reached from township 9, range 25, by following the police trail from Regina to Wood mountain. It was in good condition. The soil is light in quality, and on account of the broken nature of the surface is suited only for grazing purposes. The surface is rolling and hilly prairie, with no timber, broken on the north and west sides of the township by deep ravines in which small bluffs of poplar and willow occur. Hay of good quality is to be found in the small hay marshes in the township. Fresh water occurs in the marshes and in the two creeks. One creek runs northerly through the west (fractional) tier of sections; it is ten links wide, one foot deep and has a current of one and one-half miles per hour. The other joins this one from the east, draining a deep ravine in sections 35, 34 and 33. It is six links wide, one foot deep and has a current of one and one-half miles per hour. There is no water-power. The climate is moderate, with no frosts at the time of survey (July). Fuel consists of small poplar and willow occurring in the ravines along the north and west sides of the township. There is said to be lignite coal in all the hills, but none, however, was seen. There are no stone quarries nor minerals. Duck is the only game.—*J. L. R. Parsons, D.L.S., 1907.*

6. This township was reached from township 6, range 29. The soil is of good quality, suitable for agricultural purposes. The surface is level and rolling prairie with no timber. Good hay is found in the small hay marshes in the township. Water was plentiful at the time of survey (July) in the small marshes. There is no water-power in the township. There is no fuel but some wood can be obtained in township 5, range 30. No stone quarries nor minerals were found. The only game was duck. —*J. L. R. Parsons, D.L.S., 1907.*

17. (*Eastern Boundary*).—The surface of the east boundary of township 17, range 30, is generally rolling and undulating, but more broken and hilly at the south end. The soil throughout is sandy loam rated second class, suitable for growing wheat, oats barley, &c. There is no wood in this township. The main line of the Canadian Pacific railway crosses section 25. There are no hay meadows of any account and very little water. Good sweet water is obtained from a couple of small creeks. There is no water-power, nor did we see indications of coal, stone quarries or minerals.—*E. W. Hubbell, D.L.S., 1907.*

TOWNSHIPS WEST OF THE THIRD MERIDIAN.

Range 1,

4. This township was reached from township 4, range 30, west of the 2nd meridian, by following the telegraph line trail westward. It was in excellent condition. The soil is of poor quality, there being a great deal of gravel so that the township is suited only for grazing purposes. The surface is prairie with no timber. It is very hilly and broken throughout. Hay of excellent quality, blue joint and red top, is

Range 1—Continued.

found in abundance along the valley of Haymeadow creek, which crosses the township from northwest to southeast. Large quantities of hay are annually cut here by ranches of the district. Fresh water was to be found in the sloughs and marshes at the time of survey (August) and also in Haymeadow creek, which averages ten links wide, eighteen inches deep and flows with a current of one and one-half miles per hour. No water-powers occur. The climate is moderate, with no frosts at the time of survey. There is no fuel in this township, but a good supply can be obtained in the township to the north. No stone quarries nor minerals were found. Duck was the only game.—*J. L. R. Parsons, D.L.S., 1907.*

5. This township was reached from township 5, range 30, west of the 2nd meridian, by following the old trail to Elm Springs and Wood mountain. It was in good condition. The soil is of good quality, supporting an excellent growth of upland grass. On account of the broken character of the country, it is suited only for grazing purposes. The surface is chiefly prairie with no timber, except some small bluffs of small poplar and willow in many of the ravines. The township is very rough and is broken by deep ravines which drain northward into the valley of Twelvemile lake. Numerous springs are to be found in the ravines and coulées, containing excellent water. These springs feed small creeks in each ravine which drain northward into Twelvemile lake. There are no water-powers, nor is the land liable to be flooded. The climate is moderate with no summer frosts. There is an abundance of wood in the township. Coal is found in many of the hills by ranchers of the district and mined for kitchen purposes. It is a low grade lignite and occurs in thin seams. No stone quarries nor minerals were found. Duck was the only game.—*J. L. R. Parsons, D.L.S., 1907.*

6. This township was reached from township 5, range 30, west of the second meridian, by following the old trail to Elm Springs and Wood mountain. The soil in this township is of good quality and is fine rolling land, except along the shores of Twelvemile lake, where the land is cut by deep ravines to the north and south. There is no timber. A very fine hay meadow exists around the east end of Twelvemile lake. Good hay also grows in the numerous small hay marshes throughout the township. Good, fresh water was obtainable at the time of survey (July) in the marshes and sloughs and also in the south part of the township in the small spring creeks which drain the ravines and coulées. There are no water-powers. The climate is moderate with no summer frosts. There is no fuel in this township, but both wood and coal occur in the township to the south. No stone quarries nor minerals were found. Duck was the only game.—*J. L. R. Parsons, D.L.S., 1907.*

7. The township is reached by a trail from Moosejaw which passes through township 10. The trail leads to Wood mountain and is in good condition. The soil is mostly clay loam and is well adapted for general farming. The surface is open prairie, without any timber. Sections 22, 23, 26 and 27 are mostly level and produce excellent hay. There are no springs or creeks in the township, but water could no doubt be obtained at a moderate depth by digging wells. The climate is favourable, summer frosts do not appear to prevail, while the average rainfall is light. There is no fuel supply within the township, but coal can be obtained about ten miles south, at Twelvemile lake. There are no stone quarries or minerals of economic value. Antelope were seen occasionally, but no other kind of game. With the exception of a large swamp on the northeast corner and another covering parts of sections 3 and 4, there is no waste land in this township. There are no settlers at present, but they will

Range 1—Continued.

soon find their way into a desirable township such as this is.—*Geo. Edwards, D.L.S., 1906.*

8. The trail from Moosejaw to Wood mountain, passing through township 10, affords access to this township. This trail is in good condition. The soil is chiefly clay loam with clay subsoil, very suitable for agricultural purposes. The surface is rolling prairie without any timber. There are no hay areas of any account. As there are no springs or creeks, water can be obtained only from sloughs, or by digging wells. The average rainfall appears to be light. Other climatic conditions are favourable, and summer frosts would not be likely to prevail. There is no apparent fuel supply nearer than township 6 where coal can be obtained. There are no stone quarries or minerals of economic value. Antelope were seen frequently. Ducks frequent the sloughs in considerable numbers. There are no settlers at present, but this township will soon be occupied as it is well suited for farming purposes. There is no waste land, except a large slough covering parts of sections 26, 27, 35 and 34.—*Geo. Edwards, D.L.S., 1906.*

9. A good trail, from Moosejaw to Wood mountain, passes through township 10, range 1, and affords the most convenient means of access to this township. The soil is clay loam with clay subsoil, suitable for general farming. The surface is unbroken rolling prairie, without any timber whatever. At the time of survey (October) there was no means of determining existence or extent of hay areas, as all vegetation had been destroyed by a recent prairie fire. The only water available is in three small sloughs. There are no springs or creeks. The average rainfall is light, no summer frosts occur, while other climatic conditions are favourable. Fuel is not obtainable nearer than township 6, where coal is found. There are no stone quarries and no minerals of economic value. Antelope were seen occasionally. Ducks were the only other kind of game observed. I have rated this township third class throughout on account of it being stony.—*Geo. Edwards, D.L.S., 1906.*

10. Telegraph line trail from Moosejaw to Wood mountain passes through this township. This trail is in good condition. The soil is largely clay or clay loam suitable for agricultural purposes but stony in many places. The surface is open prairie with no timber of any kind. There are no springs or creeks, the only water being what can be obtained in a few small sloughs. Good water could, no doubt, be obtained by digging wells. A recent prairie fire destroyed all vegetatiou so that no hay was to be seen. Average rainfall is light, summer frosts are not usual while other climatic conditions are favourable. The nearest available fuel supply, at present, is in township 6, range 1, where coal can be obtained. There are no stone quarries, and no minerals of economic value. Antelope and a few duck were the only game noticed. This township is better adapted for grazing purposes than general farming. Owing to most of the land being stony I have rated it all as third class.—*Geo. Edwards, D.L.S., 1906.*

11. A good trail from Moosejaw to Wood mountain passes through the southeast corner of this township. The soil is mostly clay, not very good for farming but affords good pasturage. The surface is open prairie somewhat hilly in places but for the most part rolling. There is no timber. A recent prairie fire destroyed all vegetation so that no hay areas could be located. There are no springs or creeks. The average rainfall is light, summer frosts are not common, while other climatic conditions are good. The nearest apparent fuel supply is in township 6, range 1, where coal is found. There are no stone quarries and no minerals of economic value. No game was seen except

Range 1—Continued.

an occasional antelope. There are no settlers in this township. The land is suitable for grazing purposes, but too rough and stony for agricultural purposes.—*Geo. Edwards, D.L.S., 1906.*

21. This township may be reached by a graded and well travelled road from either Mortlach or Caron, stations on the main line of the Canadian Pacific railway. A number of houses forming the nucleus of a town called Brownlee lies only a couple of miles southeast of the southeast corner of this township. The soil consists of a black loam with generally a clay subsoil. The surface is an open undulating prairie without any timber or brush whatever. In a fairly dry season there are numerous small hay marshes scattered through this township, but when the seasons are very wet hay can be cut on the uplands. Water of a fair quality is found in the most of the ponds but many settlers have sunk wells. At times the water is somewhat alkaline. There are no running streams or water-powers. The climate is normal and no summer frosts were experienced. Fuel has to be imported from the nearest railway towns, Caron and Mortlach, distant twenty-three to twenty-five miles. There are no stone quarries but sufficient stone may be gathered for necessary building purposes. No minerals of economic value were observed. Game is scarce, in fact none was seen. The graded roadbed of the Moosejaw northwestern branch of the Canadian Pacific railway cuts diagonally through the southern half of this township, coming from Tuxford it also passes through Brownlee. The ironing of the grade from Tuxford is not yet completed. This township is well settled and all the homesteads occupied.—*C. F. Miles, D.L.S., 1907.*

22. This township is approached by several well beaten trails running from the small but thriving towns on the nearest railway, distant from 25 to 30 miles. The soil in the northern part of the township is sandy loam, but towards the south there is more clay. We saw several excellent crops of wheat and oats which the soil is apparently well adapted for. Vegetables also appeared to be grown with equal success. The soil is undulating to rolling, and extending across the centre of the township from the east to the northwest is the Qu'Appelle valley, averaging about a mile in width and from sixty to eighty feet deep, through which flows the Qu'Appelle river, although at the time of survey (September) it was dry in most places. The only wood in the township consists of a few clumps of small poplar and willow growing in some of the ravines, but it is not even used for firewood, as the settlers burn coal which they bring from the nearest railway stations. Hay is procured from a few dry sloughs, but principally from the bottom land in the Qu'Appelle valley. There are no lakes in this township. Drinking water is very scarce, in fact the only place we found any was in the northeast quarter of section 12, where there is a small spring. There is no flooded land, and from what we could learn no summer frosts are likely to do damage to any extent. We did not perceive any signs of lignite or seams of coal, nor were there stone quarries, but on many ridges in the northern part of the township numerous huge boulders and outcroppings of stone were quite apparent, also in various places we found considerable gravel. The nearest postoffice is Hustler, situated in township 22, range 29, fifteen miles distant from Craik, from which the mail is brought once a week. With the exception of a few antelope and numerous wild ducks we did not see any variety of game. I learned that all the land available for homesteading was taken and many new buildings are being erected. The Walsted ranch is situated in section 24 in this township, and has two hundred head of stock. —*E. W. Hubbell, D.L.S., 1906.*

Range 1—Continued.

24. This township may be reached by a good graded road from the village of Craik, a station on the Canadian Northern railway, Craik being about seventy-two miles from Regina. The soil generally is a black loam, varying in depth from four to twelve inches, four inches predominating, underlaid mostly by a sandy clay. The surface is an undulating and gently rolling, open prairie without any timber or brush whatever. There are a number of marshes scattered over the township, which in ordinary dry seasons are available for making hay. The only water to be found is in ponds, although the settlers now have wells, the water in some instances being slightly impregnated with alkali. There are no running streams and no water-powers. The climate is normal and summer frosts not general. There being no timber, coal has to be procured from Craik, or wood from the sand hills about ten miles to the west. There are no stone quarries, although stones or boulders may be found in sufficient quantities for local building purposes. No minerals were observed. Game is scarce, although an occasional antelope is still to be seen. This township is pretty well settled, and no more homesteads are available.—*C. F. Miles, D.L.S., 1907.*

33. The southwest corner o f the township is hilly, the remainder of the south half varies from rolling to hilly and the north half is hilly. It is all open prairie. The surface is broken by sloughs and lakes, the water in nearly all of which is more or less alkaline. The lake in section 7 has banks from ten to twenty feet high, sand and gravel shore, sand bottom and fresh water. A creek from the hills to the south runs into this lake; it was dry however at the time of survey (August). Of the five lakes traversed this is the only one containing fresh water. The lake in sections 1 and 12 has a large slough or marsh, on the west side extending with many crooks nearly across the south half of section 11. The lake in section 14 has a slough on the west side of it extending into section 15. A large swamp covers a part of sections 8, 9, 16, 17 and 18. At a short distance it appears to be one mass of reeds, but there is a considerable area of open water in it. The reeds afford cover for ducks and other water fowl which gather there in great numbers. The water is shallow but as it lies in a depression there is apparently no easy way of draining it. A quantity of hay can be cut around many of the sloughs and in many places on the upland. The soil is good clay or clay loam and produces good crops. I think that for farming this is the best of the four townships surveyed in this district. The main line of the Grand Trunk Pacific railway cuts the north half of section 36. Nearly all homesteads have been taken up and a large area is under crop considering the short time since settlement started in the township. The close proximity to the main line of the Grand Trunk Pacific railway has increased the value of the land and added much to the prospects of the settlers.—*Wm. R. Reilly, D.L.S., 1906.*

34. This township is very much like those to the south and west of it. It is rolling prairie with many sloughs in which the water is more or less alkaline. A lake was traversed in sections 27 and 28. It has a soft clay shore, and the water is strongly alkaline. The soil is mostly a rich clay loam, with a clay subsoil. It produces excellent grain and other crops. Hay is not found in large areas, but nearly all the sloughs produce some, and on a number of the upland flats a large quantity was cut this year. The season was a very favourable one for farming, there being frequent showers in the early part of the season. Some extra heavy thunder storms occurred in July, but crops were not damaged to any great extent. The settlement is new but excellent progress has been made in breaking up the land. A number of first class dwellings were built this season and in many ways the district has the appearance of a much older settled country. The main line of the Grand Trunk Pacific railway

Range 1—Continued.

cuts the township diagonally from the southwest corner of section 1 to the northwest corner of section 18. This has increased the value of the land and added much to the prospects of the settler.—*Wm. R. Reilly, D.L.S., 1906.*

35. The soil of this township is generally sandy loam with a clay subsoil, suitable for the production of wheat, barley, flax, oats and vegetables. The surface is mostly undulating, being more rolling towards the northern part, and is destitute of timber or bush of any description. There is scarcely any hay except that obtained from the large marshes in sections 2, 9, 10, 16 and 20. The settlers content themselves with prairie grass or 'wool top.' Most of the water obtained from wells, which are 20 to 50 feet deep, has an alkaline flavour. However as there are several comparatively large bodies of fresh water throughout the township, the supply is permanent and more than sufficient. As far as we could ascertain the land is not liable to be flooded and summer frosts are of rare occurrence. The settlers, generally, use coal for fuel, hauling it from Davidson or Saskatoon, from thirty to thirty-five miles distant. Some wood is procured from the hills to the northeast about twenty miles distant, but as this section of the country is being rapidly homesteaded, the supply obtained from this district will naturally cease. We did not observe any indications of lignite veins, coal, minerals nor stone in sufficient amounts for quarrying. The only game is of the feathered variety and these were quite plentiful this year, except prairie chickens. This township is well settled and a considerable portion is under cultivation. The Canadian Pacific railway runs across sections 12, 11, 10, 9, 8, 17 and 18. As yet it is only graded but the rails are expected to be laid very soon. The town of Elstow, situated in sections 3 and 10, is making fair progress and doubtless in a short time will be a town of importance, as it is surrounded by a splendid agricultural country, and it is about the right distance from Saskatoon.—*E. W. Hubbell, D.L.S., 1907.*

37. This township is open prairie, very hilly on the south and west sides, rolling to hilly on the north and east sides and depressed in the interior. It is very much broken by lakes and sloughs in which the water is mostly fresh. The soil in all parts of the township is good. It is mostly a rich sand or clay loam. Hay cannot be said to be plentiful for a township that has so many sloughs. A large amount can be cut around sloughs and on the low ground but no great quantity in any one place. A large fresh water swamp stretches nearly across section 26. It is very much like the swamp in township 33, range 1. A heavy growth of reeds covers almost the whole area. There are only a small number of homesteads in this township that will make good grain farms. The greater portion, being either hilly or broken by water areas, is not a desirable location for the majority of settlers whose chief aim appears to be grain growing. This ground supports a good growth of grass and, with abundance of fresh water, makes a splendid grazing country. All the good homesteads have been taken up and considerable improvements made on some of them. This season with abundance of rain and little damage by frost or hail was a favourable one for farming. A ravine on the north side of section 35 has a little scrub in it, the only wood in the township.—*Wm. R. Reilly, D.L.S., 1906.*

38. The surface is open prairie, flat in sections 31, 32, 33, 34, 35 and 36, but gradually becoming rolling or hilly in the next tier of sections, while from the south it is all rolling or hilly, and stony on many of the side slopes and ridges. The soil is mostly a rich clay loam on a clay subsoil. The soil of the sections on the north side of the township is first class. Some quarter sections scattered over the township will make good farms, but the greater part is rather too rough or too stony for cultivation. A number of sloughs and lakes are dotted all over the townships,

Range 1—Continued.

the water in the majority of them is fresh. Eight water areas were traversed. A pumping station on the side of lake No. 6 in section 33 supplies the water tank on the Canadian Northern railway at Vonda. All the desirable homesteads have been entered for, and most of them well improved. Owing to the short distance from the railway many of the poorer homesteads will be taken by those who will not go far from the railway to settle. A ravine in section 21 has a quantity of poplar and willow scrub in it. The lake in sections 14 and 23 is fringed with poplar and willow scrub, except the north side which is bare. Scattered clumps of poplar are dotted over sections 10, 11, 12, 13, 14, 15, 23 and 24. The season was a very favourable one for farming, sufficient rain, very little frost and very fair harvest weather.—*Wm. R. Reilly, D.L.S., 1906.*

52. There is a road from Prince Albert to the Sturgeon Lake Lumber Company's mill, whose buildings are on sections 22 and 27 of this township. The road is in fairly good condition. The surface of the township is timbered with poplar and spruce. The better spruce is cut, but there is still some small 12-inch spruce in the vicinty of Big Belly lake. There is no hay to speak of in this township. The water is fresh and the supply is sufficient and permanent. There is no land liable to be flooded. There is no water-power. The fuel is poplar and dry spruce and can be procured in almost any part of the township. There is no coal or lignite, stone quarries or minerals of any kind. There are a few moose, deer, bear, foxes, lynx and numerous muskrats. Partridges are scarce but duck plentiful. Bell lake, north of this township, is locally known as Sheal lake. It is a shallow, soft bottom lake, whose shores are bordered with swamp grass and brushes.—*A. L. McLennan, D.L.S., 1907.*

Range 2.

4. This township was reached from township 4, range 1, by following the police trail along the government telegraph line from Willowbunch to Wood mountain. It was in good condition. The soil is of poor quality, being gravelly and stony in many places and is suited only for grazing purposes. The surface is chiefly rough and broken prairie with no timber except small scrub poplar and willow on the north slopes of many of the ravines. Good fresh water was readily found in marshes and sloughs at the time of survey (August) and also in the creek which crosses sections 19, 20, 21, 27 and 34 on its way to Twelvemile lake. The land is not liable to be flooded. No water-powers occur. The climate is moderate, with no frost at the time of survey. Firewood is plentiful in the ravines and small seams of coal are readily found by the ranchers a few feet below the surface. It is lignite of low calorific value, but burns in an ordinary cook-stove. No stone quarries nor minerals were found. Duck was the only game.—*J. L. R. Parsons, D.L.S., 1907.*

5. This township was reached from township 4, range 1, by following the police trail along the government telegraph line. It was in good condition. The soil is light with a considerable amount of sand and gravel and on account of the uneven surface is suitable only for grazing. The surface is everywhere hilly and broken prairie, with no timber. Hay is plentiful in the numerous small hay marshes throughout the township. Good fresh water was to be found in the sloughs and marshes at the time of survey (August) and also in the creek which enters the township from the south in section 3, and flows north into Twelvemile lake. It averages ten links wide, one foot deep and was flowing very sluggishly at the time of survey. The land is not liable to be flooded and no water-powers occur. The climate is moderate, with

Range 2—Continued.

no frosts. Deadwood is to be found in the township to the south, and the ranchers state that lignite coal exists in many of the hills in the township. It is the characteristic low grade variety of the district. No stone quarries nor minerals were found. Duck was the only game.—*J. L. R. Parsons, D.L.S., 1907.*

5, 6, 7 and **8.** (*Boundaries*).—Township 5 is exceedingly rough and altogether unfit for agricultural purposes. There are numerous springs of good water and general conditions are favourable for ranching purposes. The southern part of township 6 is rough and hilly. It is traversed by Twelvemile lake, the water of which is alkaline. This township affords favourable conditions for ranching, but a large part of it is too rough for cultivation. Coal is found in this township on the south side of Twelvemile lake. Township 7 is well adapted for agriculture, there being very little waste land. There are no streams or springs, but water could doubtless be obtained by digging wells. There are no settlers here at present. Township 8 has a gently undulating surface, and would make good farming land. There are no springs or creeks, but water could doubtless be obtained by digging wells.—*Geo. Edwards, D.L.S., 1906.*

7. This township was reached from township 11, range 10, by following the old trail eastward to the provincial government bridge across Wood river in township 11, range 4. The trail was in good condition. The soil in the northeast, one-third of the township, is of fine quality and is good farming land. The soil in the remainder of the township is lighter and better suited for grazing purposes. The surface is prairie throughout. The northeast one-third of the township is gently rolling, while the remainder is more rolling and hilly. No timber occurs. Hay is plentiful in the numerous hay marshes throughout the township. Good fresh water was plentiful at the time of survey (October) in the small sloughs and marshes in the township, and settlers were able to find water by digging twelve feet. No water-powers occur. The climate is moderate, with slight frosts at the time of survey. No fuel, stone quarries nor minerals were found. Duck was the only game.—*J. L. R. Parsons, D.L.S., 1907.*

8. This township was reached from township 7, range 2, by following the telegraph line trail. It is in good condition. The soil is of excellent quality and well suited for agricultural purposes. The surface is level and gently rolling prairie with no timber. A small amount of hay is found in the hay marshes. Fresh water was scarce at the time of survey (October), and was to be found only in the small marshes. No creeks nor water-powers occur. The climate is moderate, with frosts at the time of survey. No fuel, stone quarries nor minerals were found. Antelope was the only game.—*J. L. R. Parsons, D.L.S., 1907.*

9. This township was reached from township 8, range 2, by following the telegraph line trail northward. It was in good condition. The soil of the west three-quarters of the township is of good quality, while the remainder is ligher, but the whole is suited for agricultural purposes. The surface is level and rolling prairie with no timber. A little hay is found in the few scattered hay marshes. Water was very scarce at the time of survey (October), and was only to be had in a few scattered marshes. No creeks nor water-powers occur. The climate is moderate with frosty nights at the time of survey. No fuel, stone quarries nor minerals were found. Antelope was the only game.—*J. L. R. Parsons, D.L.S., 1907.*

10. This township was reached from township 9, range 2, by following the telegraph line trail northward. It was in excellent condition. The soil is of good quality. There is a good deal of gumbo in the township which is very stiff to break, but otherwise it is

Range 2—Continued.

good agricultural land. The surface is gently rolling prairie with no timber. Hay is plentiful, occurring in the numerous small hay marshes, and also around the large marsh situated in sections 35 and 36. Water was scarce at the time of survey (October), but was obtained in a few of the marshes. No creeks nor water-powers occur. The climate is moderate with slight frosts at the time of survey. No fuel, stone quarries nor minerals were found. Game consists of duck and antelope.—*J. L. R. Parsons, D.L.S., 1907.*

11. This township was reached from township 5, range 3, by following the old Wood mountain trail, northerly, through range 3 to township 10. It was in good condition. The soil is of fair quality and suited for agricultural purposes. The surface is rolling prairie with no timber. Hay is plentiful in the numerous small hay marshes throughout the township, and in the large hay marsh which occupies the south half of sections 1 and 2. At the time of survey (August) water was scarce, but obtainable in a few marshes. No creeks nor water-powers occur. The climate at the time of survey was moderate with no frosts. No fuel, stone quarries nor minerals were found. Game consists of antelope and duck.—*J. L. R. Parsons, D.L.S., 1907.*

12. This township was reached from township 11, range 2. The soil is of fair quality, supporting a good growth of grass and is suited for agricultural purposes. The surface is rolling prairie with no timber. Good hay is to be found in the small hay marshes through the township. Water was scarce at the time of survey (August) and was to be found only in the deeper marshes, which had not dried out. There are no creeks and no water-powers. The climate is moderate with no frosts. No fuel, stone quarries nor minerals were found. The only game was antelope and duck.—*J. L. R. Parsons, D.L.S., 1907.*

21. This township is approached by several well beaten trails from the east and south connecting with the main trails running to the different towns which are situated on the various railway lines, twenty to twenty-five miles distant. The soil is generally sandy clay, suitable for growing wheat, barley, oats and vegetables, of which I saw several excellent crops. The surface is generally undulating, and in a few places rolling prairie. There are a few isolated hills situated in sections 26, 32, 33 and 18. The one in section 26 is known as Eyebrow hill from its peculiar shape, and is about seventy feet high. There is very little water. A small spring in section 27 was the only one noticed; the creeks and sloughs being all dry at the time of survey (September). However the settlers in this township have numerous wells from which a supply of excellent water is obtained. There is no timber or bush of any description in this township, so that the settlers have to burn coal which is obtained at the nearest railway stations. A small amount of hay is obtained from the bottom lands and a few of the dry sloughs, but the supply is limited. There are no lakes or sloughs and from what I could learn, there are no summer frosts that do any material injury. We did not perceive any signs of lignite or coal seams. The nearest postoffice is Hustler, situated in township 22, range 29, west of 2nd meridian, to which the mail is brought once a week from Craik, fifteen miles distant. We did not notice any stone quarries, but observed many boulders scattered on the hill tops. The proposed route of the extension of the Canadian Pacific railway from Moosejaw to the Elbow runs across the northern part of this township and when finished will be a great boon to the numerous settlers in this vicinity, especially as they are forming a village in this township.—*E. W. Hubbell, D.L.S., 1906.*

Range 2—Continued.

22. This township can be reached by several well travelled trails from towns situated on the nearest railways and distant thirty-five to forty miles. The soil is generally sandy clay intermixed occasionally with a little gravel. We came across several excellent crops of grain, principally wheat; thirty-eight bushels to the acre was threshed off about eighty acres, on the northeast quarter of section 10. The surface is generally undulating to rolling but is slightly hilly in the west half of the township. There are two springs in this township, situated in sections 1 and 16 respectively and the water is fresh and sweet although in very hot weather the supply is limited. Water is also obtainable from Eye lake in sections 2, 3, 10 and 11, also from a lake in the east half of section 5. Otherwise the country is rather dry. There is no wood of any description except a little poplar in the east half of section 36, which has been culled over and over again. The settlers burn coal, although some obtain a little wood from the sand hills to the north. Hay is very scarce, a limited amount being obtained from a few dry marshes. Wool top and straw are generally used by the settlers as fodder for their stock. There is no flooded land and I believe no summer frosts that do any material damage. No sign of lignite veins or coal were noticed nor are there stone quarries. There are several trails passing through this township; one of them is the old and well travelled trail to Saskatoon, which is, however, gradually getting ploughed up in places. The nearest postoffice is Hustler, situated in township 22, range 29, and distant fifteen miles from the town of Craik, from which place the mail is delivered once a week. The original survey was fairly well done, except for a few miles which had to be entirely resurveyed and the old mounds of which had to be destroyed. All the homesteads are taken up and improvements were noticed on nearly all of them, as well as upon the odd numbered sections. This is a well settled and apparently a prosperous agricultural district.—*E. W. Hubbell, D.L.S., 1906*

23. That portion of this township lying south of Qu'Appelle river can be easily reached from projected stations on the new Moosejaw Northwestern branch of the Canadian Pacific railway, which, although graded, had not been ironed at the time of survey. That part lying to the north of the Qu'Appelle valley may be reached by fair roads from Craik, a station on the Canadian Northern railway. In the greater part of this township the soil consists of light and sandy loam with sometimes a clay subsoil. The sections however in the northeast and southwest corners are of a black loam suitable for raising any indigenous crops. The surface in the northeast and southwest corners is somewhat rolling but a good deal broken in the central parts from the northwest to the southeast corners. It is all open prairie except in the valley of the Qu'Appelle, where it is somewhat scrubby. There is no timber. There are but few hay marshes, the hay having to be procured from the uplands. There is plenty of water, but not of very good quality, except in wells sunk by some of the settlers. There is no current in the river nor in Eyebrow lake, nor are there any water-powers. Fuel has to be brought from the sand hills to the northwest or from the nearest railway stations. No stone quarries or minerals were observed. The best lands in the township, I believe, have already been taken up, although not all occupied.—*C. F. Miles, D.L.S., 1907.*

24. This township may be reached by a graded road from the village of Craik, a station on the Canadian Northern railway distant from Regina about seventy-two miles by rail. There are several elevators here and a daily train service. Some of the settlers in the westerly portion of this township trade at Girvin, and others at Davidson, both villages on the same line of railway. The soil in the easterly portions is generally a black loam with a clay subsoil, whereas the westerly smaller part is more

of a sandy nature, with nearly a pure sand in some of the westerly tier of sections. The surface is undulating and open prairie, except the southwesterly quarter which is partly covered with a dense growth of scrub and brush—being a part of the sand hills extending in here from the west. It is a comparatively dry township. The hay is got from the uplands or dry beds of marshes. The water in the ponds is frequently alkaline, but many settlers now have sunk wells from which they draw their supply of water. There is a lake on sections 8 and 17, from which there is a flow at times of high water. There are no water-powers in the township. The climate is normal and no summer frosts were experienced, in fact settlers maintained that no summer frosts had occurred since they settled there. There is some timber in the sand hills to the west, from which much of the fuel supply is procured, but in course of time it will have to be imported from the nearest railway stations. All the poles that have been used for building purposes have also been drawn from the adjacent township. There are no stone quarries, but sufficient stone may be gathered for local building purposes. No minerals were observed. Antelope and deer are still to be found in the hills, and put in an occasional appearance. Prairie chickens appeared still to abound in the brushy parts after the cold weather set in. This township is well settled and the homesteads in the open parts are all occupied.—*C. F. Miles, D.L.S., 1907.*

33. The southeast quarter of the township is from rolling to hilly prairie, most of the hills and ridges and many other parts being stony. The soil is good clay loam, but on account of broken surface and stones, the greater portion of this part of the township is best adapted for grazing. The southwest quarter and the north half of the township are rolling prairie. The soil is mostly a good clay loam running into sand loam at the northwest part of the township. Sloughs are found all over the township with water more or less alkaline in all of them. No extensive hay meadows exist, but hay in small quantities can be cut around nearly all sloughs and in many places on the upland. A traverse was made of four water areas and the water in all of them was found to be strongly alkaline. With the exception of the southeast part, this is a good township for farming. The homesteads are nearly all taken up and good progress has been made in developing them. The building of the Grand Trunk Pacific railway has increased the value of land and added much to the prospects of the community. The season was a very good one for farming. There was sufficient rain and little damage by frost or hail in this township.—*Wm. R. Reilly, D.L.S., 1906.*

34. This township varies from rolling to hilly prairie, there being very little level land. There is no wood of any kind. There are patches of alkali land in the majority of the sections, the largest stretches being in the north part of sections 31, 32 and 33. This township is dotted all over with sloughs containing water more or less alkaline. One lake was traversed in sections 15 and 16, and one in sections 7 and 18. The water in the former is slightly alkaline, and in the latter it is so strongly alkaline that stock will not drink it. The soil is generally a good clay loam, but is somewhat alkaline in the lowlands. It produces first class grain and other crops. Hay is not plentiful, but a considerable quantity can be cut in many places. Settlement started in this township less than four years ago, but it has many appearances of an old settled district. A large amount of improvements has been done this season. The season was an excellent one for farming, there being an abundance of rain, little or no damaging frost, and very slight damage on account of hail. The survey of the main line of the Grand Trunk Pacific railway cuts the township from sections 13 to

Range 2—Continued.

31. The advent of this road has greatly advanced the price of land and added fresh impetus to the settlers. A very prominent hill which can be seen for many miles is on the southeast quarter of section 16.—*Wm. R. Reilly, D.L.S., 1906.*

38. The surface is from rolling to hilly prairie. The township is cut diagonally by a range of hills from sections 6 to 36. The southeast portion is hilly with many sloughs containing mostly fresh water. The greater part of this portion of the township is stony, sections 2, 3, 4, 5, 9 and 10 being very stony. A flat at the foot of the hills has a succession of sloughs from sections 7 to 35. The ground gradually rises westward from the flat. The northwest part is all rolling. The soil is mostly a rich clay loam with clay subsoil. The northwest part is splendid farming land. Some quarter sections south of the flat and along the east side of the township are very good, but the greater part of the south of the township is unfit for cultivation. Small quantities of hay, can be cut in many places, but no large amount in any one place. The original plan shows an old cart trail, crossing the township. This has been ploughed up in many places and is nearly blotted out. The township has farm trails in all directions but as they are of no importance they were not noted. The main line of the Canadian Northern railway curves a short distance into sections 33, 34 and 35. The climate was favourable for all classes of farming with frequent rains through June and July, little or no summer frost and very good harvest weather.—*Wm. R. Reilly, D.L.S., 1906.*

52. The surveyed trail to Montreal lake passes within a few miles of the Sturgeon Lake Lumber company's mill, which is in section 22 of the township immediately east; the trail to the mill is good but the bush road from the mill is not in good condition. The nature of the soil would permit of good mixed farming. The surface is slightly rolling, covered with poplar and thick hazel. The north shore of Von Mehern lake is bordered with first class spruce from six to thirty inches in thickness. There is a small quantity of hay on the south shore of Von Mehern lake and also on the shore of Cox lake; the quality is coarse. There is a sufficient and permanent supply of fresh water. Some of the smaller sloughs are slightly alkaline. The streams are small and not liable to flood the adjacent land to any appreciable extent. The climate for this summer was exceptionally wet and very cool. We had ice during the months of June, July, August, September, October, November and December. Poplar for fuel is most readily available and can be procured in any part of the township. There are no stone quarries, or minerals of any kind. Red deer, cotton tail, bear and partridges exist but are very scarce; muskrat, foxes and lynx are more numerous, also innumerable black ducks.—*A. L. MacLennan, D.L.S., 1907.*

Range 3.

5. This township was reached from township 5, range 2, by travelling westward along the 2nd base line. The soil is of good quality and the greater part of the township is suited for agricultural purposes. The surface is level or rolling prairie except along the east branch of Wood river, where it is rough and broken. No timber occurs. Good hay is found in the small hay marshes and in the valley of the east branch. Fresh water was obtainable at the time of survey (August) in the small sloughs and marshes, also in the east branch of Wood river which crosses sections 4, 9, 16, 15, 22, 27 and 33, in its northerly course; it averages eight links wide, one foot deep, and has a current of one mile per hour. No water-powers occur. The climate is moderate with no frosts. There is no fuel in the township but wood and coal are both obtain-

Range 3—Continued.

able in the township to the south. No stone quarries nor minerals were found. Duck was the only game.—*J. L. R. Parsons, D.L.S., 1907.*

11. This township was reached from township 12, range 2, by following the settler's trail westward to township 11, ranges 4 and 5. It was in good condition. The soil is of fair quality and adapted for agricultural purposes. The surface is level and rolling prairie except the easter'y tier of sections which are hilly prairie. There is no timber. Hay is scarce in this township. A small amount is found in the small hay marshes in the north part of the township. Water is not plentiful but at the time of survey (September) was obtainable in small marshes in the north part of the township. No creeks nor water-powers occur. The climate is moderate with no frosts. No fuel, stone quarries nor minerals were found. Antelope was the only game.—*J. L. R. Parsons, D.L.S., 1907.*

12. This township was reached from township 11, range 2, by following the old Qu'Appelle trail westerly. It was in good condition. The soil is of good quality, but on account of the hills the land is suitable for grazing purposes only. The surface is rolling and hilly prairie with no timber. A little hay is to be found in the small hay marshes scattered through the township. Water was to be had at the time of survey (September), in the small sloughs and marshes. There are no creeks and no water-powers. The climate is moderate with no frosts at the time of the survey. No fuel, stone quarries no minerals were found. The only game was antelope.—*J. L. R. Parsons, D.L.S., 1907.*

51. This township was reached by the Sturgeon lake trail from Prince Albert. When we went out part of the trail was very wet so that we had great difficulty in getting to our township, but later on the trail was dried up, so that is was fair for travelling on. This township we found to be a very difficult one to survey as the entire surface is covered with timber and scrub. It was also very wet so that we could make little progress in our work, owing to the thickness of the undergrowth and the numerous ponds and lakes. There are ten large lakes which we traversed, two of which are over two miles long. The water in these lakes is fairly good, there being only a little alkali in them. The soil is generally good, being clay or clay loam, which if brought under cultivation would make good farming land, but, though there would be some trouble in clearing it up, it would repay. There is not much timber that would be of commercial value but it would be suitable for small buildings. There is a fair sized stream but it has no water-powers on it. The climate is fair, but at present owing to the dense growth of wood, &c., it would seem to be subject to frosts that would be injurious to crops. Yet if cleared up the frosts might not exist. There is plenty of fuel in the timber now growing, but there are no indications of coal or any mineral of any kind. There are some deer, and other kinds of game, but not very numerous. Taking the township as a whole there are a good many desirable sections for settlement.—*James Warren, D.L.S., 1907.*

Range 4.

1. There is a trail from Moosejaw running south of Johnston lake leaving the Wood mountain trail at the east end of the lake and crossing the east boundary of section 24. There is also a trail from Mortlach which runs to a squatter's house on section 4, township 12, range 4. The soil is clay or clay loam and suitable for farming. The land along the creek is broken and scrubby and more adapted for stock raising and mixed farming. The remainder of the township is a level or gently rolling prairie. There are no timber and no hay sloughs but there is considerable

Range 4—Continued.

good prairie hay. The streams are the only permanent water supply of the township, the largest being Wood river. It is from fifteen to sixty feet wide but the current is sluggish, and during the fall and winter it is practically dry except for standing water. Power could be developed only for a small portion of the year. There were no summer frosts up to the time of completion of survey (July.) There is a little wood along the streams but there are no lignite or coal veins in the township. There are no stone quarries or minerals of economic value known. There are ducks and chicken along the creek and a few deer along the streams in sections 22 and 27. —*Chas. M. Teasdale, D.L.S., 1907.*

12. This township was reached from township 12, range 3, by following the old Qu'Appelle trail westerly. The soil is of good quality and is excellent agricultural land. The surface is rolling prairie with no timber. Hay is scarce in this township. A little is to be had where the valley of Wood river widens out. Good fresh water is to be found in the river. The junction of the south and middle forks occurs in township 11, range 4, and the river flows northward in township 12 through sections 2, 3, 9, 10, 15, 16, 22, 27, 28, 29 and 32. It is joined in section 32 by the north branch in which however there was no water at the time of survey (September.) This stream averages twenty-five links wide, three feet deep and has a current of one and one-half miles per hour. No water-powers occur. The climate is moderate with slight frosts at the time of survey. Fire wood sufficient for the needs of the settlers for several years is to be found along the river. No stone quarries nor minerals were found. Antelope and duck were the only game seen. —*J. L. R. Parsons, D.L.S., 1907.*

50. This township was reached by a trail cut through woods from township 51, range 3, which was very rough and difficult to make. This township is largely timbered with jackpine, spruce and young poplar. The soil is chiefly sandy and there is very little soil that would be adapted for farming purposes except some locations in the south and northeasterly portions of the township. There are some patches of poplar, but none of any commercial value. The jackpine timber would make ties for railway purposes but the supply is limited. In the centre of the township there is a large muskeg which breaks up the township very much. At the southwesterly part of the township Shell river comes in. This is a large stream about fifty links wide, used at times for floating logs by the lumbermen. There is plenty of fuel all through, the township being covered with timber, but there are no indications of coal or any other mineral, nor is there any fixed rock in any part of the township. Game is scarce, there being only an occasional deer to be seen. The only meadow for grass is in sections 36 and 25, but only in a limited quantity.—*James Warren, D.L.S., 1907.*

51. This township was reached by a trail cut through township 51, range 3, which connected with the Sturgeon lake trail. There was a good deal of difficulty in getting to this township owing to many wet and soft places. There is a good deal of good land in parts of the township especially in the eastern portion. It would be well adapted for farming purposes, but would require the clearing away of the timber, scrub, &c., as the whole surface is covered with woods, there being no prairie or opening of any kind. There is a good deal of very fine timber in the western portions of the township, chiefly spruce and poplar, which are of commercial value. There are no hay marshes, as where there are any openings it is covered with water. The water is good, there being little or no alkali in it. There is a stream running southeasterly through the northerly portion of the township, which is a nice sized

Range 4—Continued.

stream, but it has no water-powers on it as the current is not strong. It has some hay flats along parts of it. There is plenty of fuel all over the township, there being an abundant supply of timber or wood. There are no indications of coal or any mineral of any kind, nor is there any fixed rock exposed anywhere. There are a few ducks on the ponds or lakes, but not very many. This township would be well adapted for farming purposes. Of course there would have to be a good deal of labour expended before the land would be in a state fit for cultivation. At present the township would be liable to frosts, but I think that would be less if the land were cleared up.—*James Warren, D.L.S., 1907.*

Range 5.

10. This township is reached from Moosejaw by following the Wood mountain trail to township 10, range 1, and then following a trail which runs west along the north boundary of township 10, range 4. The soil is a clay or clay loam and suitable for farming except in sections 3, 4, 5, 6, 7, 8, 9, 18 and 17, which are rolling and have considerable stone on them. These sections are best adapted for grazing. The surface is all prairie with no timber except some small maple all along Wood river creek. The prairie is covered with a heavy growth of grass suitable for hay. Water is very scarce except in the river. The water in the lake in section 16 is alkaline but the water in the lake on secton 36 is fresh. At the time of survey (June) the river was from ten to fifteen feet deep and had a strong current, but it became partly dry later in the season. This river is not suitable for water-power as the water does not run all year. There were no summer frosts. There is a little wood along Wood river and coal can be procured at Wood mountain. There are no stone quarries, and no minerals of economic value. Game is not very plentiful but there are a few chickens and ducks along the river and a few antelope in the hilly portion to the southwest of the township.—*Chas. M. Teasdale, D.L.S., 1907.*

11. This township is reached from Moosejaw or Mortlach. The trail from Moosejaw runs north of Johnston lake, and is known as the Fort Walsh trail. The soil is a clay or clay loam, well adapted for farming. The surface is all prairie except a little maple and willow bush along the river. There is no timber. Hay is not plentiful, but there is some on the flats on sections 34, 35 and 26. At the time of survey (August) there was no water in the township except in the river and in a long slough in the valley. The stream is from ten to twenty feet wide and contains fresh water. There is very little current, and, as it is practically dry during the fall and winter, it is not suitable for water-power. There were no frosts during the survey. Some deadwood can be had along the river, but not in large quantities. There are no coal or lignite veins, no stone quarries and no minerals of economic value found in the township. Duck and chickens are quite plentiful along the river and a few antelope are found in the west part of the township.—*Chas. M. Teasdale, D.L.S., 1907.*

12. This township was reached from township 12, range 4, by travelling west. The soil is good and suited for agricultural purposes. The surface is rolling prairie with no timber. Hay is not plentiful, but a limited supply is to be had in the small hay marshes and flats along the two branches of Wood river. Good water is to be had in the little branch, Notukeu creek. The north branch, Wiwa creek, was dry at the time of survey, September. Notukeu creek crosses sections 7, 8, 9, 10 and 3, while Wiwa creek crosses sections 31, 32, 33, 34, 35 and 36. No water-powers occur.

Range 5—Continued.

The climate is moderate. A limited amount of firewood is to be found along the river. No stone quarries nor minerals were found. Game consists of antelope and duck.—*J. L. R. Parsons, D.L.S., 1907.*

Range 6.

11. This township was reached from township 6, range 12, by travelling south. The soil is of light quality and is only fair agricultural land. The surface is level and rolling prairie except the three southwest sections, which are hilly. There is no timber. A fine hay marsh occupies the south half of sections 14, 15, 16 and 17, and the north half of sections 8, 9, 10 and 11, affording abundance of good hay. This hay was cut this year by settlers or ranchers. Water is very scarce and at the time of survey (September) it was possible to obtain it only by digging in the centre of hay marshes and dry slough bottoms. No creeks nor water-powers occur. The climate is moderate with light frosts. No fuel, stone quarries nor minerals were found. Antelope was the only game seen.—*J. L. R. Parsons, D.L.S., 1907.*

12. The north half of this township is poor soil, while the south half is fair and suited for agricultural purposes. The surface is rolling prairie with no timber. Hay is not plentiful, but a little is to be found along the banks of Notukeu creek. Good water is to be found in this creek, which crosses sections 18, 17, 16, 15, 9, 10, 11 and 12. It averages twenty-five links wide, two feet deep and has a current of one and one-half miles per hour No water-powers occur. The climate is moderate with slight frosts. A little fuel is found along the creek. No stone quarries nor minerals were found. Game consists of antelope and duck.—*J. L. R. Parsons, D.L.S., 1907.*

34. This is a rough broken township. South Saskatchewan river enters the township in section 2. It flows northward through wide undulating flats, in a channel with sharp cutbanks twenty to thirty feet above low water. It cuts sections 2, 11, 10, 15, 14, 23, 22, 27, 28 and 33. A large and a small island is formed by two channels of the river in sections 27 and 28. The large island is covered with a heavy growth of poplar, willow, ash and alder scrub. The south channel has the widest and deepest stream. A small wooded island is formed near the left bank on section 2. At the medium height of water a long narrow island is formed along the right bank in section 2 by a narrow stream that branches off the main stream about a quarter of a mile above the south boundary of the township. This stream will be dry in low water. The lower portion of the island is covered with a thick growth of small willow, the remainder with heavy poplar and willow scrub. A long narrow crooked body of fresh water known as Pike lake, covers a portion of sections 9, 4, 5, 8, 17, 16 and 21. It seems to be well stocked with fish principally pike. The west shore through sections 5 and 8 and the east shore through section 8 is well defined with good banks. The remainder of the shore line is low and flat. A small creek runs into the lake on the east side of section 5 and one out of the south and through sections 9, 16, 21, 29 and into the river in the southeast corner of section 32. These creeks are dry during the summer.

Browns lake, a shallow body of fresh water, cuts the corners of section 32 and 33. It is muskeggy on the west and north sides. From section 17 a muskeg and marsh extend across sections 20, 29 and 32. A large quantity of hay can be cut in the marsh on sections 29 and 32. The river valley is skirted on the east by a range of hills sloping to the river and outlined, roughly speaking, by a crooked course from the northeast corner of section 1 through 12, the west half of 13, the southwest corner

Range 6—Continued.

of 24, skirting the river closely through 23 and 26 and into the centre of 27, thence northeasterly through 27 and the west half of 35. The valley is marked on the west side by a range of similar hills, whose outline is near the centre of sections 5, 8, 17, 20, 29 and 32. The hills on both sides of the valley are mostly light sandy soil, third or fourth class and fit only for grazing purposes. The western hills are thickly dotted with poplar bluffs with timber four inches to eight inches in diameter. The eastern hills are nearly bare, having only odd clumps of brush or light poplar bluffs. The greater part of the valley is covered with poplar bluffs and heavy underbrush of willow, poplar, alder, ash, cherry and hazel with intervening prairie openings. A large portion of the poplar is large enough for building purposes, fencing, etc. Only a small portion of the willow is large or straight enough for fence posts. There are some scattered cottonwood trees twelve to twenty inches in diameter along the river in sections 2 and 11. The largest quantity of timber is on the flats in sections 27, 28, 33 and 34. A great quantity of firewood can be taken off these flats. On the west side of the river nearly all the homesteads in the valley are taken, and some settlers have made good improvements. The soil of this part of the valley is mostly a rich clay loam. An Indian reserve in the southeast corner of the township covers the most of the good land on the east side of the river. A trail from Saskatoon to the Indian reserve runs along the east side of sections 25 and 24 and through 13 into the reserve. An old trail on the west side of the river passes nearly due south through sections 32, 29, 20, 17, 8 and 5. Some very strong springs flow out at the foot of the hills in section 32. Indications are that enough water could be got here to supply a large town. No stone quarries or minerals of economic value were found. No water-power exists except what might be developed on the river. Game was scarce, Some badgers, rabbits, coyotes, grouse and prairie chicken were seen, also some marks of deer but none were seen.—*Wm. R. Reilly, D.L.S., 1907.*

35. The surface, soil and general appearance of this township vary very much. The southeast and northeast corners are broken by the south branch of Saskatchewan river. The eastern part is rather flat, being valley land, the western part rolling to hilly. The division is marked by a range of hills skirting the flat from the southeast corner of section 35. An old trail follows the brow of these hills. It is the summer road of the settlers in the valley up the river. They make a winter road in the flats below. Moon lake in the flats is a shallow body of fresh water cutting sections 10, 14, 15, 16, 21, 22 and 23. It has low marshy shores with reeds on the greater part of its border, extending far out into the water. It can be easily drained into the river. A large portion of the southeast quarter of the township and sections 22, 23, 24, 25 and 36 are covered with a heavy growth of red willow, poplar and balm of Gilead. Some of the willow is large enough for fence posts. The poplar and balm of Gilead can be used for fuel and rough buildings. The remainder of the township is dotted more or less with clumps of poplar and willow brush, which will supply fuel and fencing, but very little building material. The soil of the flats is mostly good clay loam. The upland in the northwest quarter of the township is good sand loam. There is light sand in the southwest corner of the township and on sections 1, 2, 3 and 4. This part of the township is of little use for farming purposes but will make good grazing land. The greater number of the homesteads have been taken up, and good progress made in many cases. Hay is not plentiful but a limited quantity can be cut in many places on both low and high ground. The soil, character of the ground and shelter for stock, make the district more suitable for mixed farming than for exclusive grain growing.—*Wm. R. Reilly, D.L.S., 1906.*

Range 6—Continued.

48. This township is on the whole very sandy and light soil, timbered with spruce, jackpine, and poplar. Some of the timber is of commercial value, but the greater part is small and light. There is a good deal of scrub especially along the banks of the Snake Plain creek which runs through this township. This stream has a very slow current as is indicated by its crooked course. There are no water-powers on the stream in this township as in the township to the west. There are no indications of fixed rock, nor mineral of any kind, but there is plenty of fuel consisting of the timber now growing. There are no hay marshes or meadows in any part of the township. There are two lakes partly in this township and in the adjoining lands.—*James Warren, D.L.S., 1907.*

Range 7.

11. This township was reached from township 12, range 6, by travelling westward along the north bank of Notukeu creek. The soil is light but of good quality and is suitable for agricultural purposes. The surface is rolling prairie with no timber. Very little hay is to be found in the few scattered hay marshes. Water is very scarce except in Notukeu creek, which crosses sections 31, 32, 33 and 34, and averages twenty-five links wide, two feet deep and has a current of one and one-half miles per hour. No water-powers occur. The climate is moderate with light frosts at the time of survey (September). The only fuel consists of a little brush found along the banks of the creek. No stone quarries nor minerals are found. Antelope and duck were the only game.—*J. L. R. Parsons, D.L.S., 1907.*

12. This township was reached from township 12, range 6, by travelling along the north side of Notukeu creek. The soil is light but of good quality and suited for agricultural purposes. The surface is level and rolling prairie with no timber. A little hay is to be found in a few scattered hay marshes. Water is very scarce except in the creek which crosses section 3, 2, 11, 12 and 13, and averages twenty-five links wide, two feet deep and has a current of one and one half miles per hour. No water-powers occur. The climate is moderate with light frosts at the time of survey (September.) The only fuel is a little brush found along the banks of the creek. No stone quarries nor minerals occur. Game consists of antelope and duck.—*J. L. R. Parsons, D.L.S., 1907.*

48. This township was reached from the trail passing through Mistawasis Indian reserve which is a very good trail for travelling. The township is very much broken up with lakes and small ponds. We traversed eighteen and there are a number nearly large enough to be included in the traverse. The soil is largely clay and would be fit for cultivation, but for the greater part the township is better adapted for ranching as there is an abundance of good feed in the township, but only very few hay marshes. There are no indications of any minerals, but for fuel there is plenty of wood, and in parts there are some good patches of jackpine that would be available for railway ties. There is a fine stream, Snake plain creek, running through the southerly part of the township on which there are many good millsites or water-powers for any kind of machinery. There are few such streams in the territory. From fifty to one hundred horse-power could be easily developed. The water in the lakes and streams is very good being almost entirely free from alkali and in many of the lakes there are plenty of fish. Game is also plentiful in some localities, deer and duck being quite common. On the whole the township would be better adapted for ranching than for any other purpose.—*James Warren, D.L.S., 1907.*

Range 7—Continued.

49. This township was reached from the Snake plain trail through the Mistawasis Indian reserve. The trail was a very good one and easy to travel on owing to the dry nature of the soil. A great part of the soil in this township is light or sandy, parts of the south and west being somewhat heavier. The soil as a whole is better adapted for grazing or ranching than for farming, as the grass in the woods is very good and there is also plenty of water. The surface of this township is nearly all wood or covered with light scrub. There are a few openings in the northeasterly parts of the township. There is no timber of any commercial value on the township, being chiefly small poplar and scrub. There are no hay marshes or lands, as around the lakes the land is dry. The water is generally good being fresh and not very alkaline anywhere. There are no streams of any size and consequently no water-powers. There is plenty of wood fuel, but there are no indications of coal, of any fixed rock, nor of any kind of mineral. Game is scarce, none of any sort being seen. The soil and surroundings would indicate that the township could be utilized for ranching, there being plenty of pasture in the woods but the scarcity of hay would be a drawback.—*James Warren, D.L.S., 1907.*

Range 8.

11. This township was reached from township 12, range 7. The soil is light but of good quality and is suited for agricultural purposes. The surface is rolling prairie with no timber. Fresh water is found in the Notukeu creek, which crosses sections 18, 19, 20, 29, 28, 27, 26 and 36, and averages thirty links wide, two and one-half feet deep and has a current of one and one-half miles per hour. There are no water-powers. Hay grows in the small hay marshes scattered through the township, a large hay marsh occurring in section 6. The hay is marsh grass of good quality. The climate is moderate with light frosts at the time of survey (September.) Fuel consists of a little brush found along the creek. No stone quarries nor minerals were found. Antelope and ducks were the only game.—*J. L. R. Parsons, D.L.S., 1907.*

12. This township was reached from township 12, range 7. The soil is light and sandy and on account of the hills suited only for grazing. The surface is rolling and hilly prairie with no timber. A little hay is to be found in the few small hay marshes in the township. Water is scarce. A little was found in marshes which had not dried up, but no creeks were found and consequently no water-powers. The climate is moderate with sharp frosts at the time of the survey, (September.) No fuel, stone quarries nor minerals were found. Antelope was the only game.—*J. L. R. Parsons, D.L.S., 1907.*

Range 9.

11. This township was reached from township 12, range 9. The soil is light, with much sand and gravel, and is suited only for grazing purposes. The surface is rolling and hilly prairie with no timber. Marsh grass of good quality is found in a number of small hay marshes throughout the township. Fresh water is found in the small marshes and in the middle branch of Notukeu creek. This creek, which crosses sections 7, 18, 17, 20, 21, 22, 23 and 24, averages thirty links in width, two and one-half feet in depth and has a current of one and one-half miles per hour. No water-powers occur. The climate is moderate, with light frosts at the time of survey—October. Fuel consists of a little brush found in the valley. No stone quarries nor minerals occur. Antelope and duck were the only game.—*J. L. R. Parsons, D.L.S., 1907.*

Range 9—Continued.

12. This township was reached from township 12, range 8. The soil is sandy and light, and suited for grazing purposes. The surface is rolling and hilly prairie, with no timber. Marsh grass and red top were found in a few scattered hay marshes. Fresh water was scarce and was found only in a few marshes and in a small lake in section 35. No creeks and no water-powers occur. The climate is moderate, with light frosts at the time of survey—October. No fuel, stone quarries nor minerals were found. Antelope and ducks were the only game.—*J. L. R. Parsons, D.L.S., 1907.*

Range 10.

11. This township was reached from township 12, range 9. The soil is light in quality but is fairly well suited for agricultural purposes. The surface is rolling prairie with no timber. Fresh water was found in the small marshes in the township, in a large marsh in section 22, which drains into Turkeytrack lake, and also in Notukeu creek and its branches. One branch, Mosquito creek, flows southerly through sections 19, 18, 17 and 8, joining the main creek in section 5. This is twenty links wide, one foot deep and has a current of one and one-half miles per hour. Old Notukeu creek flows through sections 5, 4, 9, 10, 11 and 12. It is thirty links wide, one and one-half feet deep and has a current of one and one-half miles per hour. No water-powers occur. The climate is moderate, with light frosts at the time of survey—October. The only fuel is a little scrub found along the creeks. No stone quarries nor minerals occur. Antelope and ducks were the only game.—*J. L. R. Parsons, D.L.S., 1907.*

12. This township was reached from township 12, range 9. The soil is light with much gravel and sand and is suited only for grazing purposes. The surface is rolling and hilly prairie with no timber. Marsh grass of good quality is to be had in the few hay marshes in the township. Fresh water is scarce and is found only in the few small marshes which occur. No creeks nor water-powers occur. The climate is moderate with light frosts at the time of survey—October. No fuel, stone quarries nor minerals were found. Antelope was the only game seen.—*J. L. R. Parsons, D.L.S., 1907.*

Range 11.

47. This township is reached from township 49, range 12, by travelling south to an old trail called the Carlton trail, running southeast to township 47, range 11. This trail is not much travelled in the eastern part, although it is in good condition. Settlers have travelled to this township without any trail from the west for timber, which they cut on section 31. One of my party went to town for supplies by going west across country to Meeting lake postoffice, which is situated on township 47, range 13, and from there following a new trail until he struck the road leading from town to township 49, range 12. The soil is generally a layer of six to twelve inches of sandy loam over a sandy clay subsoil, well adapted for farming, but if hay were more plentiful it would be a good country for ranching, with its numerous valleys and sloughs giving an abundance of water. Gravel and stones are found on every section, but as this is one of the features of the surrounding country the settlers seem to be quite satisfied with their lot. The surface is hilly and in places very broken, in fact, it is one of the most hilly townships which I have survey for a few years. Slopes rising to one hundred feet are frequent, but there are very few coulées with sides steep enough to be an obstacle to travel. From an elevation situated on the southwest quarter of section 16 we had a view of the country for ten

Range 11—Continued.

miles all round except where the sight was blocked by the hill situated on the north boundary of section 10. The north part of the township, especially the northeast, is covered with poplar of fair proportions. On section 31 there was a fine grove of spruce, now cut for the most part by the settlers. It was one of the few places where spruce was found in this township. In fact, there is not a great amount of commercial timber in this section and it would be safe to preserve the timber on sections 33, 34 and 35 for the use of settlers. Besides a mile and a half in the north containing a certain amount of timber the township is a succession of patches of open prairie, extents of scrubby prairie and areas covered with willow brush and scattered bluffs of poplar from four to eight inches in diameter. The largest space of open prairie is situated partly in sections 28 and 21, encroaching towards the east of sections 22 and 27. But although the remainder of the township is not all prairie the bush can easily be cleared, and there exists actually on every quarter section enough of open land to give plenty of farming land to a new settler. Hay is not plentiful. Although the place is within the reach of settlers none have come this way for hay, they seem to prefer going north. However, around the edges of the numerous sloughs existing here there is a fair quantity of hay in some places sufficient to save a good crop. Water is good all over. There are no water-powers, and fuel is not plentiful, except in the north part. No stone quarries nor minerals exist. Duck and prairie chicken were the only game seen, although quite a few tracks of moose and deer were observed.—*Geo. P. Roy, D.L.S., 1907.*

Range 12.

11. A good trail from Swift Current affords easy and convenient access to this township. The soil is chiefly loam with clay subsoil making good farm land when not too rough for cultivation. The surface is chiefly open prairie, more than half of the township being very rough. There is no timber except in sections 11, 14 and 23 where there are clumps of willow along Russell creek. The only hay obtainable is a light growth on the uplands. Russell creek traverses the township from northwest to southeast. It has a rapid flow of excellent water which seems to be permanent in this township, but soon after leaving it, becomes entirely absorbed in the lower flats beyond. The width of the creek varies from five to thirty links and the depth from six to eighteen inches. The climate is good and summer frosts do not appear to do any damage, but the precipitation of moisture is light. A small quantity of brush along the creek affords a meagre supply of fuel, but there is no other source of supply nearer than Swift Current. There are no stone quarries or minerals of economic value. The only kinds of game seen were a few antelope and duck. This township is well adapted for ranching purposes fully half of it being too rough for cultivation. The only settlers are the Russell brothers who occupy section 23 and have a small ranch.—*Geo. Edwards, D.L.S., 1906.*

12. A good trail from Swift Current affords access to this township. The soil is chiefly sandy loam with hard clay subsoil, and is well adapted for farming. The surface is open prairie, with no timber of any kind. There are no areas of good hay. Water is scarce and can be obtained only by digging wells. The usual rainfall is light, summer frosts are not frequent, while other climatic conditions are favourable. There is no fuel in this locality and coal would have to be obtained from Swift Current. There are no stone quarries and no minerals of economic value. A few antelope were the only game seen. There are no settlers in this township at present. —*Geo. Edwards, D.L.S., 1906.*

Range 12—Continued.

49. The route to this township runs west from North Battleford fourteen miles, thence northwest to this township. The first part is an old well-beaten trail extending about twenty-five miles from the town. From there it is merely a track of recent date, made by the settlers, but is in good condition. The soil is sandy loam from six to ten inches deep, suitable for farming. The surface along the north and east boundaries of section 7 is hilly, with a hill about two hundred feet high along the south boundary. The remainder is gently rolling throughout. Except section 6 and a small part of section 7 the township is all bush, mostly heavy bush especially in the northern part. The timber is poplar from eight to fifteen inches in diameter with scattered spruce along the lakes and sloughs, and also some birch. There are a few hay sloughs on the south part of sections 5 and 6 and on section 10, but hay is scarce elsewhere. The water is good wherever found, in the streams and sloughs as well as in two large lakes, Meeting lake on the south and Deserter lake in the northwest corner. These two fine lakes abound with pike. The climate is the same as that of Battleford. We had frost in the beginning of August. Wood the only fuel, is plentiful. Although stones are found on every section there are no quarries nor minerals in the township. There were plenty ducks in Meeting lake, but other game seems to be scarce.—*Geo. P. Roy, D.L.S., 1907.*

Range 13.

10. A good trail from Swift Current affords convenient means of access to this township. The soil is chiefly a heavy stiff clay overlaid in most places with loam from four to twelve inches deep. The surface is open prairie with no timber of any kind. There is some good hay land on sections 1, 2 and 3. A creek enters this township in section 18 and leaves it on the south boundary of section 2. It contains good water and has a rapid current. Its average width is about twenty links and its depth twelve to eighteen inches. A small creek from the north enters it near the southeast corner of section 18. There are no other creeks of any account. The climate is good, although the average rainfall is light. Summer frosts do not seem to prevail. No fuel supply is available nearer than Swift Current. There are no stone quarries nor minerals of economic value. The only kind of game noticed was antelope. There are no settlers here at present. Part of the land is suitable for cultivation, but it is on the whole better adapted for grazing.—*Geo. Edwards, D.L.S., 1906.*

11. A good trail from Swift Current affords means of easy access to this township. The surface is prairie without any timber. There are no hay meadows. A small creek crosses sections 35 and 36. It has good water and a rapid permanent current. In the northern part of the township there are three small creeks with good water but there is little or no flow in dry weather. The average fall of rain or snow appears to be light. Summer frosts are not frequent while other climatic conditions are favourable. Fuel is not obtainable here, the nearest source of supply being Swift Current. There are no stone quarries or minerals of economic value. No game was seen except a few antelope. There are no settlers in the township at present, but it will doubtless be taken up in the near future as about half of it is good for general farming.—*Geo. Edwards, D.L.S., 1906.*

49. This township can be reached either by the trail running northeast nearly direct from Battleford to township 49, range 14 and thence west, or from the road leading to township 49, range 12 which strikes near the southeast corner of this township. Most of the trails are only tracks followed by settlers. The soil is mostly

Range 13—Continued.

a layer of eight to ten inches of sandy loam over a sandy clay subsoil, well adapted for farming. The surface of this township is rolling covered in the south part with scattered bunches of poplar, willow brush and scrub with generally a good piece of scrubby or open prairie in every section, which makes the settling of this part very easy. The middle part is more wooded and the northern sections contain heavy timber and thick bush with few openings. Except around the lakes, where there are some spruce, the timber is poplar of very little value except as fuel. There is a certain quantity of hay in the township especially on section 5 but the settlers near by had to go north for most of the hay they required for the winter. There are a large number of sloughs and lakes in this township, the most remarkable being a large and deep lake on sections 28 and 27, and Deserter lake in the northeast corner. Pike are plentiful in these lakes. Water is good wherever found. The climate appears to be good although we had slight frosts in the latter part of July. The available fuel is wood and the supply is plentiful especially in the north part. There are no water-powers in this township, no stone quarries nor minerals of any kind. Game consists of chicken and numerous duck.—*Geo. P. Roy, D.L.S., 1907.*

Range 14.

49. We reached this township by the graded road running due north from North Battleford for a distance of fifteen miles, and thence by following an old trail called the Buffalo lake trail for the remainder of the distance. Mostly all through the soil is a coat of sandy loam six to ten inches deep over a sandy clay subsoil, altogether suitable for farming. The surface is rolling covered with a growth of scrub, willow brush, bluffs of poplar four to ten inches in diameter, and also patches of open and scrubby prairie. There is no spruce nor any kind of commercial timber. The only wood is a small quantity of poplar. The densest wood is found in the northeast corner of the township. There are a few hay sloughs, the largest covering nearly half of section 24. Poplar is the only fuel readily available, but it will not last long after the country is settled. There are no water-powers, stone quarries nor minerals of any kind. Game appears to be scarce. The climate is the same as in Battleford.—*Geo. P. Roy, D.L.S., 1907.*

50. Ths township can be reached by the trail running northerly from Battleford to township 49, range 14, where it crosses on section 33 what is called the Buffalo lake trail, coming also from this town. This trail enters into the township by crossing the south boundary of section 3 and leaves it on the east boundary of section 13. The soil is mostly a coat of sandy loam, six to ten inches deep over a sandy clay subsoil well adapted for farming. The soil in this township is better than in any of the other townships forming part of my contract. The surface is rolling and covered with a succession of patches of open prairie, scubby prairie which a good fire would clear, and large spaces containing small poplar, willows and scattered bluffs of poplar. There are no spruce groves, the only wood of the kind being on the shores of the lake situated on the east boundary of sections 25 and 36. It is on these two sections also where the heaviest and densest timber is seen, penetrating from there into sections 26 and 35. There is also quite an amount of fairly large poplar on sections 13 and 24, and large extents covered with it on the other sections, but these extents are intersected with spaces of prairie, scrub, small willows and small poplar. There are hay sloughs on every section, but the largest ones are situated on section 3 and sections 23 and 24. The hay in those sloughs was cut this year by settlers from the south. The water is good everywhere

Range 14—Continued.

in the sloughs and the lakes. The climate is the same as in Battleford. The only kind of fuel known is wood and the supply, especially in the south part of the township, cannot last long if not carefully looked after. We saw no stone quarries nor minerals of any kind. Plenty of duck, some prairie chicken, and a couple of scared deer constituted the game that we saw here, but this part of the country has the reputation of being a very good game country.—*Geo. P. Roy, D.L.S., 1907.*

51. The southern part of this township is reached by following the graded road fifteen miles due north from North Battleford and the Buffalo lake trail running northeast to township 49, range 14, through which it runs nearly north until it reaches section 33 where we left it to go into township 50, range 14; across this last township we travelled to township 51, range 14, on a trail of our own. The northern part can be reached by a trail which crosses it diagonally on sections 30, 31 and 32. I was informed that this trail comes from Jackfish lake but I could not ascertain where it leads after leaving township 52, range 14, along the east outline of which it runs for three miles. It is in good order. The surface is rolling covered in the southwestern part with patches of light scrub, willow brush and scattered bluffs of small poplar. Brush and bush thickened gradually going northeast until on sections 35, 36, 24 and 25 we met a dense wood of poplar, spruce and jackpine six to eighteen inches in diameter. There is, however, no extent of commercial timber of any consequence, poplar being nearly the only kind all over. However, near the centre of section 24 we saw two groves of fine spruce ten to twenty inches in diameter, each about three or four acres in area. The soil is a coat of sandy or black loam six to twelve inches deep over a sandy clay subsoil; gravel being found in some parts. Although the soil is light it is well suited for farming. Hay is found along the edges of the large sloughs and in some of the smaller ones, but there is no great quantity of slough hay. Water is good all over the township in the sloughs and the lakes. There are no streams and consequently no water-falls. The only fuel available is poplar and there is sufficient of it for many years to come. There are no stone quarries nor minerals of any kind. We saw no game during the survey, except a few duck. The climate is the same as that of Battleford.—*Geo. P. Roy, D.L.S., 1907.*

52. We reached this township by opening a trail of our own which leads from the Buffalo lake trail in township 49, range 14, through townships 50 and 51, range 14, to the wagon trail crossing the south sections of this township. I was informed that this wagon trail came from North Battleford through the Jackfish Lake settlement. It enters township 51, range 14, on section 30, leaving it in section 32, then runs nearly west across sections 5, 4, 3 and 2, northeast across section 1 and part of 12, then along the outline in and out of the township until it leaves it on section 24. I followed it to the base line, which it crosses in a northeasterly direction on the south boundary of the east half of section 32. It is a good wagon trail. The soil is a coat of sandy or black loam over a clay or sandy clay subsoil and the surface is rolling. Along the east boundary of section 36 the country is covered with a thick growth of poplar eight to ten inches in diameter to a coulée about fifty feet deep at the northeast corner of section 25. Along the east boundary of sections 25 and part of 24 there is a thick growth of two-inch poplar and small brush followed by poplar six to ten inches in diameter. From the stream crossing on section 24 to the end of this meridian, the bush is thick poplar with some jackpine and spruce. It grows in size until on the east boundary of section 1, we found spruce from ten to eighteen inches in diameter, and poplar eight to fifteen inches in diameter. We found no hay sloughs along this line. The water is good in the small streams which crosses the line. There were no

Range 14—Continued.

water-powers in this township. Wood is the only fuel available. There is a quantity of it all over the township. We saw no stone quarries, nor minerals of any kind. Game was scarce. This climate is the same as that of Battleford.—*Geo. P. Roy, D.L.S., 1907.*

Range 15.

49. This township is reached without any difficulty from the Battleford-Birch Lake trail which passes through township 49, range 16, being from one-half to three miles west of the line between the ranges. The trail is a good one and, although there are two creeks to be crossed, makes the township easily accessible. The soil throughout the township is more or less uniform, consisting of two to three inches of black loam over a subsoil varying from sandy clay to clay, with gravel in some places. Stones and boulders occur to a small extent. Except the southwestern corner of the township the surface is hilly, being much broken by coulées. The northern and western portions of the township are covered with scrub poplar and willow and the western portion with clumps of poplar varying in diameter from four to eight inches. The southeastern portion is more open, although more or less scrub occurs. While no large hay sloughs occur hay could be cut from around nearly all the small lakes or ponds throughout the township. Grass is abundant and of good quality. Several ponds, marshes and small lakes occur in the northern and central portions of the township. Losthorse creek rises in section 25 and flows generally southwest leaving the township in section 4. This with the exception of a small creek in section 5 constitutes the only outlet. Losthorse creek varies from ten to twenty-five feet in width, and from two to four feet in depth with a current averaging about two and a half miles per hour. The water throughout the township is excellent and the supply is permanent. No water-power is available. Besides some marshes adjacent to the creek no land would be flooded. General climatic conditions were favourable, but frosts occur early in the year. Fuel, consisting of poplar, is abundant. No coal or lignite veins economically valuable, minerals or stone in place were discovered. Sand-hill crane, duck of various kinds and prairie chicken were common. Indications of moose and deer were noticed although no large game was seen.—*H. S. Holcroft, D.L.S., 1907.*

50. The old Carlton-Regina trail crosses the northeastern portion of this township entering section 24 and leaving near the northeast corner of section 34. This trail joins the Battleford-Birch lake trail in township 51, range 15. From Battleford the township is easily reached by the trail to Birch lake which passes within half a mile of the southwest corner and enters section 31 near the northwest corner of the township. Both of these trails are in good condition and make the township easily accessible. The soil is rather uniform, varying from two to eight inches of black or sandy loam with a subsoil varying from clay to sandy clay. Stones and gravel occur slightly, but are by no means troublesome. The surface is generally gently rolling, but the northeast corner is rather heavy. The surface is covered with scrub poplar, an willow throughout, while all but the southeast portion is covered with a more or less heavy growth of poplar, ranging from five to twelve inches and averaging about six inches in diameter. Several hay sloughs occur, notably in sections 34, 27, 29, 20 and 17. Grass is abundant. Excellent water occurs thoughout the township. Several small lakes and treams making the supply permanent. Outside of the sloughs and marshes mentioned no land is liable to flooding. No water-powers exist. Stone in the shape of boulders suitable for building purposes, occurs to a small extent, but

Range 15—Continued.

no stone in place or minerals of economic value were discovered. Fuel is abundant, consisting of dry poplar. The general climatic indications were favourable but summer frosts are more or less frequent. Tracks of moose and deer were common, although no animals were actually seen. Duck, a few geese, sand-hill cranes and some few chicken were noticed.—*H. S. Holcroft, D.L.S., 1907.*

51. The trail from Battleford to Birch lake enters this township through sections 6, 7, 17 and 20. In section 20 it branches, one branch going westerly around Birch lake, and the other going easterly, passing through sections 21, 22, 23, 24 and 25. These trails are moderately good and make the township easily accessible. By trail the south end of this township is about fifty miles northerly from the town of North Battleford. The soil is a light covering of black loam from about two to six inches deep on a top soil of sandy loam or clay loam with usually a subsoil of clay or clay loam. This soil should produce excellent crops of the usual products of the soil in this province. Practically the whole of the surface is covered with a growth of varying density of scrub poplar and willow. Sections 1 to 12, inclusive, and sections 17, 18, 19 and 30 are more lightly covered than the remainder of the township. Bluffs of poplar and balm of Gilead from three to ten inches in diameter occur frequently in the above mentioned sections. The whole of the northeastern portion is densely covered with scrub, moderate sized poplar and balm of Gilead. Some small open spaces occur in sections 1, 2, 3, 10, 11 and 12. An occasional small spruce was seen in the eastern part of the township. The surface is nearly level in the western portion, rolling in the middle and somewhat hilly in the eastern portion. A small amount of hay could be cut around some sloughs in the southwestern portion of the township. The rest of the township contains very little hay except very small amounts around the edges of very small sloughs scattered throughout the township. A large hay meadow occurs on the boundary between sections 12 and 13. Birch lake occupies a great portion of the northern part of the township. This lake presents a very rough outline, having several large points extending out into the lake and several deep bays extending into the land. In sections 30, 29 and 20 the shores are not well defined, being marshy. Several small lakes and sloughs occur throughout the township. Broughton lake in sections 13, 14 and 24 is a long and very narrow lake lying between high banks. Though very narrow, averaging only about one-eighth of a mile in width, it is very deep and contains a large quantity of fish. Birch lake is very plentifully stocked with pike and pickerel, and I believe whitefish also. All the water is fresh and is sufficient and permanent. No power could be generated from falls or rapids. A heavy frost occurred on the 12th of August, but apparently did no harm. This season was very wet and somewhat cold, but the climatic conditions seemed in general to be favourable. Fuel, in the shape of poplar and balm of Gilead, is plentiful throughout all the township. No coal or lignite veins were seen. Boulders and stones occur in small numbers on the surface. Throughout the township no stone in place or any economically valuable minerals were encountered. Game is rather scarce, a few duck and an occasional prairie chicken were seen, also some traces of deer, bear and muskrat. Badger, coyotes and gophers were scarce.—*H. S. Holcroft, D.L.S., 1907.*

52. The western portion of this township is reached without any considerable difficulty by the trail from Battleford to Birch lake, a branch of which passes round the west of Birch lake, entering the township in section 7. Another branch of the same trail enters the township in section 18. In wet weather both these trails are very difficult to travel, as the first follows the west and north shores of Birch lake, while the other passes in close proximity to the southern shore of Long lake, the

Range 15—Continued.

shores of both lakes in these places being marshy. The soil throughout the township is very uniform and in most places of first class quality, consisting of from two to ten inches of black or sandy loam with a subsoil varying from sandy clay to clay. Pebbles and stones occur but seldom, and never in such quantities as to hinder agricultural operations. The surface is gently rolling, there being two general slopes, one towards the northwest drains into Long lake, while the other, comprising practically all the township, drains into Birch lake. Spruce is found scattered all over the township and around Birch lake. While much of the larger timber, especially that adjacent to Birch lake has been cut, there still remains a considerable quantity of good timber, averaging about twelve inches in diameter, although some trees thirty inches in diameter were noticed. A few tamarack occur in the northeastern portion of the township. Poplar and balm of Gilead occur uniformly throughout the township, having a maximum diameter of about fifteen inches and averaging about eight inches. Jackpine in small quantities occur on nearly all the ridges in the central and northern part of the township, having a maximum diameter of twenty-two inches, but averaging about ten inches. Some poplar and willow occur all over the township. The marshes along the north shore of Birch lake and all around the shores of Long lake would supply an immense quantity of fine hay, especially sections 17 and 20, although in a wet season much of this would be difficult to cut. A few meadows scattered throughout the township would slightly augment the supply of hay. The water throughout the township is excellent, due, no doubt, to the fact that the moss and marshes form excellent reservoirs, keeping the creeks full of pure cold water. Several of these flow south into Birch lake. This lake occupies practically all of the southern two tiers of sections and extends also into township 52, range 16. The water is good. The shore presents a very broken appearance and is generally ill-defined, being marshy for the most part and often separated from a lagoon or marsh by a thin fringe of boulders. Long lake, which occupies practically all of sections 19, 30, 31 and parts of sections 29 and 32, is a fine sheet of clear, cold water, extending far to the north. A small lake occurs on the east outline in sections 24 and 25. A few small lakes and sloughs scattered throughout the township still further increase the water supply. No water-powers occur. Although the summer of 1907 was extraordinarily wet the general climatic indications were favourable, the nights being cool and the days moderately warm. Frosts occurred on August 1st and 2nd, but apparently no harm resulted. Fuel is plentiful throughout the township. No coal, lignite or minerals of economic importance were discovered. Stone suitable for building purposes in the shape of boulders and irregular pieces of rock occur in several places on the shores of Birch lake, but no stone in place exists. Game, while not abundant, is frequently found. A moose cow and calf were seen on Birch lake. Several varieties of duck, a few ruffed grouse, some pelican, sandhill crane and muskrat were noticed. Traces of deer and bear were observed. Both Long and Brick lakes contain an immense quantity of fish including pike, pickerel, sucker and whitefish.—*H. S. Holcroft, D.L.S., 1907.*

Range 16.

8. The route to reach this township is by trail from Swift Current. This trail runs south to township 10, range 14, from which point we went in a southwesterly direction to the northeast corner of the township. It is a good hard road most of the way. The soil is for the most part about six inches of clay loam with a clay subsoil and is suitable for grazing being covered with good grass. The whole township is prairie with a little scrub along a small creek in section 35. The surface is mostly

Range 16—Continued.

rolling but in some places quite hilly. The water is good and many springs appear in the hills but none large enough to be utilized for water-power. The climate is good. There is scattered stone suitable for building but no indication of other minerals of economic value. The wild animals found were antelope, coyote, badger and gopher.—*J. Waldron, D.L.S., 1907.*

52. The township is reached without difficulty by means of the Battleford-Birch Lake trail, which enters the township from the southeast in section 2. The soil consists of from three to seven inches of black loam with a subsoil varying from sandy clay to sandy loam. Stones and small boulders occur in several parts, but are not of sufficient size or quantity to hinder agricultural operations. The southern part of the township is covered with clumps of poplar and willow scrub but towards Birch lake, which lies in the southeastern part of the township, these become more dense and much heavier. To the east and north of Midnight lake which occupies a large portion of the western part of the township some spruce and a few tamarack occur. Although much of this has already been cut there are perhaps fifty or sixty thousand feet of lumber still standing, the trees considered averaging eight inches in diameter. Between Midnight lake and Long lake, which occupies the northeast corner of the township, the country is gently rolling and covered with poplar and balm of Gilead averaging six inches in diameter, and dense scrub and underbrush. Thus, except the southern part, the township is heavily wooded and fuel, consequently, abundant. Excellent hay meadows occur in the south and, in fact, grass is everywhere abundant. A large hay slough occurs to the west of long lake. The southwestern part of the township is level the remainder being gently rolling. Three large lakes enter the township on the west. Midnight lake occupies nearly all of sections 7, 18, 19, 30, 17, 20, 29, 28, 21 and 22. The water while slightly brackish is not at all bad. Several streams enter the lake, the largest, formed by the union of creeks from Birch and Long lakes, is about ten feet wide, and from two to four feet deep with a current of two miles per hour. Long lake lies in the northeast occupying sections 36, 25 and 24. The water is clear and the shores sandy. Birch lake, although a very large body of water, occupies only sections 1 and 12 of this township. The water is good although not so clear as that of Long lake, the shores being more marshy. No water-power exists. The days are warm and the nights are cool but so far (July) no summer frosts have occurred. No coal or lignite is known to occur, nor was any stone in place found. While deer, bear and moose undoubtedly exist, the only game seen consisted of duck which were exceedingly abundant. The lakes, especially Birch and Long lakes, contain an abundance of fish. The two southern tiers of sections are reserved for Indian lands and are exceedingly well adapted for ranching or for farming. Several itinerant bands of Indians of a rather fine type were met with around the lakes. One rancher has done considerable work to the south of Midnight lake and reports it as an ideal ranching district, the stock finding ample shelter amongst the dense clumps of scrub, and hay being everywhere abundant.—*H. S. Holcroft, D.L.S., 1907.*

Range 17.

8. The route to reach this township is by trail from Swift Current to township 10, range 14. From here we travelled in a southwesterly direction to township 8, range 16, and then west to range 17. The soil varies from a sandy to a clay loam of about six inches with a gravelly or clay subsoil. The whole surface is rolling, open, prairie, no timber of any kind being found, and is very suitable for grazing. A few sections in the northern part of the township are suitable for farming. There are no

Range 17—Continued.

large hay meadows but good hay could be cut on the high ground. There is plenty of fresh water in small sloughs and in springs that rise in the southeast and northwest parts of the township. There are no water-powers. The climate is good, only a few frosts occurring even in the early part of October. The nearest fuel is about twenty miles west in the Cypress hills. There is some surface stone, but no minerals appear. Antelope, coyote, badger and gopher are plentiful.—*J. Waldron, D.L.S., 1907.*

Range 18.

8. This township is most easily reached by a trail running south from Gull lake to some settlers' homes in township 9, range 19. From here it is good travelling across the open prairie into township 8, range 18. This trail is good at all seasons of the year. The soil is mostly eight inches of light loam with a clay subsoil, and is suitable for farming or grazing purposes. The eastern part of the township is quite rolling while the western part is quite smooth and is very good farming land. Grass is abundant everywhere. There is no timber and the nearest fuel is in the west side of township 8, range 20. Water is not very plentiful on the surface in autumn but where obtained it is fresh. No water-powers occur. The climate is good. Some stone can be had in the southern part of the township but there are no indications of minerals. Antelope, badger, coyote and gopher are plentiful.—J. *Waldron, D.L.S., 1907.*

Range 19.

8. This township is best reached by a trail from Swift Current which enters the township at the northwest corner. It is hard and passable at all seasons of the year. The soil is mostly a sandy loam with a clay subsoil, and is suitable for agricultural purposes. The surface is mostly level except in the south where it becomes more broken. No wood is found in the township but it is to be had in the west side of range 20 of the same township. There is also a little wood in a coulée south of this township. Hay can be had anywhere in the township and in large quantities in the central part. Fresh water is plentiful in Rock creek which passes through the township from one to two miles from the east boundary. Sloughs are not plentiful but there are two lakes with water only slightly alkaline. No water-power is available. The climate is good. In the south there are a few scattered stones and some indications of soft coal which is plentiful, and has been mined in the township to the south. No other minerals of economic value appear. Game is not plentiful although some antelope were seen. Coyote, gopher and badger are numerous.—*J. Waldron, D.L.S., 1907.*

Range 20.

8. This township is reached by a trail from Gull lake which enters the northeast corner of the township. The soil varies from sandy loam to clay and gumbo with clay subsoil. The surface is fairly level in the eastern and southeastern parts of the township. The central and southern part is broken by Swiftcurrent creek. On the west side are the Cypress hills, at the foot of which is Jones creek, a branch of Swiftcurrent creek. Between the creeks is a level bench of good prairie. The level part of the township is suitable for farming while the sections through which the creeks pass is especially suitable for ranching. Hay can be had in quite large quantities on the level sections. Fresh water is plentiful in the creeks, and several springs occur in hills along the creeks. The flats along the creeks could be made quite fertile by irrigation and some work has been done along that line by some of the settlers.

Range 20—Continued.

There are no water-powers available. Wood is found only on the western side of the township in the coulées, and some indications of coal appear in the Cypress hills in section 18. The timber is principally poplar and willow with some spruce and is very suitable for fuel and building purposes. Scattered stone is present in the broken parts, but no minerals besides coal appear. The only animals seen were coyote, badger, gopher and a few prairie chicken.—*J. Waldron, D.L.S., 1907.*

Range 21.

8. This township is best reached by a surveyed trail from Maple creek which enters the township on the west side in section 18. The soil is mostly clay loam with a clay subsoil. The surface is rolling in the west while the central and eastern part is hilly The township is open prairie except the coulées on the eastern side. These are generally wooded with poplar and willow, while a few good spruce occur. The timber is suitable for fuel or building purposes. The whole township has abundance of grass and is especially well suited for grazing. Fresh water is to be found in several small lakes and in the coulées on the eastern side. Swiftcurrent creek rises in section 10 and flows south nearly parallel to the east side of sections 10 and 3. No waterfalls occur but the creek has sufficient fall to be used for irrigation purposes with good results. The climate seemed good but suggests the possibility of early frosts because of its high altitude. Scattered stone is plentiful. A very soft coal appears in section 13 but seems charred. No other minerals appear. Prairie chicken, coyote and badger were the only animals seen.—*J. Waldron, D.L.S., 1907.*

Range 27.

51. The surface of the township is from rolling to hilly. It is dotted all over with bluffs of poplar, many sloughs and patches of marsh. Four large lakes occur in the following sections, one in 14, one in 26 and 27, one in 31, and one in 32. The lakes in sections 14 and in 26 and 27 are much smaller than they were at the time of the original survey. These lakes have no outlet and rise and fall in wet and dry season the same as sloughs. The lakes in sections 31 and 32 have not changed much. They have an outlet are fed by springs and do not vary much in height. Big Gully, a permanent spring creek, flows out of the lake in section 32 through sections 32, 28, 30, 20, 17, 16, 9, 3 and 2. From section 29 it runs into 30 is there joined by a branch from the west and passes through a marsh from 30 to 29. From section 29 it runs through a valley from three-quarters to half a mile wide, formed by banks from one hundred to one hundred and fifty feet high. The stream passes through several stretches of muskeg, where it has no channel. The water in most of the sloughs is good, in the lakes in sections 31 and 32 and in the creek it is excellent. A limited quantity of building logs, fencing and fuel is found on every section. The soil is mostly a good sand loam with odd patches of clay loam on sandy and clay subsoils. It is generally second class. The southwest corner is the best part of the township. Hay is not very plentiful but a considerable quantity can be cut around sloughs and in the valley of the creek The trail from Lloydminster to Hewitt landing and Onion lake runs through sections 6, 7, 8, 17, 20, 21, 28 and 33. The creek is bridged where the trail crosses. A number of settlers have homesteaded and are making good progress. Northminster postoffice is on the northeast quarter of section 18. No stone is found other than scattered field stones around several sloughs and lakes and along the creek. There is no water-power that would be permanent. No minerals of economic value are found. Game is limited to badger, coyote, skunks, muskrat, prairie chicken, duck and geese, none of which were plentiful. The weather during the sur-

Range 27—Continued.

vey (October) was exceptionally fine. General appearances indicate a section of country that is supplied with a good deal of rain. Vegetation is excellent and water is good while the soil is rich and fuel plentiful. These conditions make it well adapted for mixed farming where stock raising would be the principal object. Horses, cattle, or hogs would do well, and if properly cared for the chances of failure with either would be slight.—*Wm. R. Reilly, D.L.S., 1907.*

52. The surface is rolling to hilly, most hill slopes being gradual and capable of tillage. There are many lakes and sloughs, the majority in the south half of the township. The water in all these water areas is fresh and much lower than at the time of the original survey. The lakes on the north boundary of section 9 and in the northeast quarter of section 8 have dried up very much. The lakes in sections 5 and 6 are fed by springs and have not changed much, the water in these is extra good. Small poplar bluffs and clumps of willow are dotted all over the township, the popular is small but affords a limited supply of fencing and firewood. On sections 6 and 7, south of the lake in 15, and south of the lake in 12, are belts of poplar with timber large enough for log buildings. The soil is mostly of fair quality being sand and clay loams on clay and sand subsoils. Hay of good quality can be cut around nearly all sloughs and lakes but no great quantity in any one place. This is not a grain district but it is well adapted for dairying, cattle and other stock raising in connection with general farming. A number of settlers have recently taken up homesteads and are making improvements. A trail from Lloydminster to Hewitt landing and Onion lake runs northeasterly through the township from section 4 to section 36. There is very little stone, no minerals of economic value, and no water-powers. Game is scarce, and is limited to badger, coyote, skunks, muskrat, gopher, prairie chicken, duck and geese. The weather during the survey was extra fine for the season of the year. Grain crops in this district were damaged by frost owing to the backward spring and late sowing.—*Wm. R. Reilly, D.L.S., 1907.*

53. Saskatchewan river enters this township in the north half of section 24 and leaves it in the north half of section 1 crossing the township in almost a straight line. Two large wooded islands are formed in the river one in sections 19 and 20 about three-quarters of a mile long, and one on sections 20 and 17 about half a mile long. The south bank of the river is very rough. A mile from the west boundary it extends back a mile in broken steeps rising to a height of over four hundred feet. It gradually falls towards the east to about two hundred feet above the river in section 1. The north bank is not so rough, it extends back about half a mile, rising to an average height of about two hundred feet. South of the river is very rolling or hilly. A number of lakes and sloughs are scattered over this part but are apparently much smaller than at the time of original survey. Bluffs and stretches of willow and poplar of small growth are thinly scattered over the upland and down the river bank. North of the river is a rolling bluff country, which gradually rises to the north. The most of the northeast quarter of the township is nearly covered with scrub poplar, odd clumps of spruce six to fifteen inches in diameter, small patches of tamarack six to ten inches in diameter and heavy willow, poplar, alder and other underbrush. Alternate bluffs of poplar, patches of willow and poplar scrub, and large prairie openings occur on the remainder of the tract north of the river. Over this whole area a number of sloughs and lakes are scattered. Large lakes cover a portion of the following sections west half sections 14 ,35 and 36, northeast quarter 33, northwest quarters 31, 21 and 22. Water in this lake is strongly alkaline. Water in the majority of sloughs and lakes is good. The soil is mostly sandy loam of fair quality but the northeast corner of the township is very light. A considerable quantity of hay can

TOWNSHIPS WEST OF THE THIRD MERIDIAN.

Range 27—Continued.

be cut in the northwest quarter of the township and a limited amount in other parts. The township is good grazing ground and well adapted for stock raising. Only a very few quarter sections are fit for farming but many small patches can be cultivated. General conditions show a temperate summer climate, with plenty of rain to produce excellent grass. The autumn was exceptionally fine; the river was not frozen over for safe crossing until November 25. A Hudson's Bay company's reserve covers the most of sections 12 and 13. The telegraph line from Battleford to Onion lake crosses sections 25 and 35. The trail from Lloydminster to Onion lake, via Hewitt landing, passes through the west half of sections 1, 12 and 13 and sections 24, 23, 26, 27, 28, 33 and 32. Hewitt landing postoffice and ferry, is on the northeast quarter of section 1, The postoffice and ferry takes the place of Fort Pitt which has been abandoned. There are no minerals or stone other than field and river boulders and no water-powers except what might be developed in any township on the river. Game was fairly plentiful, badger, coyote, muskrat, skunk, prairie chicken and ducks were often noticed. North of the river a few jumping deer were seen, also tracks of lynx, bear, mink and fox.—*Wm. R. Reilly, D.L.S., 1907.*

54. This is a fractional township composed of the south halves of sections 1, 2, 3, 4, 5 and 6. It is similar in appearance to the north part of township 53, range 27, being rolling to hilly, bluff country with sloughs, lakes, swamps and prairie openings. A large swamp runs through the south part of sections 1 and 2. The telegraph line to Onion lake crosses the west half of section 2. The trail from Hewitt Landing to Onion lake crosses section 5. Odd clumps of spruce and tamarack six to twelve inches in diameter occur in sections 1 and 2, and poplar in bluffs four to ten inches in diameter on every section. The soil is sandy loam. No minerals, stone quarries or water-powers occur. Game seen was coyotes, badgers, skunks, muskrats, prairie chickens and ducks.—*Wm. R. Reilly, D.L.S., 1907.*

Range 28.

54. This is a small fractional township, composed of the east three-fourths of the south half of section one. The surface is rolling to hilly prairie, with small bluffs of poplar and odd sloughs. A small lake cuts the northwest corner. The soil is sandy loam. There are no minerals, stone quarries or water-powers. No game was seen.—*Wm. R. Reilly, D.L.S., 1907.*

TOWNSHIPS WEST OF THE FOURTH MERIDIAN.

Range 6.

4. (*Part.*)—This township is reached by a trail leading from Medicine Hat to Milk river entering on section 35, and crossing it in a southwesterly direction. The soil is composed mostly of a light loam underlain by a clay subsoil and suitable for grazing purposes. A good crop of natural hay can be procured from a number of small marshes scattered throughout the township, and in order to increase the crop an irrigation ditch collecting the waters of a few small water-courses, was constructed by a ranching firm. The surface is that of a slightly rolling prairie dotted here and there with sage brush. The small streams flowing in this locality have not a permanent flow and at the time of the survey, water could be obtained only from pools in one of them, and at rare intervals along its course, but a permanent supply can be obtained at a few feet from the surface by sinking wells. The water is free from

Range 6—Continued.

alkali. No water-powers, stone quarries nor traces of minerals of economic value are known to occur in this township. The survey operations in this part were carried on towards the end of November during which time the weather was of course cold and wintry. This region receives the beneficient effects of the Chinook winds. No timber exists in this township. Coal for fuel can be procured at a distance of about twelve miles in an easterly direction. The only existing game is prairie chicken, but at the present they are very scarce.—*Louis E. Fontaine, D.L.S., 1907.*

27. This township may be reached by following a good graded road south from Lloydminster for about thirty-two miles along the fourth meridian, crossing Battle river about thirty miles south of Lloydminster, thence by a fairly good trail to the east side of Sounding lake where there is a small detachment of mounted police, thence along the valley and on the west side of Sounding creek crossing a branch of said creek coming in from the west about fifteen miles from the lake, thence over open rolling prairie to the township. The soil is generally heavy clay but on the higher ridges and hills there is gravel and stones. The surface is rolling prairie and is quite hilly on the east side of the township. There are only a few small hay marshes although there is considerable low flat land but it is alkaline with short grass and weeds not suitable for hay. The two lakes in this township are alkaline and were nearly dried up at the time of survey. There is a spring of good cold water in the northeast corner of section 2 at the head of an alkaline flat which extends across section 3. This flat has the appearance of being covered with water in the spring of the year but was perfectly dry at the time of survey (September) and could be driven over anywhere with the wagons. The only game seen was antelope. There are no water-powers, minerals or stone quarries.—*David Beatty, D.L.S., 1907.*

28. This township may be reached by following a good graded road from Lloydminster south along the fourth meridian for about thirty-two miles crossing Battle river about thirty miles from Lloydminster, thence by a fairly good trail to the east side of Sounding lake where there is a small detachment of mounted police, thence along the valley and on the west side of Sounding creek for about fifteen miles where I left the valley, thence over rolling prairie to the township. The soil in this township is mostly clay without any black soil on top and may be ranked third class. The surface is open rolling prairie with a few small patches of small poplar not large enough for fuel. The nearest good fuel is in the valley of a branch of Sounding creek coming in from the west about thirty miles distant. There is a large flat or lake (in the early part of the season) on sections 3, 4, 9 and 10. There was a little water in a few places at the time of survey but the horses could not reach it on account of wet ground and I was obliged to draw water from Sounding creek in township 30 for the horses and camp use. There was nothing but weeds growing on the driest part of this flat and I surveyed it as a lake. I found no good water in the township. There are no water-powers, minerals or stone quarries. The only game I saw was antelope.—*David Beatty, D.L.S., 1907.*

29. This township may be reached by following a good graded road south from Lloydminster for about thirty-two miles along the fourth meridian, thence by a fairly good trail to the east side of Sounding lake where there is a small detachment of mounted police, thence up the valley and on the west side of Sounding creek for about fifteen miles, crossing a branch of said creek coming in from the west, thence out of the valley and over rolling prairie to the township. The soil is generally heavy clay without any black soil on top and may be ranked as third class. The surface is rolling prairie without any timber, the nearest firewood is in the valley of the creek

Range 6—Continued.

crossed on the route from Sounding lake. The water is alkaline and is also very scarce, as the small sloughs dry up in midsummer There is very little hay land in the township. There are no water-powers, mineral or stone quarries. A few duck was the only game seen.—*David Beatty, D.L.S., 1907.*

30. This township may be reached by following a graded road south from Lloydminister along the fourth meridian for about thirty-two miles, crossing Battle river at thirty miles south of Lloydminster, thence by a fairly good trail to the east side of Sounding lake where there is a small detachment of mounted police, thence following the valley and on the west side of Sounding creek for about fifteen miles crossing a branch of said creek coming in from the west, thence over rolling prairie to the township. The soil of this township is generally heavy clay without any black soil on top and may be ranked as third class. The surface is rolling prairie with neither wood nor scrub. The nearest wood is in the valley of a branch of Sounding creek about fifteen miles distant. There are a few bunches of willow along Sounding creek which crosses the southern part of the township. There is very little hay land in the township. The only fresh water is that of Sounding creek. There are no water-powers or falls although small water-powers may be created by building dams across Sounding creek between the high banks. I saw no indications of coal, mineral or stone quarries. The only game I saw was antelope and duck, the latter being very plentiful on Sounding creek.—*David Beatty, D.L.S., 1907.*

31. This township may be reached by following a good graded road south from Lloydminster along the fourth meridian for about thirty-two miles, crossing Battle river about thirty miles from Lloydminster, thence by a fairly good trail to the east side of Sounding lake where there is a small detachment of mounted police, thence along the valley and on the west side of Sounding creek for fifteen miles, thence leaving the valley and over rolling prairie to the township. The soil is generally heavy clay without any black soil on top and may be ranked third class. The surface is slightly rolling prairie. There is no wood in the township, the nearest fuel is in the valley of a branch of Sounding creek coming in from the west and about twelve miles distant. I found enough fresh water in small sloughs for camp purposes but later in the season the sloughs were all dry. There is very little hay land in the township. There are no water-powers, minerals, or stone quarries. Duck was the only game seen in the township.—*David Beatty, D.L.S., 1907.*

Range 7.

27. This township may be reached by following a good graded road south from Lloydminster along the fourth meridian for about thirty-two miles, crossing Battle river about thirty miles from Lloydminster thence by a fairly good trail to the east side of Sounding lake where there is a small detachment of mounted police, thence along the valley and west side of Sounding creek for about fifteen miles, thence leaving the valley and over rolling prairie to the township. The soil in this township is principally clay without any black soil on top The surface is rolling prairie without timber or scrub and the nearest fuel that I know of is in the valley of a branch of Sounding creek coming in from the west about thirty miles distant. There are three alkaline lakes in the township on sections 3, 10, 9, 14 and 15. The only water I found fit for use was in a spring on the northeast quarter of section 9 near a lake on said section. There is very little hay land in the township, and no water-powers, minerals or stone quarries. The only game seen was antelope and ducks.—*David Beatty, D.L.S., 1907.*

Range 7—Continued.

28. This township may be reached by following a good graded road south from Lloydminster along the fourth meridian about thirty-two miles, crossing Battle river about thirty miles south of Lloydminster, thence by a fairly good trail to the east side of Sounding lake where there is a small detachment of mounted police, thence along the valley of Sounding creek about fifteen miles, thence leaving the valley and over rolling prairie to this township. The soil of this township is generally clay without any black soil on top and may be ranked as third class. The surface is rolling prairie without any timber or scrub. The nearest fuel that I know of is in the valley of a branch of Sounding creek coming in from the west about twenty-five miles distant. There is very little hay land in the township. I found no water, and was obliged to draw it from the south side of township 27, range 7, for my horses and camp use. There are no minerals or stone quarries. The only game seen was antelope.—*David Beatty, D.L.S., 1907.*

Range 8.

1 and 2. The best route for reaching this locality is by way of the police trail from Coutts, a station on the railway owned by the Alberta Railway and Irrigation company, in township 1, range 15. This trail leads directly to these townships and at the time of my visit (August) was in good condition. The soil on the uplands is generally a hard clay with a few patches that appear to be loamy, while in the valleys it is a clay or sandy loam very fertile but limited in quantity. The surface is very much broken by Milk river valley and by coulées leading into it, thus rendering travelling through these townships a rather difficult task. The only timber is in the valleys and coulées, and consists of willow and cottonwood of no great quantity or value. Hay was cut last summer in townships 1, ranges 8 and 9, in a number of places that had been fenced to keep stock away, but it was very short, averaging from six to eight inches. The only water of consequence is Milk river. It is fresh, but during the summer months becomes very low, and I am informed has at times ceased to run entirely. The bottom lands in the valley are liable to be flooded the extent and depth of the flooding depending entirely upon the season. There are no water-powers in this township. The climate is said to be equable with occasional summer frosts, but frequent and violent winds prevail through the entire locality. Both coal and wood are used for fuel in this township. They may be procured along the river and in several of the large coulées. Coal was dug by our party in section 36, township 1, range 9, and I was informed that in section 34 or 35, township 1, range 8, a vein had been opened by the settlers. Veins of weathered lignite were observed in several of the coulées in these townships, which would seem to indicate a very large supply of coal in this locality. There is an abundance of sandstone in the coulées. The harder varieties, which are easily obtained, make very good building material. No minerals of economic value were found by us in these townships. Coyotes, badgers, rattle snakes and a few prairie chickens were the only varieties of game noticed. There are several settlers and ranchers in these townships, and the Pend. d'Oreille Northwest Mounted Police post is situated on Milk river in township 2, range 8.—*A. H. Hawkins, D.L.S., 1907.*

3 and 4. The best route for reaching this locality is by way of the police trail from Coutts, a station on the railway owned by the Alberta Railway and Irrigation company, and situated in township 1, range 15. This trail leads directly past these townships, and at the time of my visit (August) was in good condition. The soil is a hard clay, but in places appears to be loamy. I think it is probably best adapted for cattle or sheep raising, except in the bottom lands of the Pend d'Oreille

Range 8—Continued.

coulée, where the soil seemed to be a very fertile clay loam, and where at the time of my survey there was a thick growth of blue-joint grass. This land would probably raise very excellent crops of hay or grain if cultivated, but the great drought to which this country is subject renders farming difficult. The surface is rolling prairie broken by Pend. d'Oreille coulée and the coulées entering it in the southern portion of township 3. No timber of any kind was seen in these townships. Hay might be cut in the coulées, but at the time of my visit thousands of cattle made the place a rendezvous. No water was crossed by the lines which I was directed to retrace in these townships. No water-powers, stone quarries or minerals of economic value were found in these townships. The fuel most easily obtained is coal, which may be dug in several of the coulées to the south of Milk river, although a small amount of wood along the river, chiefly small willows and cottonwood, is available for fuel on the river. The climate is said to be equable with occasional summer frosts, but frequent very high winds prevail throughout this locality. Coyotes, badgers, rattlesnakes and a few prairie chickens were the only varieties of game noticed.—*A. H. Hawkins, D.L.S., 1907.*

Range 9.

1 and **2.** The best route for reaching this locality is by way of the police trail from Coutts, a station on the railway owned by the Alberta Railway and Irrigation Company, in township 1, range 15. This trail leads directly to these townships and at the time of my visit (August) was in good condition. The soil on the uplands is generally a hard clay with a few patches that appear to be loamy, while in the valleys it is a clay or sandy loam very fertile but limited in quantity. The surface is very much broken by Milk river valley and by coulées leading into it, thus rendering travelling through these townships a rather difficult task. The only timber is in the valleys and coulées, and consists of willow and cottonwood of no great quantity or value. Hay was cut last summer in townships 1, ranges 8 and 9, in a number of places that had been fenced to keep stock away but it was very short, averaging from six to eight inches. The only water of consequence is Milk river. It is fresh but during the summer months becomes very low and I am informed has at times ceased to run entirely. The bottom lands in the valley are liable to be flooded, the extent and depth of the flooding depending entirely upon the season. There are no water powers in this township. The climate is said to be equable with occasional summer frosts, but frequent and violent winds prevail through the entire locality. Both coal and wood are used for fuel in this township. They may be procured along the river in several of the large coulées. Coal was dug by our party in section 36, township 1, range 9, and I was informed that in section 34 or 35 township 1, range 8, a vein had been opened by the settlers. Veins of weathered lignite were observed in several of the coulées in these townships which would seem to indicate a very large supply of coal in this locality. There is an abundance of sandstone in the coulées. The harder varieties which are easily obtained, make very good building material. No minerals of economic value were found by us in these townships. Coyotes, badgers, rattlesnakes and a few prairie chickens were the only varieties of game noticed. There are several settlers and ranchers in these townships, and the Pend. d'Oreille Northwest Mounted Police post is situated on Milk river in township 2, range 8.—*A. H. Hawkins, D.L.S., 1907.*

3 & **4.** The best route for reaching this locality is by way of the police trail from Coutts, a station on the railway owned by the Alberta Railway and Irrigation Company, and situated in township 1, range 15. This trail leads directly past these

Range 9—Continued.

townships and at the time of my visit (August) was in good condition. The soil is a hard clay but in places appears to be loamy. I think it is probably best adapted for cattle or sheep raising, except in the bottom lands of the Pend. d'Oreille coulée, where the soil seems to be a very fertile clay loam, and where, at the time of my survey, there was a thick growth of blue-joint grass. This land would probably raise very excellent crops of hay or grain if cultivated, but the great drought to which this country is subject renders farming difficult. The surface is rolling prairie broken by Pend. d'Oreille coulée and the coulées entering it in the southern portion of township 3. No timber of any kind was seen in these townships. Hay might be cut in the coulées but at the time of my visit thousands of cattle made the place a rendezvous. No water was crossed by the lines which I was directed to retrace in these townships. No water-powers, stone quarries or minerals of economic value were found in these townships. The fuel most easily obtained is coal which may be dug in several of the coulées to the south of Milk river although a small amount of wood along the river chiefly small willow and cottonwood, is available for fuel on the river. The climate is said to be equable with occasional summer frosts but frequent very high winds prevail throughout this locality. Coyotes, badgers, rattlesnakes and a few prairie chickens were the only varieties of game noticed.—*A. H. Hawkins, D.L.S., 1907.*

60. This township is easily reached from St. Paul de Metis by the old Onion lake and Lac la Biche trail which crosses the southwest corner of the township, also by a less used trail branching off from the former trail and traversing sections 3, 10, 15, 14, 23, 26 and 35. The township is fairly well watered by creeks but there are few sloughs with the exception of those in sections 23, 22, 26, 34 and 35. Yelling creek runs across the township from west to east. It averages six feet wide and one foot deep and contains excellent water. Wood is generally plentiful except in Yelling Creek valley. The timber is chiefly poplar from two to eight inches in diameter. There is also a ridge of excellent building jackpine and some spruce and tamarack in sections 10, 11, 14 and 15. No mineral of economic value was found. Moose, caribou, bears and other fur bearing animals and ducks are plentiful, but there are very few chickens and no fish. The soil is excellent being a rich black loam fourteen inches in depth with a clay subsoil. The growth of peavine and grass is most luxuriant, and upland and slough hay could be cut in great quantities. The township is excellently adapted for mixed farming or stock raising. Early frosts are rare.—*M. W. Hopkins, D.L.S., 1906.*

Ranges 10 and 11.

1. The best route for reaching this locality is by way of the police trail from Coutts, a station on the railway owned by the Alberta Railway and Irrigation Company in township 1, range 15. This trail leads directly past these townships and at the time of my visit (August) was in very good condition. The soil is a hard clay, in places appearing to be loamy, and is, I think, best adapted for cattle or sheep raising. In the ravines the soil appears to be more fertile, and is a sandy or clay loam. The surface is very rolling prairie and is cut by several deep couleés or gulches, three of which are Bear creek, Breed creek and Miners' gulch, all leading from the Sweet grass hills to Milk river. Neither timber nor hay lands were found in this township. Water at the season in which I visited this locality was all supplied by springs which are fresh and good. I understand, however, that all three couleés carry considerable streams during the spring. There are no water-powers in this township. The climate is equable, and although summer frosts have been experienced they are not frequent. Violent winds, however, prevail here at all sasons of the year. Coal and wood are

Ranges 10 and 11—Continued.

both used for fuel. Coal is generally obtained from the vicinity of Gold Butte, a small town in the state of Montana, some twelve miles south of the international boundary. Wood is obtained in the Sweetgrass hills south of the boundary. No stone quarries or minerals of economic value were found. Several settlers have located along the south boundary of these townships, on the bottom lands and appear to be making a living. Two of them have small irrigation systems fed chiefly from springs. —*A. H. Hawkins, D.L.S., 1907.*

Range 12.

1. The easiest route for reaching this township is by a very good trail following the international boundary from Coutts, a station on the railway owned by the Alberta Railway and Irrigation Company, and distant about twenty-five miles. The soil is a clay or sandy loam, with patches of gravel and clay, but owing to the very dry seasons is probably best adapted for cattle or sheep raising. The surface is rolling prairie traversed by Milk river along the north boundary, and cut by several large and deep couleés running north and south, while several spurs from the Sweetgrass hills project into this township. There is neither timber nor scrub, except what is found in the valley of Milk river and in the larger couleés where occasionally a thick bunch of willow scrub, a clump of poplars or cotton wood, is met with. There are no hay-lands in this township. The only water of consequence is in Milk river which flows through the northern portion of the township. The water is fresh, but during the summer months the river is very low, and I was credibly informed that it had on several occasions entirely ceased to flow. I understand that the bottom lands of the valley are flooded during the spring freshets. There are no water-powers in this township. The climate during the summer months is warm and dry and is said to be equable throughout the year with occasional summer frosts, but this district is subject at all times to violent winds. Coal and wood are both used as fuel by the settlers. A small quantity of wood, chiefly dried willow brush, may be obtained in places along Milk river and in some of the couleés. Coal is procured from Coutts, but traces of it were observed on couleés crossed by the east boundary of sections 31 and 32, and it would require but little development to make it available. No minerals of economic value were observed, but sandstone may be obtained along the valley of Milk river, and in the larger couleés. It is easily procured and seems to be very good building material. Coyotes, foxes, badgers, a few beaver along Milk river and prairie chicken were the only varieties of game noticed. There are several settlers along the valley of Milk river.—*A. H. Hawkins, D.L.S., 1906.*

7. The surface is principally an undulating and level prairie. Chin couleé, about one hundred and fifty feet deep, cuts across the southwest corner of the township. In and along the sides of this couleé a great many surface stones are found. The water of the lake in this coulée is about ten inches deep and suitable only for cattle. The soil is principally clay loam with a mixture of sand and a stiff clay subsoil. The grass is not very strong in this township, possibly due to successive prairie fires. There are no hay lands of any value, no timber, no quarries and no indications of coal or other minerals within the township.—*C. A. Magrath, D.L.S., 1907.*

8. This township varies from level to gently rolling prairie. Surface water, the result of some recent heavy rains, was available in a few small sloughs. Some surface stones are to be seen in the eastern portion of the township. The soil consists of a

Range 12—Continued.

sandy and clay loam with a clay subsoil and supports a fair growth of grass. There are no hay lands of any value, no timber, no quarries and no indications of coal or other minerals within the township.—*C. A. Magrath, D.L.S., 1907.*

Range 13.

2. The best road to reach this township is along the very excellent trail used by the Royal Northwest Mounted Police officers from Coutts, a station on the railroad owned by the Alberta railway and Irrigation company, in township 1, range 15 and distant about ten miles. The soil is a clay or sandy loam with patches of clay and gravel, but owing to the very dry seasons this locality is probably best adapted for sheep or cattle raising. The surface is rolling prairie, the southwestern portion being traversed by Milk river. The only timber found is in the valley of this river consisting chiefly of willow, cottonwood and poplar in very limited quantities. There were no hay lands observed in this township. The only water of consequence is Milk river, the water of which is fresh. During the summer months it is very low and has ceased to flow on several occasions. The bottom lands along the valley are subject to flooding during the spring freshets, the depth varying with the season. There are no available water-powers. The climate is equable with occasionally a summer frost but this entire locality is subject to very strong winds. Coal is the fuel most readily available and may be procured at Coutts. A small quantity of wood is found on Milk river, consisting chiefly of small dry willows. Sandstone in unlimited quantities may be obtained on Milk river and is of sufficiently good quality to be used as building material. No minerals of economic value were noticed. Coyotes, foxes, badgers, a few beavers and prairie chicken were the only game seen in this township. There are two settlers in the township, both of whom devote their attention to raising cattle and horses rather than farming.—*A. H. Hawkins, D.L.S., 1906.*

8. The surface of this township varies from level to gently rolling prairie. Some depressions or coulées occur in the southern portion of the township and surface stones are found in some of these couleés. The soil is a clay and sandy loam and has a depth of from 8 to 12 inches. There is a fair growth of grass in the township. Water, from recent heavy rains, was available in some small sloughs. There are no hay lands of any value, no timber, no quarries and no indications of coal or other minerals within the township.—*C. A. Magrath, D.L.S., 1907.*

65. The township is crossed from section 3 to section 31 by the public road going to Lac la Biche. The soil consists of a layer of black loam averaging five to six inches with a subsoil of clay or sandy clay, with stones in several places. The soil of about one-half of the quarter sections is first class, while that of a great part of the rest is second class. The township is fairly good for farming. It is well timbered, except a strip that extends from section 31 to section 1 consisting of open spots, or brush and small poplar. The timber is mostly poplar. In places cottonwood and birch are met with. Spruce and tamarack are seen only in small bunches, on more than one-third of the section lines, especially in the north and west of the township. The open spots seen in sections 29, 30, 31 and 32 give a limited supply of prairie hay. Slough hay is cut mostly around Hay lake. All the hay cut in the township will not amount to more than a few hundreds of tons. The water in the lakes is not fit to drink. That of Little Beaver creek is good. This creek traverses section 31. It nearly ran dry in the summer of 1906. Lacroix lake could be used to generate water-power in the spring, but in dry summers very little water flows out of it. The climate appears to be a little colder than that of Edmonton, although the winter of 1906-1907

Range 13—Continued.

was somewhat milder here than in many parts of Alberta. Dry wood is the most readily available fuel, as no coal is known to exist in the township. No stone quarries nor minerals were observed. Moose were plentiful during the winter of 1906-1907 in the western part of the township. Lynx, coyotes and foxes are found in the township.—*Raoul Rinfret, D.L.S., 1906.*

66. The township is crossed by the public road going to Lac la Biche, which goes through sections 6, 7, 18, 30 and 31. The soil consists of a layer of black loam, averaging about four inches, with a subsoil of sandy clay, and sandy clay and stones in several cases. The soil of over one-half of the sections is second class. Although there are some good homesteads to be found in the township, I do not consider that it is good for farming, speaking generally. The township is well timbered, except the southwest portion, where there are open spots. The timber consists of poplar, there being but little spruce. The southeasterly part of the township is heavily rolling, and the remainder ordinarily rolling. There is some fine spruce in section 13, and in a couple of islands in sections 22 and 27. The spruce met with in the rest of the township is only in small bunches south of Beaver lake. There is not much hay cut. The only hay areas are in sections 3 and 4, the amount cut probably not exceeding fifty tons The water of Beaver lake is very good, the outlet of which is called 'Little Beaver.' Although high in the spring it gets very low in dry summers. Beaver lake could be used to generate water-power. The lake is said to be some ten miles long and a dam built at the outlet would store a great quantity of water. The climate would be a little colder than that of Edmonton, although the winter of 1906-1907 was somewhat milder than in many parts of Alberta. Dry wood is the most readily available fuel as there is no coal found in the township. No stone quarries nor minerals occur. Duck are plentiful on the lakes of this township. Lynx, coyote and fox are not uncommon. *Raoul Rinfret, D.L.S., 1906.*

Range 14.

1. The best route for reaching this township is by a very good trail following the international boundary from Coutts, a station on the railway owned by the Alberta Railway and Irrigation Company, situated in township 1, range 15, and distant six or seven miles. The soil is clay or sandy loam with patches of gravel and clay, but owing to the very dry seasons it is probably best adapted for cattle or sheep raising. The surface is rolling prairie and the southeast portion is broken by a rocky spur from the Sweetgrass hills. There is neither timber nor scrub in any portion of the township. There are no hay lands and there was very little water at the time of my survey (September). The climate is equable, but occasionally summer frosts are experienced and this locality is subject at all times to violent winds. Coal is the fuel most easily procured and may be obtained at Coutts. No traces of it were noticed in this township. There are no stone quarries and no minerals of economic value. A few coyote, badger and foxes were the only varieties of game seen. No settlers have yet located in this township, although on several occasions inquiries were made as to when it was to be subdivided.—*A. H. Hawkins, D.L.S., 1907.*

2. The best road to reach this township is along the very excellent trail used by the Royal Northwest Mounted Police officers from Coutts, a station on the railroad owned by the Alberta Railway and Irrigation Company in township 1, range 15, and distant about ten miles. The soil is a clay or sandy loam with patches of clay and gravel, but owing to the very dry seasons this locality is probably best adapted for sheep or cattle raising. The surface is rolling prairie, the southwestern portion being

Range 14—Continued.

traversed by Milk river. The only timber found is in the valley of this river consisting chiefly of willow, cottonwood and poplar in very limited quantities. There was no hay lands observed in this township. The only water of consequence is Milk river, the water of which is fresh. During the summer months it is very low and has ceased to flow on several occasions. The bottom lands along the valley are subject to flooding during the spring freshets, the depth varying with the season. There are no available water-powers. The climate is equable with occasionally a summer frost, but this entire locality is subject to very strong winds. Coal is the fuel most readily available and may be procured at Coutts. A small quantity of wood is found on Milk river, consisting chiefly of small dry willows. Sandstone in unlimited quantities may be obtained on Milk river and is of sufficiently good quality to be used as building material. No minerals of economic value were noticed. Coyote, fox, badger, a few beaver and prairie chicken were the only game seen in this township. There are two settlers in the township, both of whom devote their attention to raising cattle and horses rather than farming.—*A. H. Hawkins, D.L.S., 1906.*

33. The best route for reaching this township is by a good wagon trail, which runs from Stettler on the Lacombe branch of the Canadian Pacific railway to Hunt's ranch in section 17, township 34, range 15, from there it is ten miles across prairie to the centre of this township. The soil consists of two to six inches of sandy loam with a hard sandy clay or clay subsoil, and should be described as being between second and third class. It is suitable for ranching purposes and to a lesser degree for mixed farming. The surface is generally undulating or rolling prairie, but in the south of this township the surface is rolling or steeply rolling. There is no timber of any description. Small hay meadows are scattered all through the township. Water is rather scarce in this township, there are two permanent lakes one in section 29 being six feet deep and containing fresh water, the other in section 1, being four feet deep and alkaline. There are two small creeks of fresh water running through this township which were almost dry at the time of survey (October), but there were pools of fresh water all along their beds. No water-power can be developed. The climate is similar to the Stettler district, summer frosts being rare. Coal for fuel can be obtained in this township in section 36, there is a small seam about 18 inches thick, where ranchers have already commenced mining it, and in sections 11 and 13 there are outcroppings of a small seam. Wood for fuel is very scarce and the nearest obtainable in any quantity is from the Handhills about thirty miles south. There is no stone or mineral. Antelope in small numbers is the only kind of game.—*R. H. Cautley, D.L.S., 1907.*

34. The best route for reaching this township is by a good wagon trail which runs from Stettler on the Lacombe branch of the Canadian Pacific railway to Hunts' ranch in section 17, township 34, range 15, from there it is twelve miles across prairie round the south end of Sullivan lake, to the centre of this township. The soil consists of three to four inches of sandy loam with a hard sandy clay or clay subsoil and should be described as being between second and third class. It is suitable for ranching purposes and to a lesser degree for mixed farming. The surface is undulating prairie. There is no timber of any description. Small hay meadows are scattered all through the township. Sullivan lake, which takes up one-third of this township, is very shallow in most places, and the water is slightly alkaine and very muddy, a great quantity of a fine whitish clay being held in suspension. Several small fresh water springs flow into the lake in this township and water should be easily obtained by digging wells. No water-power can be developed The climate is similar to the Stettler district, and summer frosts are rare. Coal for fuel can be obtained just south

Range 14—Continued.

of this township, and also in the township just north of it. Probably this township also contains coal. Wood for fuel is very scarce and the nearest obtainable in any quantity is from the Handhills thirty to thirty-five miles south. There is no stone or mineral. Antelope in small numbers is the only kind of game.—*R. H. Cautley, D.L.S., 1907.*

67. The township is reached by the road which follows the south side of Lac la Biche. This road passes through sections 14 and 15. The soil consists of a layer of black loam averaging from five to six inches with a subsoil of clay, sandy clay and in a few cases sandy clay with stones. The soil generally is second class and is fairly good for agriculture. The township is timbered, with a few small open spots in the western part. The timber consists mostly of poplar with patches of fairly large spruce and tamarack. These patches are pretty well scattered throughout the township. Spruce is not found in great quantities. Slough hay can be cut on the west side of Little Egg lake in several places, and some prairie hay in the southwest corner of the township. The water of Little Egg lake is good, but that of the other lakes is likely not fit to drink. The only stream of any importance is the outlet of Little Egg lake. The only water-power that could be obtained would be by damming the outlet of Little Egg lake, which might furnish some power in wet summers. The climate is somewhat colder than that of Edmonton. The most readily available fuel is dry wood. There are no stone quarries nor minerals in this township. There is but little game, as the township is near Lac la Biche settlement.—*Raoul Rinfret, D.L.S., 1906.*

68. There is no wagon road reaching the township, but there is one to township 68, range 13. The township can also be reached by crossing Lac la Biche from its south shore, where there is a wagon road. The soil consists of a layer of black loam, averaging six inches, with a subsoil of sand in the eastern part of the township and of clay or sandy clay in the western part. The western half of the township is good for farming. The eastern half consists of a layer of black loam four inches thick with a subsoil of sand, and would not be good for farming. The township is well timbered throughout. There is a large quantity of spruce and jackpine in the northern part of the township, with bunches of fine spruce of small extent. In the southern part of the township there are bunches of poplar and poplar mixed with spruce. Slough hay can be cut on the shore of Lac la Biche, but only in small quantities. The water in Lac la Biche is very good. There are no streams of importance in the township and consequently no water-powers. The climate is somewhat colder than that of Edmonton. The most readily available fuel is dry wood. There are no stone quarries nor minerals. Lynx, fox and coyote are common. Caribou and moose are likely to be found in the township.—*Raoul Rinfret, D.L.S., 1906.*

Range 15.

29. The route to this township is by trail from Stettler or Gleichen. The trail from Stettler is not so hilly as the other, but both are in good condition. Clay soil, in varying forms of consistency is found throughout. The surface is prairie without any timber. Two-thirds of the township is very hilly, while the balance is rolling. Handhills lake covers a considerable part of sections 6, 7, 18 and 19. This lake is in places over fifteen feet deep and was at one time much larger than at present, the level having fallen fully twenty feet. It has now no outlet, and only some very small creeks flowing into it. The water is very soapy, probably due to the presence of soda. There are no hay areas of any large extent. The nearest present available fuel supply is about ten miles distant, but it is quite likely coal will be found in this township.

Range 15—Continued.

Some was found in the pits on the north boundary of section 31. There are no stone quarries or minerals of economic value. Duck, geese and prairie chicken were seen in considerable numbers. The soil produces excellent grass, and there are springs and sloughs where good water is to be had, making this a good location for ranching, but the surface is too rough for agricultural purposes.—*Geo. Edwards, D.L.S., 1907.*

30. This township is accessible by trail from Stettler or Gleichen, the distance either way being about the same, and the trails being in good condition. The soil is chiefly clay, producing good grass and suitable for ranching purposes. The surface is prairie without any timber. There is some rolling land in the northeast quarter of the township, but fully two-thirds of the area is very hilly. There are no hay sections of any considerable extent. Water is to be found only in a few sloughs. There are no streams. The climate is good. There does not appear to be any special danger from summer frosts. There is no apparent fuel supply in the township. Coal is obtainable in the next adjoining township south. There are no stone quarries or minerals of economic value. No game was to be seen. The township is suitable for ranching, but too rough for agricultural purposes.—*Geo. Edwards, D.L.S., 1907.*

33. The best route for reaching this township is by a good wagon trail which runs from Stettler on the Lacombe branch of the Canadian Pacific railway to Hunts' ranch in section 17, township 34, range 15, some three miles across prairie from the north boundary of this township. The soil consists of three to four inches of sandy loam over a hard sandy clay or clay subsoil, and should be described as third class, it is suited only for ranching purposes, as the surface is steeply rolling prairie. There is no timber of any description but a few small hay meadows scattered all through the township. Water is very scarce; a few small fresh water ponds which are liable to dry up in summer are to be found and there are two small springs in the west part of the township. No water-power can be developed. The climate is similar to that in the Stettler district and summer frosts are rare. Coal for fuel can be obtained in the adjoining townships north and east. Wood for fuel is very scarce, the nearest obtainable in any quantity being from the Hand hills, which are about thirty miles south. There is no stone or mineral. Antelope in small numbers is the only kind of game.—*R. H. Cautley, D.L.S., 1907.*

34. The best route for reaching this township is by a good wagon trail which runs from Stettler on the Lacombe branch of the Canadian Pacific railway to Hunts' ranch in section 17 of this township, a distance of fifty-five miles roughly. The soil consists of three to six inches of sandy loam over a hard sandy clay or clay subsoil, and should be described as second class in the north part of the township and between second and third class in the south four miles, where it is very rolling. This would make a good ranching locality and the north part is suitable for mixed farming. The north part of the township is undulating and the south four miles is rolling or steeply rolling prairie. There is no timber of any description. Small hay meadows are scattered all through the township. Sullivan lake, which extends the whole length of this township, on the east sides, is very shallow in most places, the water is slightly alkaline and very muddy, a great quantity of fine whitish clay being held in suspension. There is another permanent lake called Hunt lake in sections 22 and 27, which is also alkaline and muddy. Fresh water is rather scarce though there are a few ponds and a large fresh water spring in section 17, which forms a small creek which flows into Hunt lake. No water-power can be developed. The climate is similar to that in Stettler district and summer frosts are rare. Coal for fuel can be obtained in the northeast quarter of section 34 of this township where there is a one foot seam of

Range 15—Continued.

good lignite coal overlaid by two feet of soft brown lignite. Wood for fuel is very scarce, a small amount of dry willow can be obtained around sloughs and ponds. There is no stone or mineral. Antelope in small numbers is the only kind of game.—*R. H. Cautley, D.L.S., 1907.*

66. There is a road from section 33 connecting with the road going through the settlement of Lac la Biche. The soil is fairly good for agriculture, half the sections being first class soil and the greater part of the rest second class. Nearly one-half of the township is covered by lakes, while the remainder is wooded. Spruce is met with in great quantities in the southern and southwestern parts of the township. There are many places where very big spruce are seen. Fine spruce are also found in the northeast corner of the township. The rest of the timber is mostly poplar. Spots of small poplar and willows are not uncommon. The southern part of the township is well timbered with fine spruce. Slough hay can be cut in certain bays of Big Egg lake and south of lake Tremblay. The hay is principally along the northwest end of Big Egg lake. The water of the big lakes is good. There is no stream of importance, except the outlets of Tawakwato and Long lakes. The only water-power which could be developed would be on the outlets of the two last named lakes, by damming up the lakes, although there is very little difference of level, apparently, between Tawakwato and Big Egg lakes. The climate is somewhat colder than that of Edmonton. The most readily available fuel is dry wood, as there is no coal found in the township. There are no stone quarries, nor minerals known. Moose was very plentiful in the south and southwest parts of the township. Fresh tracks and poplar with the bark partly eaten were numerous. The only other game was lynx and foxes.—*Raoul Rinfret, D.L.S., 1906.*

67. This township is reached by roads coming from Lac la Biche settlement. The soil consists of a layer of black loam averaging seven inches on a subsoil of clay or sandy clay, and in a few cases of sand and stones. The soil of the quarter sections is mostly first or second class and is suitable for agricultural purposes. The township is timbered in the southern part while there are open patches in the northern part. The timber is mostly poplar and willow. Spruce is found only in small patches throughout the township. In many places there is only small poplar. In many open spots several hundred tons of prairie and slough hay is cut every year. The water in the lakes of this township is not fit to drink, except that in Big Egg lake. There are no streams of any consequence nor is there any water-power. The climate is colder than that of Edmonton. Wood is the most readily available fuel, as there is no coal found in the township. There are no stone quarries nor minerals, but lynx and foxes are common, while good fish is abundant in Lac la Biche.—*Raoul Rinfret, D.L.S., 1906.*

68. The route by which to reach this township is along the road which follows the south side of Lac la Biche and crosses section 7. The whole township consists of about three sections. The soil belongs to classes one and two, being fairly good for agriculture. The surface is timbered, with spruce in section 31 and poplar in the other sections. Some slough hay might be obtained in section 31.—*Raoul Rinfret, D.L.S., 1906.*

Range 16.

29. The route to the township is by trail from Stettler or Gleichen. The distance is about the same either way. The trails are in good condition. The soil is chiefly clay loam with gravel or clay subsoil, and it is well adapted for general farming.

Range 16—Continued.

Good upland hay covers nearly half the township. Handhills lake takes up about four square miles of the area. This lake has fallen fully twenty feet within a few years. It formerly was the source of Bullpound creek but there is now no outflow of water. There are a few very small creeks flowing into the lake. The water appears to contain considerable soda, giving it a very soapy appearance and taste. There is a large pool of good water on the east side of the lake, separated from it only by a narrow bar. There are several springs of good water among the hills. The climate is good, summer frosts do not seem to be prevalent. There is no fuel within the township but coal is obtainable within 15 miles both east and west. There are no stone quarries or minerals of economic value. Geese, duck and prairie chicken were plentiful. This township is at present occupied by eight or ten ranchers none of whom have done anything in the way of agriculture. Fully seventy-five per cent of this township would make good farms.—*Geo. Edwards, D.L.S., 1907.*

30. This township can be most conveniently reached by trail from Stettler. The trail is in good order. The soil is chiefly clay or clay loam with gravel subsoil, suitable for general agricultural purposes. The surface is prairie with no timber. There are no large hay meadows, but a considerable portion of the township produces good upland grass which is used for fodder. There are a few small streams and several springs of good water. Bullpound creek traverses this township. It was formerly the outlet of Handhills lake, and a stream of considerable volume, but owing to the level of the lake falling about twenty feet, there is no longer any flow of water from it, and the creek is now merely a chain of pools. The climate is favourable and no special danger of summer frosts. There is coal obtainable near the west boundary of the township in township 30, range 17. There are no stone quarries or minerals of economic value. Duck and prairie chicken were seen. Fully one-half of the township is rolling, or nearly level, and the quality of the soil seems to be excellent for farming purposes. The balance is good grazing land but rather too rough for agricultural purposes.—*Geo. Edwards, D.L.S., 1907.*

33. The best route for reaching this township is by a good wagon trail which runs from Stettler on the Lacombe branch of the Canadian Pacific railway to Shellberg's ranch in section 29, of this township, via the south end of Gough lake, a distance of fifty-three miles, roughly. The soil consists of six to eighteen inches of sandy loam in the west half of the township and of three to six inches of sandy loam in the east half, over a sandy clay or clay subsoil. There is some first class land adjoining Farrell lake and all the west half of the township may be described as second class, and suitable for mixed farming. In the east half of the township the soil is not so good and should be described as being between the second and third class suitable for ranching purposes or to a lesser degree for mixed farming. The surface is gently rolling prairie with no timber of any description. There is a large hay meadow on the east boundary of section 32, where fifty or sixty tons of hay can be cut and there are several small hay meadows scattered through the township. Water is fairly plentiful, being supplied by five large lakes including Farrell lake and two small lakes, all of which except Farrell lake are slightly alkaline. Farrell lake which enters this township in sections 30 and 31 is about eight feet deep and the water is fresh although rather milky in appearance owing to some white salt which is held in suspension although cattle like it very much. The other lakes are all shallow and the water is both slightly alkaline and thick owing to some salt in suspension. There are

Range 16—Continued.

also several freshwater springs near the edges of the lakes. No water-power can be developed. The climate is similar to that of the Stettler district and summer frosts are rare. Coal for fuel is obtainable about ten miles to the south of this township but wood is very scarce, the nearest obtainable in any quantity being from the Handhills which are about thirty miles south. There is no stone or mineral and no game. —*R. H. Cautley, D.L.S., 1907.*

34. The best route for reaching this township is by a good wagon trail which runs from Stettler on the Lacombe branch of the Canadian Pacific railway to Spiers' ranch in section 16, of this township via the south end of Gough lake, a distance of fifty miles roughly. The soil consists of two to six inches of sandy loam over a hard sandy clay or clay subsoil. In sections 35 and 36 there is some first class land, the soil being deep and the surface level and there is quite a strip of fairly level prairie on the edge of this township which should be described as second class and suitable for mixed farming, but the largest part of the township is steeply rolling prairie and only suitable for ranching purposes. There is no timber of any description. Small hay meadows are scattered all through the township. Water is plentiful there being six permanent lakes, three of which are slightly alkaline and the others fresh, also there are four large freshwater springs in different parts of the township and numerous ponds, some of which are slightly alkaline but most of which are fresh. No water-power can be developed. The climate is similar to that of the Stettler district and summer frosts are rare. Coal for fuel can be obtained in the adjoining township east but wood for fuel is very scarce, the nearest obtainable in any quantity being from the Handhills which are thirty to thirty-five miles south. There is no stone or mineral and no game.—*R. H. Cautley, D.L.S., 1907.*

Range 17.

33. The best route for reaching this township is by a good wagon trail which runs from Stettler on the Lacombe branch of the Canadian Pacific railway to the Handhills and enters this township in section 30 leaving it in section 4. The soil consists of three to six inches of sandy loam over a sandy or sandy clay subsoil except in the west two miles of the township where the subsoil is more of a gumbo nature. The east part of the township should be described as second class although there is some land adjoining Farrel lake which may be called first class and is suitable for mixed farming, but the west two miles is more suitable for ranching purposes. The surface is gently rolling in character, and there is very little brush except for a narrow strip along the south shore of Farrell lake where there is some small grey willow. There is no timber of any description. There are small hay meadows scattered all through the township and three or four hundred tons of upland hay can be cut in sections 25, 26 and 27, along the edge of Farrell lake. Water is fairly plentiful, there being five permanent lakes, two of which are slightly alkaline and milky in appearance, the others including Farrell lake are fresh water. Farrell lake stretches right across this township from east to west, and averages about three quarters of a mile in width, it is about eight feet deep and the water is fresh although rather milky in appearance owing to some white salt which is held in suspension although cattle like it very much. There are also two spring-fed creeks which run into Farrell lake and which have deep pools of water along their course. No water-power can be developed. The climate is similar to that in the Stettler district, and summer frosts are rare. Wood for fuel is very scarce, but coal can be obtained about fifteen miles southeast of the township. There is no stone or mineral and no game.—*R. H. Cautley, D.L.S., 1907.*

Range 17—Continued.

34. The best route for reaching this township is by a good wagon trail which runs from Stettler on the Lacombe branch of the Canadian Pacific railway via the south end of Gough lake and passes through this township, entering it in section 30 and leaving it in section 1. The soil consists of three to six inches of sandy loam over a hard sandy clay or clay subsoil and should be described as second class, except in the south part of the township, where, owing to the hilly nature of the country, it should be described as between second and third class The north four miles of the township are suitable for mixed farming and the south two miles would make good ranching country. The north four miles of this township are gently rolling to rolling prairie, and the south two miles are rolling to steeply rolling prairie and there is considerable grey willow brush around the edges of sloughs and pounds. There is no timber of any description. There are numerous small hay meadows scattered all through the township. The supply of water is abundant, there being thirteen permanent lakes in this township, including part of Farrell lake, all of which are fresh water except No. 3, in which the water is slightly alkaline and very milky in appearance, owing to some white salt held in suspension. Besides these lakes there are numerous fresh water ponds, scattered all through the township. No water-power can be developed. The climate is similar to that in the Stettler district and summer frosts are rare. Wood for fuel is to be found in small quantities around ponds and sloughs, where there is a grey willow from two to three inches in diameter. There are no coal or lignite veins in this vicinity. There is no stone or mineral, and no game in the township.—*R. H. Cautley, D.L.S., 1907.*

Range 18.

29. The best route for reaching this township is either from Gleichen to Percieville on the Red Deer river across the government ferry and thence to the township by the trail over the Handhills, or from Stettler to the Imperial ranch in township 33, range 18, and thence across the prairie. Both trails are very good, but the latter obviates the river crossing and the high hills close to the river. The soil is usually a good loam suitable especially for grazing and mixed farming. The surface is open prairie, with no timber nor hay of any value. The water in Michichi and Willow creeks is good, but the supply is limited, both streams drying up in the summer. A few springs on the east boundary give a permanent supply in their immediate locality. There is no water-power available. Some frosts occur in June, July and September. The climate is similar to that of the district north of Gleichen. Coal is found in the surrounding townships east and west, but no coal or lignite was found in this township. There are no stone quarries and no minerals of economic value as far as observed. No game was seen in this township. The dipping station for the district north of Red Deer river is on the east boundary of this township.—*C. C. Fairchild, D.L.S., 1907.*

30. This township is best reached from Stettler over a good trail via Imperial ranch. The soil is clay with spots of black loam and gumbo suitable for ranching. The surface is prairie with no timber of any value and no hay. The water in Michichi creek is good but the supply is not sufficient as the creek goes dry in both branches in a dry season. The lake shown on the east boundary of section 31 is alkaline. There is no water-power available. The climate is rather drier than the surrounding district, and at present subject to summer frosts. No coal was found in the township, but it is easily obtained from Michichi creek to the west or in the Handhills to the southeast. There is no stone quarry in the township and no eco-

Range 18—Continued.

nomic minerals were observed. No game was seen in this township.—*C. C. Fairchild, D.L.S., 1907*

31. The township is best reached by trail from Stettler over a good trail via Imperial ranch. The soil is chiefly clay and a gumbo suitable for ranching. The surface is open prairie with no timber. About 300 acres of coarse hay is found in the southwest corner on the north boundaries of sections 31 and 32. Water in spring is good, but the creeks are alkaline and run dry in summer. A spring in section 29 is the only permanent supply. There is no water-power in this township. The climate is dry with some summer frosts. There are no coal or lignite veins in the township, but coal is found in Michichi creek to the southwest. No stone quarries or minerals of economic value were observed. No game was seen in this township.—*C. C. Fairchild, D.L.S., 1907.*

32. This township is most conveniently reached by trail from Stettler; the trail is good. The soil is chiefly clay and gumbo, and is suitable for ranching. The surface is open prairie with no timber. A course hay slough on section 20 contains about one hundred acres. There are no creeks with running water, and no water-powers. The climate is dry with some summer frosts. No coal, lignite, stone quarries or minerals of economic value were observed. No game was seen in this township. There was no water fit for camp use in this township and this survey was made from a camp in township 31, range 18.—*C. C. Fairchild, D.L.S., 1907.*

33. The best route for reaching this township is by a good wagon trail which runs from Stettler on the Lacombe branch of the Canadian Pacific railway to the Handhills and which passes through sections 35, 36, and 25 of this township. There is also a trail which branches off the above mentioned trail in township 34, range 18, and runs to the Gopher Head ranch in section 32 of this township. The soil consists of three to six inches of sand loam over a sandy clay or clay subsoil, and should be described as being between second and third class; part of this township is suitable for ranching purposes. The country is gently rolling prairie, and there is very little brush except in the extreme westerly part of the township, where there is some grey willow from two to three inches in diameter. There is no timber of any description. There are small hay meadows scattered all through the township. Water is rather scarce, there being only two permanent lakes, including Farrell lake, which just enters the northeast corner of this township and which is fresh water, the other lake in section 21 is slightly alkaline and rather milky in appearance. There is a spring fed creek which flows through this township into Farrell lake which has pools of water along its course, and there is a good fresh water spring in section 32. No water-power can be developed. The climate is similar to that of the Stettler district, and summer frosts are rare. Wood for fuel can be obtained in small quantities in the west part of this township and the township west of it where there are scattered clumps of gray willow from two to three inches in diameter. There are no lignite veins, coal, stone or mineral, and there is no game.—*R. H. Cautley, D.L.S., 1907.*

34. The best route for reaching this township is by a good wagon trail which runs from Stettler on the Lacombe branch of the Canadian Pacific railway to the Handhills and which passes through this township, entering it in section 31 and leaving it in section 2. Another branch of this trail, which runs east of Farrell lake, enters this township in section 34 and leaves it in section 25. There is also a good trail running to the Gopher Head ranch, in township 33, range 18, which branches off the first mentioned trail in section 19, and leaves the township in section 5. The soil consists

Range 18—Continued.

of from three to nine inches of sandy loam over a sandy clay or clay subsoil, except in the extreme north part of the township where the subsoil is largely gumbo. The land may be described as being between second and third class. Part of this township is suitable for mixed farming and it is all suitable for reaching purposes. The surface is gently rolling to rolling prairie in the south part of the township and level or undulating prairie in the north two miles and there are scattered clumps of gray willow from two to three inches in diameter with small poplar in the south half of the township. There is no timber of any description, but there are small hay meadows scattered all through the township, and there are large hay marshes in sections 29, 30, 31, and 32, where about seven hundred tons of very poor quality hay can be cut, the hay in these marshes being thin and largely fox-tail. Water is plentiful in the south half of the township where there are numerous ponds, most of which are fresh water. But in the north half of the township water is very scarce. There are two permanent lakes, including a small part of Farrell lake, which is fresh water, the other lake being slightly alkaline and milky in appearance. No water-power can be developed. The climate is similar to that of the Stettler district and summer frosts are rare. Wood for fuel can be obtained in small quantities in the south half of this township, where there is some dry willow from two to three inches in diameter. There are no lignite veins, coal, stone or mineral. There is no game.—*R. H. Cautley, D.L.S., 1907.*

Range 19.

29. This township is most easily reached from Gleichen via Rosebud creek over a good trail. The soil is generally a heavy clay loam suitable for mixed farming. The surface is rolling prairie, but Michichi creek cuts through the township in the bottom of the coulée from one hundred and fifty to two hundred and fifty feet deep. There is considerable scrub and some timber suitable for fencing along the coulée bottom and sides. A considerable quantity of upland hay is cut in the township every year, aggregating to about one thousand ton. The water in Michichi creek is very good, but it dries up in the summer season, only a few springs being left, which furnish sufficient water the year around. There is no water-power. The climate is rather dry and summer frosts were observed in June and July. Coal is found in the township along Michichi creek in considerable quantities. There are no stone quarries in the township and no economic minerals were observed. A few deer were seen in the creek bottoms and duck in the sloughs.—*C. C. Fairchild, D.L.S., 1907.*

30. This township is most easily reached from Stettler over a good trail. The surface is generally rolling prairie and there is no timber. The soil is clay loam suitable for mixed farming. There is about two hundred acres of slough hay in the township. The water in Michichi creek is fair, being slightly alkaline and the creek dries up in the summer, leaving water in holes only. There is no danger of flooding and no water-power. The climate is dry with some summer frost in June and July. Coal is found in abundance in the township south of this, and although none was seen in this township, I think it will be found here also. There are no stone quarries and no economic minerals. A few antelope were seen in this township.—*C. C. Fairchild, D.L.S., 1907.*

31. This township is best reached from Stettler over a good trail. The soil is clay loam, generally suited for mixed farming, with light sandy soil in the northwestern part of the township. There is no timbr of any value and no hay. The water in Michichi creek is very good, but the creek dries up in the summer. The sloughs are alkaline. There is no danger of floods, and no water-power. The clim-

Range 19—Continued.

ate is rather dry and summer frosts were observed in June and July. Coal is obtainable to the south and west along Red Deer river and Michichi creek. No coal or lignite was found in the township. There are no stone quarries and no economic minerals. A few antelope were seen.—*C. C. Fairchild, D.L.S., 1907.*

33. The best route for reaching this township is by a good wagon trail which runs from Stettler on the Lacombe branch of the Canadian Pacific railway to the Gopher Head ranch in section 32, township 33, range 18, one and one-half miles across prairie from the east boundary of this township. The soil consists of from two to six inches of sandy loam over a sandy clay or clay subsoil, and should be described as third class land owing to the hilly nature of the country, except for a few quarter sections in sections 17, 18, 19 and 20, which being fairly level may be called second class. This township is suitable for ranching purposes. The surface is steeply rolling prairie and there are scattered clumps of gray willow from two to three inches in diameter, with some small poplar all through the township. There is no timber of any description, but there are small hay meadows scattered all through the township. Water is plentiful, as there are numerous deep fresh water ponds all through the township, especially in the north half. No water-power can be developed. The climate is similar to that of the Stettler district and summer frosts are rare. Wood for fuel can be obtained in small quantities all through the township. There are no lignite veins, coal, stone or mineral. No game is found.—*R. H. Cautley, D.L.S., 1907.*

34. The best route for reaching this township is by a good wagon trail which runs from Stettler on the Lacombe branch of the Canadian Pacific railway to the Handhills, and which passes through section 30 of township 34, range 18, three-quarters of a mile across prairie from the east boundary of this township. The soil averages from three to six inches of sandy loam, over a sandy clay or clay subsoil and must be described as third class owing to the hilly nature of the country; it is suitable for ranching purposes. There are a few quarter sections in the northeasterly part of the township which are fairly level and may be called second class, which are suitable for mixed farming. The surface is generally steeply rolling prairie, with scattered clumps of gray willow from two to three inches in diameter and some small poplar. There is no timber of any description, but there are small hay meadows scattered all through the township. Water is plentiful, there being numerous fresh water ponds all through the township. No water-power can be developed. The climate is similar to that of the Stettler district and summer frosts are rare. Wood for fuel can be obtained in small quantities all through the township. There are no lignite veins, coal, stone or mineral. No game is found.—*R. H. Cautley, D.L.S., 1907.*

66. The pack trail from Athabaska Landing to Lac la Biche crosses this township on sections 30, 29, 28, 27, 26 and 25 and was opened for wagons by me as far as section 27. It is a good trail though rough in places. Black loam and clay subsoil prevails in the twelve northern sections but the southern part of the township is generally covered with swamps and muskeg, though patches of fairly good land are found all through it. It is suitable for mixed farming. The surface is all covered with a growth of spruce, poplar and willow mostly dry. There is no timber of any value. About fifty tons of hay can be cut on the south of sections 4 and 5. There is an ample supply of fresh water from lakes on sections 17, 22, 26, and also from Flat lake on sections 6, 7 and 18. Flat lake creek is a stream about fifty links wide by one foot deep and flows in sections 8, 19, 30 and 31 where it joins Pine creek. No land is liable

Range 19—Continued.

to be flooded. There is no water-power, and no indication of summer frost. Wood as fuel can be obtained on every quarter section. There is no lignite visible in the township. There are no stone quarries, nor minerals of economic value in sight in the township.—Game is scarce.—*J. L. Cote, D.L.S., 1907.*

67. (*East outline*).—The soil is very fair along sections 36, 25 and 24. Pine creek crosses the line on section 25 and a lake is struck on section 24 which is about three miles long by one wide. There is a large supply of fresh water but there is no water-power. The climate is good and there is no summer frost. The country is all wooded with poplar and spruce, but there is no timber of any value. There are no stone quarries nor any mineral of value.—*J. L. Cote, D.L.S., 1907.*

68. (*East outline*).—Swamps seem to cover a large percentage of this country with the exception of a few ridges of sandy soil.—*J. L. Cote, D.L.S., 1907.*

Range 20.

29. This township is best reached from Gleichen on the main line of the Canadian Pacific railway, via Rosebud creek. The trail is very good except the last ten miles which is very rough. The soil in the river bottom is generally hardpan or sand and unsuitable for farming. On the top of the high bank is a heavy clay loam suitable for mixed farming. The surface is generally prairie with small clumps of timber along each side of Red Deer river and in the bottom of Michichi creek coulées. The timber is cottonwood averaging about eight inches in diameter but not in sufficient quantities to supply the wants of the settlers. There is no hay in this township. There is plenty of good fresh water in Red Deer river and Michichi creek. Red Deer river averages about five chains in width, three feet in depth with a current of two and one-half miles an hour at low water. Michichi creek for the most part dries up in summer time. There is little danger of flooding. There is no water-power available. One or two frosts were observed in June but the climate is generally good but rather dry. Coal of very good quality is obtainable along the banks of the Red Deer river and Michichi creek, the seams varying from two to six feet in thickness at the surface. There are no stone quarries and no economic minerals were observed. Deer, duck, geese, and a few partridges were occasionally seen. The surface of the south half of this township is so badly cut up by Red Deer river, Michichi creek and other ravines averaging two hundred feet in depth with cut banks as to render that portion of the township practically of no value for settlement.—*C. C. Fairchild, D.L.S., 1907.*

30. This township is best reached from Stettler over a good trail. The soil is a very tough clay loam suitable for grazing or mixed farming and the surface is prairie with no timber. There are a few small hay sloughs in the central part of the township. Water can be obtained in Michichi creek in the eastern part of the township and one spring in Fox coulée in section 5. The water is fresh but the supply is rather small. There is no danger from flooding and no water-power. The climate is dry with an occasional summer frost. Coal for fuel can be obtained from the township to the south and west along Red Deer river. There are no stone quarries and no economic minerals. No game was seen in this township.—*C. C. Fairchild, D.L.S., 1907.*

31. This township is best reached from Stettler over a good trail. The south two-thirds of this township is a tough clay loam suitable for grazing and mixed farming. The balance is very hilly with numerous small sloughs. There is no timber nor hay

Range 20—Continued.

in the township. Water may be obtained in Michichi creek at the southeast corner and in the various sloughs and small lakes in the northern part, none of which are alkaline. There is no danger of floods and no water-powers. The climate is dry with an occasional summer frost. Coal may be obtained for fuel from the valley of Red Deer river to the west. There are no stone quarries and no economic minerals were observed. No game was seen.—*C. C. Fairchild, D.L.S., 1907.*

32. This township is best reached from Stettler over a good trail. The soil is a tough clay loam suitable for ranching and mixed farming. There is no timber in the township. Some hay is cut near the west boundary on an area of about one hundred acres. Plenty of fresh water is obtainable in the lakes. There is no danger of flooding and no water-power. The climate is dry with an occasional summer frost. Coal for fuel is obtainable from Red Deer river valley to the west. There are no stone quarries and no economic minerals. A considerable number of duck and geese were seen on the lakes.—*C. C. Fairchild, D.L.S., 1907.*

33. The best route for reaching this township is by a good wagon trail which runs from Stettler on the Lacombe branch of the Canadian Pacific railway, to the Hand hills, via Big Valley creek, and which passes through this township, entering it in section 33 and leaving it in section 1. The soil averages from three to six inches of black loam over a hard clay or sandy subsoil, and may be described as mostly third class and suitable only for ranching purposes, although in the north part of the township there are some fairly level quarter sections, which may be called second class, and are suitable for mixed farming. The northwest and east parts of this township are steeply rolling prairie, with scattered clumps of gray willow and some small poplar, but the central and southwest parts are fairly level and open prairie. There is no timber of any description but there are small hay meadows scattered all through the township. Fresh water is fairly plentiful in the hilly parts of this township, there being numerous fresh water ponds, but in the level parts the water is alkaline and scarce. Mudspring lake, a large lake in the centre of the township, is about five feet deep and is quite alkaline, the water being very milky. The edge of this lake is very soft and all around the lake are to be found mudsprings from four to fifteen feet in diameter and extending to a considerable depth, which I was not able to ascertain, but it was more than twelve feet. No water-power can be developed. The climate is similar to that of the Stettler district and summer frosts are rare. Wood for fuel is obtainable in small quantities in the northwest and extreme east parts of this township, where there is some dry willow from two to three inches in diameter. There are no lignite veins, coal, stone or mineral. No game is found.—*R. H. Cautley, D.L.S., 1907.*

65. A fairly good trail crosses the township on sections 18, 17, 9, 3, 2, and 12. About sixty per cent of this township is swampy but the remaining forty per cent has about four inches of black loam with a clay subsoil suitable for mixed farming. The surface is all wooded with poplar, willow and spruce from three to six inches in diameter. There is no timber of any value. About one hundred tons of hay could be cut on the west side of Flat lake. Flat lake covers about ten sections of this township and Pine creek touches the northwest corner of section 31. This, with several small creeks flowing into Flat lake, gives an ample supply of fresh water. There is no water-power. The climate is good and there is no indication of summer frost. Wood for fuel can be obtained on every quarter section but no lignite veins were observed. No mineral of any value was seen in the township. Very little game was seen. Flat

Range 20—Continued.

lake creek as the name indicates is rather shallow. It could be dug, being very rapid in some places, and thereby improve a large area of land in this township.—*J. L. Coté, D.L.S., 1907.*

66. The trail from Athabaska Landing to Lac la Biche, crosses this township from the southwest to the northeast corner. About fifty per cent of this township has a black loam soil with clay subsoil and is fit for mixed farming. The balance is spruce swamp. This township is all wooded with poplar, spruce and willow but there is no timber of any value. About one hundred tons of hay can be cut along Pine creek. Flat lake covers about two sections of the southeast corner and Pine creek crosses from the southwest to the northeast corner of this township. Both give a very good supply of fresh water. There is no water-power. Wood as fuel can be obtained on every section but no lignite veins were observed. There are no stone quarries and no minerals of economic value. Game is very scarce.—*J. L. Coté, D.L.S., 1907.*

67. (*East outlines*).—Along sections 36, 25, 24 and 13 the soil is a black loam with clay subsoil making it very fair. Sections 12 and 1 are in a large spruce swamp with hard bottom which will be drained some day.—*J. L. Coté, D.L.S., 1907.*

68. (*East outlines.*)—Swamp and muskegs prevail along this line with an occasional ridge which seems to divide them. The land may be classified as third class.—*J. L. Coté, D.L.S., 1907.*

Range 21.

29. This township is reached either from Stettler on the northeast side of Red Deer river or from Gleichen on the southwest side, over good trails. The soil in the river bottom and along Kneehills creek coulée is mostly hardpan and sand. On the high banks the soil is generally a good black loam suitable for mixed farming. The surface is generally prairie with clumps of cottonwood spruce and poplar along the river banks, in the Kneehills creek and in the ravines adjoining these. The timber averages ten inches in diameter, although there are some trees measuring two feet in diameter in the river bottom; it will all be required by the settlers. Good upland hay can be obtained on the top of the high banks in large quantities. Plenty of good fresh water is obtainable from Red Deer river and Kneehills creek. A few springs are found in this township. Red Deer river has an average width of about five chains, a depth of three feet and a current of two and one-half miles per hour. There is little danger of flooding, and no water-power is available. The climate is dry with occasional summer frosts. Coal is obtainable along the banks of Red Deer river. There are no stone quarries and no economic minerals were observed. A few deer were seen in this township.—*C. C. Fairchild, D.L.S., 1907.*

30. This township is reached either from Stettler on the east side of Red Deer river, and Carbon on the west side of the river over good trails. The soil in the river bottoms is mostly hardpan and sand with very little growth. On the high banks the soil is generally a good clay loam and black loam suitable for mixed farming. The surface is generally prairie with clumps of cottonwood, poplar and spruce along Red Deer river bottom and in the various ravines. Timber will average ten inches in diameter but the quantity is limited and will all be required for the settlers' use. Good upland hay can be obtained on the top of the high banks of the river in large quantities. Plenty of good fresh water is found in Red Deer river and in Threehills creek on the southwest side. Red Deer river has a width averaging about five chains,

Range 21—Continued.

with a depth of three feet and a velocity of about two and one-half miles per hour. There is little danger of flooding and no water-power is available. The climate is fine and dry with occasional summer frosts. Coal is obtainable along the banks of Red Deer river. There are no stone quarries and no economic minerals were observed. No game was seen in this township.—*C. C. Fairchild, D.L.S., 1907.*

31. This township may be reached either from Stettler on the east side of Red Deer river and Carbon on the west side of the river over good trails. The soil in the river bottom is mostly hardpan and sand with very little growth. On the high banks the soil is generally a good black loam, suitable for mixed farming. The surface is generally prairie with clumps of cottonwood, poplar and spruce along Red Deer river bottom and in various ravines. Timber will average ten inches in diameter but the quantity is limited and will all be required for the settlers' use. Good upland hay can be obtained on the top of the high banks in large quantities. Plenty of good fresh water was found in Red Deer river, which averages five chains wide, three feet deep and has a velocity of two and one-half miles per hour. There is very little danger of flooding and no water-power is available. The climate is fine and dry with occasional summer frost. Coal for fuel is obtainable along the banks of Red Deer river. There are no stone quarries and no economic minerals were observed. No game was seen in this township.—*C. C. Fairchild, D.L.S., 1907.*

65. There is a good trail from Athabaska Landing to the township and the settlers have opened trails to reach mostly any point of the township. The soil is chiefly of black loam underlain by a clay subsoil and is suitable for mixed farming. About sixty percent of this township is wooded and about forty per cent is scrub or growing poplar distributed all over the township, but no timber of any value is found. There is about one hunderd tons of hay along Pine creek. This creek is about twenty feet wide, one foot deep and gives an ample supply of fresh water. There is no water-power and none can be developed. There is no indication of summer frost and the climate is good. Wood as fuel can be obtained on every section but no lignite veins were observed. There are no stone quarries and no minerals of economic value. There is very little game.—*J. L. Coté, D.L.S., 1907.*

67. (*East outline*).—Along this line about forty per cent is a sandy or stony soil while the balance is divided between lakes, muskegs and swamps.—*J. L. Coté, D.L.S., 1907.*

68. (*East outline*).—Athabaska river flows in a northeasterly direction and crosses the line on section 25. The valley is about three hundred feet deep with a comparatively easy incline. The soil along sections 36, 25 and 24 may be classified as second class but along sections 13, 12 and 1 it is generally spruce swamp with some ridges.—*J. L. Coté, D.L.S., 1907.*

Range 22

10 & 11. (*Third correction line*).—The best route for reaching this portion of these townships is by following the road along the correction line, from Leavings, a station in range 26, on the Calgary and Edmonton branch of the Canadian Pacific railway. At the time of my visit (November) this road was in excellent condition. The soil is either clay or sandy loam and is apparently well adapted for farming as proved by the heavy growth of grass and the excellent crops of grain grown in the vicinity. The surface is rolling prairie with one small coulée cutting the eastern boundary. There is neither timber nor brush in these townships. A large pond of water held by a dam, evidently for watering stock, was noticed in the eastern portion of township

Range 22—Continued.

10, range 22, but wells ranging in depth from fifteen to forty feet are the source of water supply. There are no water-powers. Hay may be cut in many places, as the natural growth in this locality is very luxuriant. The climate is equable and is not subject to summer frosts, but violent winds prevail throughout the entire district. Coal is the fuel most readily available and may be procured at any of the mines in the vicinity of Lethbridge. What appears to be shale, that was probably contiguous to coal was observed where a well was being dug in section 7 township 11, range 22, and I was credibly informed that farther north croppings of lignite were found, and that some coal had been taken out by the settlers. There were neither stone quarries, nor minerals of economic value found in these townships. Coyotes, foxes and badgers were the only game noticed.—*A. H. Hawkins, D.L.S., 1906.*

24. The township is all bare prairie, varying from undulating to rolling. The soil is clay loam with a subsoil of stiff grey clay, mixed with a slight amount of gravel. In some places the banks of the stream average about fifty feet in height and are rather steep. Herbage generally is first class except about one-tenth of the township which is exposed subsoil.—*Wm. Pearce, D.L.S., 1907.*

66. Athabaska Landing is located in this township on the south bank of Athabaska river. The provincial government has opened a trail to Lesser Slave lake which crosses on sections 21, 28, 29, and 30, and is in good condition. The soil is very light or swampy and there are only patches of fair land suitable for mixed farming. Fires have burned most of the wood leaving windfall and a few scattered green trees. There is no timber but there is an ample supply of fresh water. No water-powers occur. The climate is good with no summer frosts. Fuel can be obtained in every section but no stone quarries nor minerals of any economic value are found. There is very little game.—*J. L. Coté, D.L.S., 1907.*

67. (*East outline*).—The country along this line is rather swampy or low. A lake about two miles long and one mile wide touches the line at section 25. There are very fair patches of land.—*J. L. Coté, D.L.S., 1907.*

68. (*East outline*).—Athabaska river crosses the line in a northeasterly direction on section 12, in a deep ravine. The surface is generally undulating and the soil is fairly good.—*J. L. Coté, D.L.S., 1907.*

Range 23.

60. This township is reached from the Athabaska Landing trail but there is no trail into the township farther than to the northwest corner. The soil is mostly light and stony, and fit only for grazing or farming on a small scale. The northwesterly half is rolling and covered with a thick growth of small poplar and willow with a few small swamps of green spruce to the south, also considerable windfall. There are small lakes of fresh water in sections 18, 19, 30, 31 and 8, but they are all surrounded by muskeg. The southeasterly portion of the township is more level and swampy and is covered with scrub and timber. The most timber is on sections 35 and 36 consisting of poplar and spruce six to eighteen inches in diameter. There is no hay in this township except in small sloughs scattered over it but these are more numerous in the southeasterly half. The water is fresh but when the timber is gone it will be scarce as there are very few streams at present. There is no water-power. Wood for fuel is plentiful at present on almost every section. There are no stone quarries and no minerals of economic value. No small game was seen, but tracks of bear and moose were numerous.—*Hugh McGrandle, D.L.S., 1907.*

TOWNSHIPS WEST OF THE FOURTH MERIDIAN.

Range 23—Continued.

67. (*East outline*).—Sections 36 and 25, 24 and 13 are very fair undulating land but the balance is fourth class.

68. (*East outline*).—Sections 36, 25 and 24, are in a tamarack swamp while sections 13, 12 and 1 are in good rolling second class soil.—*J. L. Coté, D.L.S., 1907.*

Range 24.

10. (*Third correction line*).—The best route for reaching this portion of the township is by following the road along this correction line from Leavings, a station on the Calgary and Edmonton branch of the Canadian Pacific railway in range 26. This road at the time of my visit (November) was in excellent condition. The soil is either a clay or sandy loam and is apparently well adapted for farming, as the heavy growth of grass and the excellent crops of grain grown testify. The surface is rolling prairie traversed by Rocky coulée through its western portion. There is neither timber nor brush in that portion of the township which we travelled. There are several springs along Rocky coulée which furnish water to the cattle in this locality, but the water is rather brackish, evidently being strongly charged with mineral salts. The settlers however all have wells ranging in depth from fifteen feet to two hundred feet, which appear to furnish sufficient water. There is no hay in the township nor were any water-powers observed. The climate is equable and so far as I heard is not subject to summer frosts, but frequent and violent winds prevail throughout this district. Coal is the fuel most readily available and may be procured generally at one of the mines in the vicinity of Lethbridge or at Leavings. A short tunnel has been driven in Rocky coulée in section 31, evidently prospecting for coal, and the material removed has the appearance of being in close proximity to coal, and I have no doubt but that further developments would reveal a coal bed at no great depth. Wood in small quantities, chiefly willow and cottonwood, can be obtained on Oldman river. There is considerable sandstone in Rocky coulée which would not be difficult to quarry, and would I think make fair building material. No minerals of economic value were found in this township. The only game noticed was a few coyotes and badgers. This township is fairly well settled, at least along the correction line, and the settlers appear to be prospering.—*A. H. Hawkins, D.L.S., 1906.*

13. This township is reached by a good trail from Claresholm, a flourishing town on the Calgary and Edmonton extension of the Canadian Pacific railway. The old Blackfoot trail passes through the township, but much of it has been fenced across by the settlers. The soil of the township is a deep sandy loam along Little Bow river, but it becomes heavier at some distance back from the river. The surface is rolling prairie entirely devoid of woods or scrub of any description. Hay of good quality can be cut all over the township, although the grass along the river is quite short owing no doubt to the sandy nature of the soil. The northern portion has a permanent supply of good water in the Little Bow. Little or no water-power is available. The climate is that of southern Alberta, generally, with but little danger of summer frosts. Good crops are grown throughout the township. Coal is the fuel used by the settlers and can be obtained from a mine worked within reasonable distance of the township. Outcroppings of stone were noted along the river, but no quarries are in operation. No minerals of economic value were seen. Game is very scarce.—*W. T. Green, D.L.S, 1907.*

65. (*North outline*).—On this line there is no green timber with the exception of a small swamp in the north of section 34. The soil is light and third class. The

Range 24—Continued.

land is rolling and covered with fallen timber and small scrub. On the north boundary of section 34 there is a high hill, from the top of which can be seen nearly the whole of townships 67 and 68, range 24, and for a long distance to the south and west.—*Hugh McGrandle, D.L.S., 1907.*

66. This township is reached by wagon trail from Athabaska Landing to Baptiste lake and around the north and west sides of the lake, but it is very rough from the landing to the lake. The soil in this township is very light and stony and is fit only for grazing or small farming. There are a number of half-breeds living on the north and west sides of Baptiste lake, but they cultivate only small potatoe patches. The surface of the township is very rolling and is covered with fallen timber, poplar and willow scrub. A high range of hills runs from section 3 to the south end of Baptiste lake on the east side of which are a few swamps with green spruce and tamarack and a few clumps of green timber along the lake shore; this is about all the green timber in the township. The only hay seen in this township was on sections 31 and 32. The half-breeds cut most of their hay for winter use in township 66, range 25. The water is fresh and sufficient. Baptiste lake extends to near the centre of the township, and numerous small creeks flow thereto from the west, south and east. Wood for fuel can be had on nearly every section. No coal or lignite veins were seen in the township. No stone quarries and no minerals of economic value were found. No game was seen but ducks. Baptiste lake is teeming with jackfish.—*Hugh McGrandle, D.L.S., 1907.*

67. This township is reached by wagon trail from Athabaska Landing which enters at the southeast corner and passes through sections 1, 11, 15, 22, 27, and 34. The road is very rough and in much need of repair from the landing to Baptiste lake. The soil in this township is rather light but suitable for mixed farming or grazing especially sections 12, 13, 14, 15, 22, 23, 24, 26, 27, and 34, where the soil consists of four to six inches of black loam over a sandy clay subsoil. The surface of this township is rolling, the east half is scrubby with patches of prairie and clumps of poplar and a few small swamps with green spruce. The west half is mostly timbered, especially sections 6, 7, 18, 19, 30, 31, 32 and 29, the timber consisting of poplar, spruce, birch and some jackpine; there are only scattered trees sufficiently large for making lumber. The east half of section 18 is mostly all birch and poplar from four to six inches in diameter. There are no large hay meadows in the township but there is some slough hay along the creek in section 16 and along the outlet of Baptiste lake, and patches of upland grass through the eastern part of the township. The water in this township is fresh and sufficient consisting of Baptiste lake in the southeast corner, lake No. 1, in the northeast corner, several small ponds scattered over the township and creek running diagonially across from section 31 into Baptiste lake in section 10. There is no land liable to be flooded except two or three acres at the east end of the bays of Baptiste lake in section 1. There are no water-powers in this township. There is plenty of wood for fuel on almost every section. There are no stone quarries, and no minerals of economic value are found. Small game is very scarce, a few partridges and ducks were seen, and plenty of jackfish are found in Baptiste lake and Lake No. 1. Sections 20, 21, 28, 29, 32, and the east halves of 30 and 31 are mostly all burnt swamp with islands of jackpine.—*Hugh McGrandle, D.L.S., 1907.*

68. This township is reached by wagon trail from Athabaska Landing which passes almost through the centre of the township from south to north, entering at the southeast corner of section 3 and leaving at the northeast corner of section 32. From

Range 24—Continued.

Athabaska Landing to Baptiste lake the trail is very rough and in wet seasons, muddy and generally in great need of repairs. From Baptiste lake north the trail follows a sandy ridge which in places has the appearance of a railroad embankment. The soil varies from a sandy loam to clay, with considerable surface stones in places especially in the eastern portion of the township; it is suitable for grazing or farming on a small scale. The surface is rolling and hilly and covered with poplar and willow scrub with clumps of green poplar over the central portion of the township. Sections 6, 7, 17, 18, 19, 30, 13, 24, 25, 35 and 36 are almost all covered with green timber consisting of poplar, spruce and jackpine from eight to ten inches in diameter. Some spruce will go as high as eighteen to twenty inches in diameter but not in sufficient quantities for lumbering purposes. The only hay in the township is along the creek on the east half of section 3 and a few small patches of high land grass on the southwest quarter of section 2. The water is fresh and sufficient. There are four fair-sized lakes, one in each corner of the township, but there are very few running streams. A creek twenty links wide and one foot deep runs out of the south end of lake No. 2 in an easterly direction over a stony bottom leaving the township on the east boundary of section 24 thence in a northerly direction entering the township again at the northeast corner of section 25, and leaving at the northeast corner of the southeast quarter of section 36. There is considerable hay along this creek in range 23. A creek flows from the southeast end of lake No. 3 in a northeasterly direction across the southeast corner of section 27 and through section 26 entering lake No. 2 in the southeast corner of section 26. This creek flows through a deep ravine over stones but contained very little water at time of survey (September). There are no water-powers in this township. No coal or lignite veins wer seen. No stone quarries or minerals of economic value were found. There is no small game except a few ducks but tracks of moose were plentiful and we noticed a spot near lake No. 2 where three had evidently been killed. There are plenty of jackfish of good size in lakes Nos. 1, 2, 3 and 4 in this township.—*Hugh McGrandle, D.L.S., 1907.*

Range 25.

65.(*East outline*).—The soil along this line is light and stony, only suitable for small farming or grazing, classed 3 and 4. The surface is rolling and scrubby and covered with fallen timber; there are numerous small swamps of green spruce but no timber of commercial value. There is a crooked lake in section 1 from five to ten chains from the line and extending the whole length of the section. There is another lake in section 7, township 65, range 24, touching the line at 25 chains and extending toward the northeast. No fish were seen in these lakes.—*Hugh McGrandle, D.L.S., 1907.*

Range 29.

10. Two main trails lead into this township, one from Macleod by way of Five-mile creek and the other from Leavings. These trails were in good condition until settlers, who have been coming into this and the adjoining townships in large numbers in the last year or so, fenced their quarter sections and changed the trails to the proper road allowances. Many of the roads were graded and bridges built during the summer, however, and the trails will soon be in good condition again. Porcupine hills, an extremely high and very rough range, extends diagonally through this township. The northeasterly part is open rolling prairie, while the hills are timbered with some fine fir, very straight and high. This timber is not very extensive and is being rapidly depleted by settlers. The prairie sections and the valleys between the hills afford

TOWNSHIPS WEST OF THE FOURTH MERIDIAN.

Range 29—Continued.

considerable hay. Fine streams of good fresh water are numerous. Many of them have their sources in the hills in the township and could be easily utilized for irrigation in dry seasons. None of the streams are large enough to generate water-power. Some light frosts were noticed in the early summer but despite the late spring the grass was abundant by the middle of May and the crops sown seemed to grow very fast. The timber on the hills affords fuel for the settlers and if carefully preserved will continue to do so for several years. There were no stone quarries in the township but plenty of limestone is available. No minerals of economic value were seen. Some deer and partridge were seen among the hills.—*C. C. Smith, D.L.S., 1907.*

TOWNSHIPS WEST OF THE FIFTH MERIDIAN.

Range 1.

13. This township is reached by a fair trail from Claresholm, a flourishing town on the Calgary and Edmonton extension of the Canadian Pacific railway and distant about thirty-five miles. This trail has been surveyed from Claresholm to Lyndon postoffice and is good in dry weather. From Lyndon to Lyndon mill a trail has been graded by the Lyndon Lumber company. This portion is almost impassable in wet weather but is very fair in a dry season. Lyndon mill is situated in section 11, of township 13, range 30 west of the fourth meridian. When running at full capacity it has an output of 12,000 feet of lumber per day, and supplies lumber to the settlers for miles around. Some good spruce and jackpine is found on section 1, township 13, range 1 west of the fifth meridian, and on section 2 township 13 range 30 west of the fourth, and from these two sections the lumber company have taken nearly all their logs. North of Lyndon creek the township is more or less open, and hay can be cut in fair quantities. The surface is very broken and hilly and is suitable for ranching only. Water of the finest quality is plentiful and permanent in Lyndon creek and its many tributaries, small spring creeks being numerous. Wood can be had in the south portion of the township both for fuel and building purposes. No minerals of economic value were noted. Game seems to be very scarce.—*W. T. Green, D.L.S., 1907.*

14. This township can be reached by a fair trail from Nanton which, however, traverses a high hill in the northeast corner of the township making the transport of heavy loads very difficult. In a very dry season or in winter this hill can be avoided by following a trail around the foot of the hill on the west side. In an average summer, however, the trail is impassable. The township is distant from Nanton about twenty-five miles. Nanton is a flourishing town on the Calgary and Edmonton extension of the Canadian Pacific railway. Five years ago, I believe there was only a station while now it is a thriving centre with a population of about 700. The soil is generally a black loam over clay and were it not for the danger of summer frosts, much of it would be excellently suited for agriculture. Willows postoffice situated in section 12 on Willow creek seems to be the point demarkation. Below there crops generally will mature but above that point on Willow creek only very occasionally will anything ripen. The township is essentially a ranchers' paradise. Grass grows luxuriantly and hay of excellent quality can be cut on much of the open land north of Willow creek. South of Willow creek, the country is hilly and covered with willow scrub and poplar. Spruce of fair quality is to be found on sections 12 and 13 of township 14, range 2. North of Willow creek the country is hilly but generally open. Water is both abundant and permanent. Willow creek, the south branch of Willow

Range 1—Continued.

creek and the many creeks and springs flowing into these provide an excellent quality of water. No water-power is available. Fuel is amply provided for in the bush south of Willow creek. No coal or lignite veins were noticed. Outcroppings of rock were seen in several places along Willow creek but no quarries are in operation. No minerals of economic value were found. An excellent variety of trout is abundant in Willow creek. Two deer were seen in the southwestern portions of the township during the progress of the survey. Coyotes are numerous and some grouse were noticed. Timber wolves are occasionally a source of loss and annoyance to ranchers in the southern part of the township. There are also a few lynx, bob-cats and marten. *W. T. Green, D.L.S., 1907.*

Range 2.

10. This township may be reached by a good wagon road from Cowley. Though most of the township is hilly prairie much of it is very excellent farming and grazing land. Sections 6 and 7 are partly timbered with fir, spruce and poplar sufficiently large for building purposes. In the settled part of the township splendid crops and good herds of cattle and horses were seen. Hay can be cut in all the valley and on the hillsides. The north fork of Oldman river with its numerous tributary creeks afford a permanent supply of good water. The north fork could be utilized to develop extensive water-power. No summer frosts were noticed. Besides the wood referred to above there is an abundant supply of good bituminous coal for fuel. Though there appeared to be some limestone, no quarries were in operation. Game consists of partridge, chickens, coyotes and fox, and the river and creeks afford plenty of trout for the 'patient angler.'—*C. C. Smith, D.L.S., 1907.*

11. A good wagon road runs from Cowley to and partly through this township. It is necessary to ford the north fork of Oldman river, however, and even to one familiar with the fords this is a difficult and dangerous task. Generally speaking the surface of the township is very hilly prairie. Several creeks run in a southerly direction into the north fork through deep valleys or rather coulées, and high, rough watersheds divide the basins of the creeks. Bluffs of poplar and some fir and spruce were seen in sections 5 and 6. The valleys of the creeks have a good deep clay or sandy loam, but the hills are very stony and have a light soil. The township is excellently adapted to grazing and can be profitably farmed. Good hay can be cut in any of the valleys or on the lower hillsides. Besides the numerous creeks mentioned above there are very many springs affording a permanent supply of good water. There are no bad floods, as there is very little level bottom land in the valleys. None of the creeks except Callum and Coal creeks appear to be useful for water-power, though they all could be easily and profitably used for irrigation purposes. No summer frosts were seen. There is considerable limestone but no quarries have so far been opened. No minerals were seen. There were a few chicken and partridge in the bluffs, and the creeks afford a good supply of speckled trout.—*C. C. Smith, D.L.S., 1907.*

Range 3.

11. The wagon road from Cowley runs along the southerly side of the north fork of Oldman river through the Gap in the Livingstone mountains and then crossing Racehorse creek it enters this township in section 5. This road is travelled considerably and is in fairly good condition for a mountain road. A pack trail also runs along the northerly side of the river. Much of the township is very rough and mountainous, though along all the creeks there is good land which is being taken

Range 3—Continued.

up and utilized for farming and grazing. Livingstone mountains are very high and in this township rise abruptly from the valleys on each side. This township, at least in the southerly part, is mostly timbered with poplar, fir and spruce, of good size. Much of the timber in this country will doubtless become valuable for use in the coal mines. Oldman river with its tributary creeks, together with many springs, afford a permanent supply of good water. Oldman river, where it flows in a narrow defile through the Livingstone mountains, could be used to develop a very extensive water-power. There is much limestone but no quarries were in operation. A good quality of bituminous coal was seen in many places along the banks of the river. Game consists of bear, deer, fox, coyote, partridge and chicken. The climate was pleasant.—*C. C. Smith, D.L.S., 1907.*

Range 4.

20. This township can be reached by a good trail from Okotoks a flourishing town on the Calgary and Edmonton extension of the Canadian Pacific railway and distant therefrom about thirty-five miles. The nearest post office is Millarville, which is reached by a good trail, one branch of which follows the north fork of Sheep river, the other keeping to the valley of Ware creek, a tributary of Sheep river. The surface of the township is very hilly and is covered with scrub and timber except along the valleys of Ware creek and Sheep river. In these valleys there are some excellent hay lands which make the township, especially the eastern portion, well adapted for ranching. In the southwestern and western part some good spruce and jackpine is found and a sawmill could be operated there to advantage. Plenty of wood both for fuel and building purposes is obtainable all over the township. An ample and permanent supply of excellent water can be had in Sheep river and Ware creek and their numerous tributaries. Little or no water-power could be developed. The climate is that of the hill country generally—cool nights during the summer with frequent frosts. Outcroppings of rock were noticed along Ware creek but no stone quarries are in operation. No minerals of economic value were noted. Game is not plentiful though some partridge, grouse and coyote were seen. Fish are plentiful both in Sheep river and Ware creek.—*W. T. Green, D.L.S., 1907.*

21. This township is about twenty-five miles, by a good trail, from Okotoks, a growing town on the Macleod extention of the Calgary and Edmonton branch of the Canadian Pacific railway. The nearest post office is Millarville on section 12, township 21, range 3. Another trail from Priddis post office leads to the sawmill on section 25 in this township. The soil, generally, consists of black loam, varying in depth from three to eighteen inches, with a clay subsoil and frequently, on the hill-tops, with stones or rock. The township is suitable for pasturage only, as I do not think any crops would ripen here, except, possibly, the most hardy vegetables. The surface is hilly and rolling. There are a few flats along the creek bottoms, but they are mostly covered with willow and scrub, and are more or less swampy. There is but a small proportion of open prairie in the southern part, and here only on the southerly face of the hills. There is much merchantable timber still standing, such as spruce and banksian pine—commonly called jackpine—as large as thirty inches in diameter. It is more abundant on sections 8, 16, 17, 19, 20, 22, 24, 25, 28, 29 31, 32 and 33. The best timber, however, I think, is on sections 28, 29, 32 and 33. I met several parties who were contemplating erecting a sawmill somewhere on Fisher creek. A sawmill has already been in operation for several years on section 25, which may be reached by a well graded road from the east. Most of the timber on section 25 has already

Range 4—Continued.

been removed, several million feet of lumber having been cut. There was also at one time, a sawmill on the northwest quarter of section 10, but it has since been removed. At a low estimate there is still available about five million feet of lumber. Owing to want of good roads and the numerous muskegs most of the lumbering operations would have to be carried on in winter. I succeeded in moving my wagons as far as the southeast quarter of section 30, by following the valley of Fisher creek, but that was owing to the swamps being frozen. With snow on the ground good roads could be made along the creek, but the bulk of the logs in the northerly part of this township will have to be moved down the valley of Whisky creek, thence to the south fork of Fisher creek. There are no hay meadows, but hay has apparently been made along the creek in section 29, where remains of old hay corrals were found. I also came across the remains of an old shack on the south side of the creek on the southeast quarter of section 30, said to have been the site of an old illicit still. This township is well watered, both by creeks and springs. The north branch of Sheep river cuts diagonally across the south half of section 6 and part of section 5. It must be quite a formidable stream at high water. It supplies water to the irrigation ditches on some of the northwesterly sections in township 20. A good-sized stream, Fisher creek, traverses sections 30, 29, 20, 21, 16, 10, 11 and 12. Whisky creek touches the northerly part of section 32. Numerous springs add to the volume of these creeks. The water is of good quality and the springs appear to be permanent. There are no water-powers in this township, and any attempt at damming Fisher creek might require to be done in the next township west. With reference to the climate, I think the indications are that no cereals can be ripened here, owing to prevailing summer frosts. I crossed the ice, on standing water, with my outfit early in November. A rancher to the south sows both oats and wheat for green feed, which is excellent for cattle where the supply of hay is limited. Fuel is plentiful in both green and fire-killed timber, such as poplar, spruce and jackpine. There are no stone quarries, no minerals of any economic value, nor were there any indications of coal. Game is still in evidence. Grouse, partridge and rabbits were seen, also signs of deer, which very probably will soon be exterminated by the Indians and white men, who hunt here in the fall. An Indian pack trail traverses this township southerly from Morley, on the Stony Indian reserve. It is much travelled by bands of Stony Indians, and leads to the Walrond ranch, and also to the trail crossing Livingstone range into the valley of Livingstone river. The southerly half of this township has been overrun by horses and cattle, resulting in the pasture being very bare at the time of my survey. There are but two settlers, both in the southeast corner. The only farming, however, that they have attempted is sowing oats for green feed for their cattle. Another settler, the proprietor of the sawmill on section 25, has also quite a number of cattle, but here the grazing area is very limited. Many settlers from the open prairie, miles to the east, came in here by way of the graded sawmill trail, for their fencing and building material. There are no good trails within the interior. Fisher creek has to be crossed a number of times in going up its valley, and approaches have to be constructed for crossing. Also, owing to the springy nature of the side hills many of the bottom lands are wet and boggy. This township is not at all suitable for general farming and only to a limited extent for cattle-raising. At some future time, when land becomes of greater value, and when the valuable part of the timber has been removed and the inferior part consumed by fire, then, by judicious draining and irrigation, most of the bottom lands in this township that are at present swampy, may become valuable for grazing and dairying purposes.—*C. F. Miles, D.L.S., 1906.*

TOWNSHIPS WEST OF THE FIFTH MERIDIAN.

Range 4—Continued.

22. This township can be reached by a good trail from Calgary as far as Priddis. From Priddis the trail is only fair. In section 25 of township 22, range 4 the road divides, one leading northwesterly through sections 25 and 25 and thence on through the Sarcee Indian reserve, the other running southwesterly along the south branch of Fish creek to section 18. The latter would be almost impassible until late in the fall. The soil is generally a rich black loam over clay, although stone is frequently found on the hill tops. If it were not for the danger of summer frosts, the valley would be excellently fitted for agriculture. The surface is generally roughly rolling, the southerly and westerly portions becoming quite hilly. Almost the entire township is wooded, much of the northern part being covered with standing fire-killed poplar and jackpine. In the south some fair timber is found. The valleys are generally open. Hay can be cut on most of the valleys, although some are too swampy to make that possible. Water is abundant and permanent. The two branches of Fish creek, with the innumerable spring creeks scattered over the township, provide an excellent quality of water. No water-power could be developed. Summer frosts are general, though I believe there are some years when oats and barley will mature. No stone quarries were noted nor any minerals of economic value. Fuel is abundantly provided for in the fire-killed timber throughout the township. Game seems scarce, partridge and coyote being all that were seen. Deer are to be found, I believe; also an occasional bear in the western portion. A small variety of trout was found to be quite plentiful in the two branches of Fish creek.—*W. T. Green, D.L.S., 1907.*

44. The best route for reaching this township is through Bluff Centre, from either Ponoka or Lacombe. A wagon trail enters the township in section 12, and another, branching from the Bluff Centre-to-Buck Lake trail enters it in section 36. The soil is in parts suitable for agricultural purposes, but the township is largely composed of spruce muskegs, sloughs and jackpine ridges. Some patches of timber both dry and green suitable for settlers' purposes are found especially in the valley of the west branch of Blindman river. There are no large hay meadows, but grass suitable for pasturing is found in the majority of sections. Water is generally of a pure quality, the numerous small creeks and springs and the branch of Blindman river forming a sufficient and permanent supply for future settlers. The west branch of Blindman river enters this township on the north boundary of section 33 and leaves it in section 13, flowing in a southeasterly direction; its average width is about seven feet and its depth three feet with banks from twenty to thirty feet. There does not seem to be sufficient fall in this branch of Blindman river for the development of a serviceable water-power. The climate is similar to that of Edmonton. There is plenty of dry and green timber for fuel but no traces of coal, stones or minerals of any economic importance were found. There are some moose in this part of the country and a few bear, deer, rabbits, prairie chicken and some partridge.—*H. L. Seymour, D.L.S., 1907.*

47. This township is best reached by wagon trail from Wetaskiwin, entering section 1 and being well travelled on account of the lumbering carried on in this township. In section 10 this trail branches, one branch leading westward to the northeast end of Buck lake, another northward along Modeste creek and a third leads southward up the same creek. With the exception of the southwesterly part, which though quite heavily timbered with spruce, poplar, birch and balsam, is rough and uneven. The southerly part of the township is composed of timber berths numbered 1160, 1211 and 1353, being covered with spruce up to thirty inches in diameter and good sized poplar. There is but very little open country in the remainder

Range 4—Continued.

of the township, for where not thickly timbered with spruce, poplar and some birch or jackpine it is covered with brulé, windfall and willow underbrush. It is quite rough along Modeste creek and its small tributaries. No hay meadows of any size exist in this heavily timbered township. Modeste creek flows northerly through the centre of the township and is from thirty to fifty feet wide, three feet deep with banks twenty-five feet high. A creek locally known as the 'Little Poplar,' when entering the township in section 24 is but ten feet wide but before it joins Modeste creek (locally known as Poplar river) in section 26, it becomes nearly as wide and might be mistaken for the main stream. A number of smaller tributaries containing excellent water are found in other parts of the township. There seems to be no possibility of developing any serviceable water-power on either of the two before mentioned streams. The climate is similar to that at Edmonton. There is plenty of dry and green timber for fuel, but no traces of coal were found. No stones or minerals of any economic importance were discovered. With the exception of mink, found along Modeste creek and its main tributary and a few weasels, there is very little game in this township.—*H. L. Seymour, D.L.S., 1907.*

Range 5.

48. This township is reached from township 49, range 5, by a wagon trail which leads across the northeast corner of the township along Modeste creek, this trail being fairly well travelled but hilly. An old pack trail leads from Modeste creek in section 26 southwards to Buck lake. The northerly and northeasterly portions of this township would be most easily cleared of the brulé and brush covering the rolling country, and the soil is good for agricultural purposes, the greater part of the township, however, while fairly level, is thickly wooded with spruce and poplar, especially sections 18 and 19 where some spruce to twenty-four inches is found, also tamarack and poplar of good size and quality. In section 26 a hay meadow over fifty acres produces good grass and peavine. No other large hay meadows were found, however, Except in the middle of the township a number of small creeks of good water were found and a creek fourteen to sixteen feet wide, two to three feet deep, with banks from forty to one hundred feet wide, enters this township from the south in section 3, is joined by another creek four feet wide in section 11, and flows into Modeste creek in section 13 or 24. A description of Modeste creek, which flows across the northeast corner of the township, was given in the report on township 49, range 5. There is not sufficient fall in any of the above mentioned streams to develop serviceable water-power. The climate is similar to that of Edmonton. There is plenty of dry and green timber for fuel, but no traces of coal were found. Game, which is very scarce, consists of bear, deer, moose and lynx. Along Modeste creek mink tracks were noted.—*H. L. Seymour, D.L.S., 1907.*

49. The best route for reaching the township is by wagon trail from Edmonton, which crosses Saskatchewan river in section 13, township 50, and enters the township near the northeast corner of section 33. On account of the lumbering in this and the adjoining townships the trail is fairly well travelled, but from Saskatchewan river south it is quite hilly and rough. The southwesterly portion of the township through which Modeste creek flows is heavily timbered with spruce to twenty-four inches and some large poplar, two lumber camps having operated there this winter cutting timber on a permit. When cleared the soil would be good for agricultural purposes but the country is rough. The northeasterly portion of the township has generally good soil, the country being heavily rolling, covered with

Range 5—Continued.

poplar and willow scrub, brulé and patches of good spruce and poplar. The northwest quarter of section 8 and the southwest quarter of section 29 are two river flats of from thirty to forty acres, on which good hay has been cropped for the last two years. There are also other smaller hay meadows along Modeste and Buck lake creeks. In the east of the township there are a number of small streams of excellent water and in the west Modeste creek, from fifty to one hundred feet in width, and from two to three feet deep in the late summer. It has a good current in banks from fifty to one hundred feet high and flows into Buck lake creek in section 20, the latter creek differing only by a greater depth of water which in both streams is of good quality. There does not seem to be sufficient fall in either of he above mentioned streams to develop any serviceable water-power. The climate is similar to that at Edmonton. There is plenty of dry and green timber in this township for fuel but no traces of coal were found. Along the banks of Modeste creek, some friable sandstone of brownish colour was noted. There is practically no game in this township, a bear or deer track being rarely seen.—*H. L. Seymour, D.L.S., 1907.*

54. (*North part*).—A fairly good wagon road leaves the trail from Lake St. Ann to S. W. McDonald's farm, at a point about one-half mile east of Mr. McDonald's farm; then running north it continues through the township The soil is not very good, consisting of three or four inches of black loam with a subsoil of clay or gravel. It can be rated as second class land and is suitble for mixed farming. The surface is generally rolling with heavy poplar and brush along the north boundary but being fairly open in the south. There is no timber of any value. There is very little hay, although there are small patches where some hay could be cut. The water is fresh and the supply is permanent and sufficient, being furnished by two small lakes and several small ponds. There is no land liable to be flooded. There is no means of furnishing water-power. The climate is excellent, being similar to that of Edmonton district. Wood for fuel may be obtained on every section, but no coal veins have been discovered. There are no stone quarries and no minerals of any economic value. There is very little game.—*A. Michaud, D.L.S., 1906.*

55. There is a fairdy good wagon road which leaves the trail from Lake St. Ann to Donald McDonald's farm, at a point about half a mile east of McDonald's farm. This road runs north through the centre of townships 54, 55 and 56, range 5, ending in the northeast quarter of section 16, township 56, range 5. There is also a good road running from Lake St. Ann to McLeod river, which enters this township on the east boundary of section 1 and leaves it on the west boundary of section 18. The soil is fairly good consisting of 6 to 8 inches of black loam over a sand or clay subsoil and is suitable for mixed farming. The surface is rolling and is covered with brush and small poplar 3 to 8 inches in diameter. About 150 tons of hay could be put up around Little Island lake in sections 7 and 8 and small quantities of upland hay could be cut in several small prairies in the northeastern part of the township. There is no timber of any value, for lumber. The township is fairly well watered by five fair-sized fresh water lakes which are permanent. Of these Lessard lake in sections 26, 27, 34 and 35, and Little Island lake in sections 7 and 8 are the most important. There is no land liable to be flooded. The climate is excellent and is similar to that of the Edmonton district. Wood for fuel is obtainable on every section, but no coal veins have been discovered. There are no stone quarries and no minerals of any economic value. There is very little game, but there is good pike fishing in Lessard lake.—*A. Michaud, D.L.S., 1906.*

Range 5—Continued.

56. There is a fairly good road which leaves the trail from Lake St. Ann to Donald McDonald's farm at a point about a half mile east of Mr. McDonald's farm. This road runs north following the centre line of townships 54, 55 and 56, range 5, and terminates in the northeast quarter of section 16 of this township. The soil is good, consisting of six to ten inches of black loam over a clay subsoil, and is suitable for mixed farming. The surface is undulating and is covered with brush and poplar three to eight inches in diameter. In the east half of section 5 and in the west half of section 4, there is some good spruce timber ten inches in diameter. There is very little hay. The water is fresh, but is not very plentiful, there being only one small permanent lake on the east boundary of section 26, but there are several small creeks containing fresh water with an average width of three to four feet and a depth of six to eighteen inches. There is no land liable to be flooded. There is no way of obtaining water-power. The climate is excellent, being similar to that of the Edmonton district. Wood for fuel is obtainable on every section. There are no stone quarries and no minerals of any economic value. There is very little game.—*A. Michaud, D.L.S., 1906.*

Range 6.

49. This township is reached from township 49, range 5, by a wagon trail which enters section 25 and follows up Buck lake creek to a lumber camp in township 48, range 6, leaving the township in section 3, also by a wagon trail across the northeast corner of the township which leads to Saskatchewan river in section 8, township 50, range 6. Both these trails have been well travelled but are hilly, especially the one to the south. The westerly two-thirds of the township is heavily timbered with spruce to twenty-four inches and some large poplar. The soil is good and the easterly third of the township might be easily cleared of the brulé, poplar and willow scrub, which cover the rather rough country. A few patches of hay meadow are found in the easterly part of the township and in section 31. Saskatchewan river with banks from one hundred to one hundred and seventy-five feet high and one quarter of a mile wide enters this township in the northwest corner. Buck lake creek, four feet deep, fifty to seventy-five feet wide with banks one hundred feet high enters the township in section 2, and leaves in section 24. Except in the middle of the township small creeks containing good water are found. There does not seem to be sufficient fall in Buck lake creek to develop serviceable water-power. The climate is similar to that of Edmonton. There is plenty of dry and green timber for fuel but no traces of coal were found. No stone or minerals of economic importance were found. Game is very scarce in this part of the country. Bears are probably most numerous and tracks of deer and moose were seen.—*H. L. Seymour, D.L.S., 1907.*

Range 7.

54. The shortest and best route whereby this township can be reached from a railway point is by a good wagon trail from Edmonton to Grey's store. This store is situated in section 28, township 53, range 6. Thence there was a trail for about two miles from there it was necessary to open a trail through the woods entering the township in section 24. This trail was opened out northwesterly to the north boundary of section 34. A good pack trail passes through sections 24 and 23 and westerly connecting Lake St. Ann with Jaspar House. The surface of this township is gently rolling but is broken on the east by Pembina river valley and on the north by a couple of ravines about one hundred feet deep in which are good streams of water. The township is timbered throughout. On sections 25, 26, 35 and 36 the bush is not

Range 7—Continued.

as thick as it is to the west of these sections. The timber consists of poplar ranging in size up to two feet in diameter and averaging ten to twelve inches. Along with this poplar in many places there is a thick growth of willow ranging in size up to five inches in diameter. The soil generally consists of three inches of black loam with a subsoil of hard stiff clay which would be very difficult to cultivate. In many places the clay was so hard that the mounders were compelled to use picks. The clearing of the bush in this township would cost about thirty-five dollars per acre. From this it can be seen that present settlement is not probable. There is abundance of good water of a permanent character. There is no hay. Wood fuel is abundant and there is probably an underlying stratum of coal about one hundred and fifty feet below the surface, for coal outcrops along Pembina river are frequently to be seen, the seams appearing to be from five to six feet thick. There are no water-powers, no stone quarries nor minerals of economic value. No game was seen in the township.—*R. H. Knight, D.L.S., 1906.*

55. The nearest and best route whereby this township can be reached from a railway point is by a good wagon trail from Edmonton to Gray's store which is situated in section 28, township 53, range 6. From Gray's store the trail continues westward for two miles, and from there it was necessary to open a trail through the woods, entering the township at the south east corner of section 3. This trail was opened to Pembina river in section 22. The surface of this township west of Pembina river is nearly level, except for a couple of ravines in sections 16 and 21 in which streams of good water flow. Sections 29, 30, 31 and 32 are composed chiefly of swamps. All that portion of the township lying to the east of Pembina river is broken and hilly, except sections 25 and 36, which are somewhat gently rolling. The soil throughout consists of about three inches black loam with a hard white clay subsoil, which is exceedingly difficult to cultivate. The whole of the township except a few swamps or muskegs is covered by a thick growth of poplar, averaging about ten inches in diameter. In many places the trees are twenty inches in diameter and are long and straight. To clear the land for agriculture the cost would be upwards of thirty-five dollars per acre. This will retard the settlement of the township. The only hay found is around Michaud lake in section 25. Pembina river which runs through the township enters in section 1 and passes through sections 1, 12, 11, 10, 14, 15, 23, 22, 27, 28 and 33. The water of the river is good. The cross section at time of survey (November) was about six hundred square feet having a velocity of about two miles per hour. At high water the cross section is fully ten times as great. There are no water-powers nor stone quarries. At many points along the river there are outcrops of apparently good sandstone, in some places forty feet thick. Underneath this sandstone is a layer of lignite coal, of a superior quality being equal to that found in the vicinity of Edmonton. The seam of coal seems to be about six feet thick and outcrops frequently along the river. Other minerals of economic value do not occur. There is no game.—*R. H. Knight, D.L.S., 1906.*

57. A good road runs from Lake St. Ann, crossing the lake at The Narrows, and enters this township at the southeast corner, thence it runs in a northwesterly direction across the township to McLeod river. In section 16 other short trails branch off from this main trail to the different farms in this neighbourhood. In the northwest quarter of section 3 this road is joined by a road cut by the Grand Trunk Pacific railway survey parties, which also enters the township in the southeast corner. The soil in the centre of this township, in the valley of Big and Little Paddle rivers, is first class, consisting of from ten to eighteen inches of black loam over a clay sub-

Range 7—Continued.

soil, and is suitable for all kinds of farming. In the extreme north and south parts of the township the soil is not so good, the depth of black soil averaging from four to eight inches over gumbo or clay subsoil, but it would be considered second class land suitable for mixed farming. The valley of the two Paddle rivers, which run from west to east through the centre of the township, is level and is filled with willow brush and in some places with hay meadows. The two south rows of sections and the north one and one-half rows are rolling and timbered with heavy poplar five to ten inches in diameter. There is no timber suitable for lumbering purposes, but good building timber can be obtained in the north and south parts of the township. In sections 24 and 25 there is a large hay meadow which will produce about one hundred tons of hay, and in sections 28 and part of 21 there is another large hay meadow which will produce from two to three hundred tons. There are also small patches all over the centre of the township where hay may be cut. The township is well watered by the two Paddle rivers, which run through the centre of the township from west to east and which meet at the northeast corner of section 22, also by Pembina river, which runs through the extreme southeast corner of the township. Of these, Pembina river averages four chains wide, four feet deep and has a current of three miles an hour. Big Paddle river averages thirty feet wide, two feet deep and has a current of two miles an hour. Little Paddle river averages twenty feet wide, one foot deep and has a current of two miles an hour. There are no lakes and no land is liable to be flooded. There is no means of obtaining water-power. The climate is excellent and similar to that of the Edmonton district. Wood for fuel is obtainable on nearly all sections, but no coal has been found. There are no stone quarries, and no minerals of economic value. There is no game in this township.—*A. Michaud, D.L.S., 1906.*

Range 9.

54. This township was reached by crossing Chip lake on the ice, thence by pack horses to section 21. There is a trail known as 'Jack's trail' passing through the north part of this township. The soil is mostly clay and is suitable for farm purposes. The surface is gently rolling, covered with poplar and willow. In the southwest sections of this township and in those sections bordering on the lake there is a large tamarack muskeg, which might be suitable for farm purposes when drained. There are no meadows, but some hay is found along the lake. The water is fresh and consists of one large creek running southerly through the township. It crosses the north boundary of section 34 and flows into Lobstick river. It is about fifty links wide and from two to six feet deep. No water-power exists in the township. The climate was very cold at time of survey—May. Dry tamarack, spruce and poplar may be obtained in large quantities for fuel. No stone quarries nor minerals were found. Bears, wolves, ducks and geese were the only game seen.—*J. C. Baker, D.L.S., 1907.*

Range 10.

53. We reached the township by crossing Chip lake on the ice. It can also be reached by the Yellowhead pack trail which runs through the southern part of this township. The soil is principally clay, and when cleared of the heavy bush will be suitable for farming. This township is gently rolling and covered with a heavy growth of poplar, willow, jackpine, tamarack, spruce, birch and balsam. Some timber suitable for lumber can be found in the southern part of this township. No hay meadows were seen, but hay in quantity can be obtained along the shore of Chip

Range 10—Continued.

lake. The water in this lake as well as in all the creeks in this township is fresh. The creeks are small and I think will be dry in summer time. The climate was cold at the time of survey—April. Plenty of dry tamarack, jackpine, spruce and poplar can be obtained for fuel, but no coal was seen. No stone quarries nor minerals were observed. Bear, mink, lynx and plenty of duck and geese on Chip lake were the only game seen.—*J. C. Baker, D.L.S., 1907.*

54. This township was reached by crossing Chip lake on the ice. 'Jack's pack trail' passes through a part of this township, crossing the north boundary of section 34. The soil is mostly clay and is suitable for farming. The surface is gently rolling and covered with poplar, willow and spruce, but there is no timber of importance in this township. Hay is plentiful along the lake, but no hay meadows were seen. Fresh water is found in the lake. One large creek occurs in the western part of this township. It flows into Chip lake, crossing the north boundary of section 32. It is about fifty links wide and three to five feet deep. There is no waterpower. The climate was cold at the time of survey—April. Plenty of dry poplar and tamarack can be obtained for fuel, but no coal was seen. There are no minerals nor stone quarries. Bears, wolves, ducks and geese were the only game noticed.—*J. C. Baker, D.L.S., 1907.*

55 & 56. *(Outlines).*—We crossed Chip lake on the ice to section 28, township 54, range 10, and from there we used pack horses, following an old pack trail which runs due north crossing the north boundary near the northeast corner of section 32. The soil in township 56, range 10 along the meridian lines is well adapted for farming but in township 55 there is more muskeg and swamp. In township 56 the surface is rolling and covered with second growth poplar. In township 55 the surface is rolling but covered with large poplar, spruce and willow. No timber of value was seen along the meridian lines. The south branch of Paddle river crosses the east boundary of section 13. It contains fresh water, is about fifty links wide and from three to six feet deep. About three feet of snow was on the ground at the time of survey (March) while the weather was very cold. Plenty of dry tamarack, jackpine, spruce and poplar can be obtained for fuel. No stone quarries or minerals were found. No game of any kind was seen.—*J. C. Baker, D.L.S., 1907.*

Range 11.

53. I reached this township by the Jasper or Yellowhead pack trail, which passes through the southern part of the township. The trail was in very poor condition. The soil is black loam and clay, suitable for farm purposes. The surface is level and covered with poplar, spruce, tamarack and willow. There is spruce and tamarack suitable for timber in sections 1, 2, 3, 4, 9, 10 and 11. It is from eight to sixteen inches in diameter. No hay is found. There are several small creeks in this township, the water of which is fresh. The land is not liable to be flooded and no waterpower occurs. The climate was cold and wet at time of survey (June) with no summer frosts. Fuel consists of plenty of dry spruce, tamarack and poplar, but no coal, stone quarries nor minerals are found. Game consists of moose, deer, bear, &c.—*J. C. Baker, D.L.S., 1907.*

54. I reached this township by making a pack trail along Lobstick river. The trail is very poor. This township is nearly all muskeg. If the land can be drained it will be suitable for farming. The surface is level and covered with small poplar, willow, swamp spruce and tamrack. There is no timber nore hay in this township.

Range 11—Continued.

Lobstick river flows through this township, through sections 18, 17, 16, 9, 10 and 3. No water-power is found. The climate was warm at time of survey (September) with no summer frosts. Fuel consists of plenty of dry spruce, tamarack and poplar, but no coal, stone quarries nor minerals are found. Game is moose, deer, bear, &c., —*J. C. Baker, D.L.S., 1907.*

Range 12.

53. I reached this township by the Jaspar or Yellowhead pack trail. This trail runs through the southern part of the township. The trail at the time of survey (July) was in very poor condition. This township is level and covered with a thick growth of poplar, spruce and willow. There is some large spruce but not in sufficient quantity for timber. When cleared, the soil, which is mostly black loam and clay, will be suitable for farm purposes. In section 6, near Lobstick river there is some hay land, but no other hay lands were seen. Lobstick river flows along the west boundary. The water is fresh. There is also a number of creeks, but no water-power The climate was wet and cool at time of survey, with no frosts. Fuel consists of plenty of dry wood, but no coal was seen. There are no stone quarries nor minerals. Game consists of deer, moose, bear, wolves, &c.—*J. C. Baker, 1907.*

54. I reached this township by making my own pack trail along Lobstick river. The trail in many places was very bad. This township is nearly all muskeg and under water, not suitable for farming. It is level and covered with poplar, willow and swamp spruce and tamarack. There is no timber except a small amount along Lobstick river. This occurs in sections 19, 20 and 21. This timber is spruce and tamarack varying from ten to twenty-four inches in diameter. There are no hay lands. Lobstick river flows along the west boundary, north boundaries of sections 19, 20, 21 and east boundaries of 22, 14 and 13. It is about sixty feet wide and varies from two to ten feet deep. The water is fresh. There are no water-powers. The climate was warm at the time of survey (September) with no frosts. Fuel consists of plenty of dry poplar, spruce and tamarack, but no coal nor minerals were found. Game consists of moose, deer, bear, wolves, &c.—*J. C. Baker, D.L.S., 1907.*

Range 13.

52. The surface of this township is mainly rolling, or gently rolling and well wooded with spruce and jackpine, running from about five to ten inches in diameter. Intermingled with the spruce and jackpine in many places are scattered poplar, and there are also considerable areas wooded with aspen and balsam poplar from four to fourteen inches in diameter, and occasionally a few birch trees about five or six inches in diameter are met with. I was unable to properly explore the whole township, but apparently the greater portion of it is similar to the northerly part which is well fitted for settlement, being mostly high land, rolling enough for good drainage, and well watered with many small creeks, varying from one to four or five feet in width, and having a depth of one or two feet. These creeks generally flow with a good current, and their waters are fresh and soft.

Carrot creek flows through the northwestern part of the township in a valley about a quarter of a mile wide at the bottom, and three-quarters of a mile wide at the top; the bottom of the valley being depressed about fifty feet below the level of the surrounding country, and mainly consists of boggy hay land interspersed with clumps of willow brush.

Range 13—Continued.

The soil in the higher portions of the township is principally clay, or clay loam with a light covering of black loam, though in the depressions, or swampy portions, the soil is black muck or peaty loam.

This township though mainly wooded throughout could be cleared without a great deal of difficulty and should prove a very desirable location for settlers. The soil is well adapted for the successful production of the various grains and vegetables usually grown in the province of Alberta. Very little of the timber in this township is suitable for being converted into lumber but timber for building houses, fuel and fencing can be obtained on any quarter section in it.—*Geo. Ross, D.L.S., 1907.*

53. I reached this township by the Yellowhead pack trail which passes through the southern part of the township. It was in very poor condition at time of survey (July). The soil in this township is fairly good being black loam and clay subsoil. It is suitable for farm purposes. The township is gently rolling, covered with small poplar and willow. There is no timber in this township. No hay meadows are found. Carrot creek flows along the western boundary of this township. It is about sixty feet wide and two to four feet deep. The water is fresh. The land is not liable to be flooded. It was fine summer weather with no frosts at the time of survey. Plenty of dry poplar can be found anywhere. No coal, stone quarries nor minerals were found. Moose, deer, bear, wolves and other small animals were seen.—*J. C. Baker, D.L.S., 1907.*

53. This township is rolling and consists of a succession of ridges from about fifteen to fifty feet high, with wide intervening valleys. The south boundary in general runs through a thick growth of live timber, spruce and jackpine, mixed with poplar and also tracts of aspen and balsam poplar, the trees varying from four to twelve inches in diameter. The Yellowhead pass pack trail traverses this township from east to west, keeping about three-quarters of a mile north of its south boundary. This trail in the eastern portion of the township passes through a spruce brulé, with some patches of live spruce averaging eight inches in diameter for about two miles, then west of this it passes through some very soft swampy ground with live spruce for about a mile and a half, then comes out on higher ground well wooded with poplar from six to twelve inches in diameter, then winds westerly through some comparatively open patches of rolling land with poplar and willow brush and a good growth of grass and past an occasional old beaver meadow. The south part of section 5 and the southwest part of section 4 is heavily wooded with poplar from four to fourteen inches in diameter, but the greater portion of the township is brulé, and comparatively open, the timbered area in general only reaching about half a mile north of the south boundary, and even in this there are strips of timber killed by fire. In going west from Lake St Ann, by the Yellowhead pass trail, our first view of the mountains was obtained from the top of a ridge, about midway between the east and west boundaries of this township. The soil is mainly light sandy loam, although clay soil with a light covering of black loam predominates in the wooded portion near the south boundary. The greater part of the township can be readily cleared, and would be well adapted for grain growing, gardening or mixed farming, and should be quite desirable as a location for settlers.—*Geo. Ross, D.L.S., 1907.*

54. I reached this township by an old Indian pack trail which follows along the east bank of Carrot creek. The trail was in very poor condition. The soil is nearly all muskeg, not suitable for farming. This township is level and covered with poplar, willow, tamarack and spruce. There is no timber, the tamarack and spruce found being small. No hay land is found. Carrot creek flows through the

Range 13—Continued.

western part of this township. The water is fresh. No water-power occurs. The climate was warm at time of survey (August) with no frosts Fuel consists of dry poplar, spruce and tamarack, but no coal was seen. There are no stone quarries nor minerals. Moose, deer, bear, wolves, &c., were seen.—*J. C. Baker, D.L.S., 1907.*

Range 14.

52. The northern portion of this township is mainly rolling land, generally high, and when cleared would be well adapted for cultivation. It is watered by several small creeks running northerly into a tributary of Carrot creek, which flows easterly through the southern portion of township 53, in this range. On section 36 there is a fine woods of aspen and balsam poplar, from which good logs, suitable for building timber or for being converted into lumber, can be obtained. In the northern parts of sections 32 and 33, in the valley of the creeks draining this part of the township, there is a considerable area of brulé with dead standing spruce, but the remainder of the township, except an occasional small area, is heavily timbered with poplar, spruce and jackpine suitable for the ordinary requirements of settlers. I did not explore the southern part of this township, but apparently all of it is fairly high and rolling land, not broken by true muskegs, although in the bottoms of some of the valleys or depressions the surface has become rather spongy owing to the excessive amount of moisture retained by the covering of moss. The soil is principally clay, under a shallow covering of black loam, but on the tops of ridges in many places the subsoil is gravelly, and in the depressions, or bottom of lower land between ridges the soil is black muck or peaty loam. As far as I can judge the whole of this township is well adapted to meet the ordinary requirements of settlers.—*Geo. Ross, D.L.S., 1907.*

53. The surface of this township is rolling, with the ridges or higher elevations of land running from about ten to seventy feet above the depressions, or lower intervening land. The Yellowhead pass trail traverses the township in an easterly and westerly direction, about a mile or a mile and a half north of the south boundary of the township. The southerly portion of sections 1 and 2 is well wooded with poplar and spruce, varying from about six to twenty-one inches in diameter. Between the Yellowhead pass trail and the south boundary of the township, a tributary of Carrot creek flows easterly in a valley of partially open land, on which there is a good growth of grass, but the soil is rather soft and spongy, owing to the soakage of water from the adjoining higher land, but when cleared and drained would form very desirable grazing grounds. North of this valley and south of the trail in the western half of the township there is a very fine wood of poplar and spruce, the trees being in general from four to fourteen inches in diameter. The wooded portion of the township lies mainly between its south boundary and the trail, but there are also some groves of fair sized poplar and jackpine to be found north of the trail, though the greater portion of the surface of the whole township is brulé, with a fairly good growth of grass. The township is well watered throughout by many small creeks, having a good supply of pure water, and along the courses of some of them old beaver meadows with good pasturage are occasionally found. The soil in the poplar woods is mainly clay, or clay loam, but in the greater portion of the township the soil is sandy loam. Taken as a whole, this township is quite well adapted for grain growing, gardening or mixed farming, and timber for the ordinary requirements of settlers can be readily obtained.—*Geo. Ross, D.L.S., 1907.*

54. I reached this township by following the Grand Trunk Pacific pack tail, which passes through section 12, 14, 15, 9, 8, 17 and 18. The soil consists of alter-

Range 14—Continued.

nately muskeg and sand ridges, not suitable for farming. The surface is gently rolling and covered with small poplar, jackpine and willow on the ridges and spruce and tamarack on the muskegs. There is no timber in this township. No hay is found. There is one small creek flowing north through the centre of the township. The water is fresh. There is also a small lake in section 19, too small to traverse. No water-power occurs. The climate was clear and fine at time of survey (September) with frosts at night. Fuel consists of plenty of dry poplar, jackpine, tamarack and spruce, but no coal, stone quarries nor minerals are found. Game consists of moose, deer, bear, etc.—*J. C. Baker, D.L.S., 1907.*

73. The greater portion of this township will make excellent farms some time, but at present there are not prairie openings of sufficient area, to induce the settler to stop there now. There are numerous small spruce muskegs nearly dry, a large one at the southwest corner and another near the northeast corner. Both of these large muskegs are at present very soft and unsafe for pack trains to cross and the timber adjoining these muskegs is not large enough nor in large enough quantities to be of much value except possibly for settlers' uses. Large poplar is found in belts along the east boundary but it is decaying rapidly. A creek flowing through the westerly part of the township, crosses the north boundary in section 31. The average width is twenty-five feet and the depth of water three inches in the rapids. Very little current can be noticed except where the water is shallow. The banks rise from twenty-five to seventy-five feet high, and prairie spots are found occasionally along this creek. Another small stream leaves the township near the northeast corner. This flows northeasterly into the lake about a mile and one-quarter east of the east boundary of township 74, range 14. This small stream about four links wide and two inches deep contains good water and is said by the Indians to have its head in a small lake east of the wagon road and south of the large muskeg. Several other water courses were crossed which had water in pools within their banks but no running water. These came from the higher lands to the south and east of this township. The wagon road which crosses the base line in section 2 leaves the township in section 34 and is quite good as far as seen. It is used occasionally by people travelling light, but it would require much improvement for loaded wagons. No rock, coal, or game and very few sloughs or hay meadows were seen.—*Henry W. Selby, D.L.S., 1907.*

75. That part of the township north of Lesser Slave lake lies with a general descent towards the lake into which the greater part of it is drained. The settlement survey lying within its boundaries takes in nearly all the prairie but there has been a good deal of the timber suitable for sawlogs and much firewood cut for the uses of the settlement so that it would not be difficult to clear up many of the farms not embraced within the settlement survey. There are several hundred thousand feet of spruce which could be cut yet, and should a fire run over the slashed portion of the bush it would severely damage that now standing. A road has been cut about sixteen feet wide from the village southeasterly, which leaves the township in section 24 and intersects Slave lake about a mile east of the township. This road is used mainly by the freighters in the winter to avoid the dangerous ice around Shaw point. It is also used by people in the summer who are travelling with light loads. The soil generally is loam with a sandy clay subsoil and will make good farming land when once cleared. Shaw point and for some little distance inland is composed of coarse sand, gravel and stones partly covered by sand and leaf mould. At the time of low water there is a strip of land along the west side of the settlement survey which makes good pasture land especially those portions of it west of the main outlet of Buffalo Bay, but this is liable to be flooded at any time. There is a narrow strip of land a

TOWNSHIPS WEST OF THE FIFTH MERIDIAN.

Range 14—Continued.

little over six chains wide lying to the west of Indian reserve No. 150 A which being thickly covered with brush is now considered too wet for farming, but when cleared it will make good farming or meadow land. There are two squatters, one on section 31 and the other on section 12 who have good houses but very little clearing, neither of them living there at the time of survey. Water found in the township is very good, one spring found near the southeast corner of section 27 has a strong mineral taste. If this was analyzed it might prove to be of commercial value. There are no hay lands except those mentioned along the west boundary and along the lake shore at low water. I did not see any coal or stone quarry on these lands and no game of any kind although moose were killed this spring three miles east of these lands.—*Henry W. Selby, D.L.S., 1907.*

Range 15.

52. This township contains some areas of good rolling high land with clay soil well adapted for grain growing, when cleared, but the greater portion of it is covered with spruce and tamarack swamps, the soil in which consists of a black muck or peaty loam. Many of these swamps if cleared would not retain so much moisture and would become drier. Many of them could be quite readily drained, and no doubt in time will become valuable agricultural land. On the north east qarter of section 36 there is a fine poplar woods, the trees in which vary from about four to twelve inches in diameter, and on the west side of the north half of section 35 and east side of the north part of section 34, is a ridge rising between swamp lands on either side, which is well wooded with poplar, cotton-wood and spruce from six to twenty inches in diameter. These and a few similar tracts of high land are the most valuable portions of this township. Some of the timber on these tracts is suitable for lumber, but in general it would be mainly useful in building log houses, and in providing timber for fuel, fencing, &c. For the latter purposes, spruce and tamarack from the swamps is also available. The western and southwestern portion of this township is watered by Wolf creek, a fine stream of pure water, about eighty feet wide, and from two and a half to five feet in depth, flowing with a fairly rapid current. In section 31, it flows through a valley in which the bottom lands are prairie mixed with scrub and groves of poplar. The open land has a good growth of grass, peavine and vetch, and is well adapted for grazing. The banks of the valley of Wolf creek are about thirty or forty feet high and are generally sloping grassy banks, but in places they are steep cutbanks, and in one place in the north half of section 31, an eighteen-inch seam of coal is exposed. Intermingled with the spruce and tamarack swamps in this township are many ridges the surface of which is brulé, with willow and poplar brush, or a growth of young jackpine. On the ridges with light brulé there was a good growth of wild strawberry vines, bearing a fine crop of large strawberries of excellent flavour. The timber in the swamps is not generally larger than eight inches in diameter, and would average about five inches. The soil in the swamps is black muck or peaty loam, and on the ridges, generally it is light sandy loam. In the valley of Wolf creek the soil is a rich dark alluvium. Speaking generally this township cannot be classed as being well adapted for farming operations, on account of so much of its area being covered with spruce and tamarack swamps, though there are some good arable tracts, more particularly in the north-eastern part.—*Geo. Ross, D.L.S., 1907.*

53. This township is composed mainly of a succession of ridges from fifteen to forty feet high, with intervening swamps, covered with spruce and tamarack from three to six inches in diameter. The Yellowhead pass trail runs westerly through

Range 15—Continued.

the southerly portion of the township, except in the west half of section 5, and the east half of section 6, where it takes a southerly loop into the northerly part of township 52. Along the trail, there is a considerable amount of light brulé in which there is a good growth of grass, and interspersed are groves of young or medium-sized poplar, and also considerable areas of thick poplar and willow brush. In the southeast portion of section 1, there is a fine wood of poplar, averaging from four to twelve inches in diameter, and on a ridge which extends into the southeast part of section 3 and the southwest part of section 2 is another small area of good poplar timber. About midway between the east and west boundaries of the township and about a quarter of a mile north of the Yellowhead pass trail, there is a beautiful lake about a mile and a half long, and a mile wide, that is mostly surrounded by spruce about four or five inches in diameter. The banks of this lake are well defined though in many places they are not more than two or three feet high. Towards the southern part of the lake there is an island of about an acre in extent, elevated about eight or ten feet above the water and covered with a heavy growth of spruce and jackpine. In addition to Wolf creek which flows northerly through the southwesterly part of the township, it is well watered with numerous small creeks having a good supply of pure water. The soil on the ridges is mainly light sandy loam, well adapted for gardening, and fairly suitable for grain growing, but the township on the whole is rather broken by swamp to be of much value to settlers who wish to make a success of grain growing, unless a good deal of draining is first done. The timber found in general is only suitable for fuel and fencing.—*Geo. Ross, D.L.S., 1907.*

54. I reached this township by following the Grand Trunk Pacific pack trail. This trail passes through sections 24, 23, 22, 21, 20, 19 and 18 of this township. The trail is in good condition. The soil is black loam and clay. It is suitable for farm purposes. The surface is rolling and covered with small poplar, jackpine, willow and windfall. There is a small amount of timber in sections 11, 12, 2 and 1 of this township, consisting of tamarack and spruce, varying in size from ten to twenty-four inches in diameter. There is some hay land to be found in the flats along McLeod river, which flows along the north boundaries of sections 19, 20, 21, 22, 23 and 24. It is a fine stream five hundred feet wide and varies from one to ten feet in depth. At time of survey (October) it was shallow but usually it is very difficult to ford. McLeod river could be used for water-power by damming the stream. The climate was fine and clear at the time of survey, with frosts. Fuel consists of plenty of dry spruce, tamarack, poplar and jackpine, but no coal was seen. Sandstone might be obtained along the banks of McLeod river, but no minerals were seen. Game consists of moose, deer, bear, wolves, etc.—*J. C. Baker, D.L.S., 1907.*

73. Large muskegs are seen in various parts but these should not be permanently a detriment, as the township being high, these can be easily drained. The soil is three to ten inches of black loam on hard clay subsoil and produces rich vegetation. The timber generally is not of much value, most of the spruce and poplar being bad at the heart and easily broken off by the wind. Several small creeks or watercourses were crossed and the water was good, especially in one flowing easterly through section 25. The west branch of this rises in the westerly part of the township and although only a small stream three links wide and three inches deep it appears to be flowing quite steadily when it was crossed, while many others were quite dry.—*Henry W. Selby, D.L.S., 1907.*

74. This township is very well supplied with wagon roads, one passing through the northwesterly sections 18, 19, 30 and 32 from the Prairie River settlement to

Range 15—Continued.

Lesser Slave Lake P.O. and the other from the same settlement to the lake at the mouth of Sucker creek, and passing through sections 18, 17, 16, 15, 14 and 13. These roads except at the time of wet weather are very good for present traffic. The soil is black loam from eight to eighteen inches on clay subsoil. The surface is undulating with a very gentle descent towards the northeast. A large spruce swamp occupies the greater part of sections 25 and 26 and extends into the Indian reserve. The timber in this swamp is generally small but around the outer edge a few spruce trees from twelve to sixteen inches in diameter are found. The poplar on the south tier of sections is from four to fourteen inches in diameter and with a few spruce and willow bunches fairly covers them through the remainder of the township. The poplar is in belts and bluffs with prairie openings and willow bunches. The greater part of sections 13, 14, 15, 16, 19, 20, 29, 30, 31 and 32 are prairie with poplar bluffs and bunches of willow along the watercourses. Some of these sections have been occupied for several years and the growth of grain, potatoes and hay is amazing. Several well defined watercourses are noticeable within the township, but only three appear to be permanent creeks. These were Travers creek, Bridge creek and the west branch of Sucker creek. The water in each of these is good though slightly alkaline; this of course is more noticeable later in the season. There is a slough which lies across sections 29, 28 and 27 in which the water is from four to eight feet deep and over a chain wide. It has the appearance of once having been a river channel which had been dammed by beaver in places and gradually filled up so that there is no inlet or outlet except at flood time. The dry channel is seen through the willows both east and west of that part which crosses sections 27, 28 and 29. Hay grows in abundance on all the prairie sections mentioned and in addition to these large hay meadows are found on sections 21, 22, 27, 28, 34 and 35, upon which grass grows luxuriantly but the ground is so rough and wet generally, that a good deal of work would be required before machinery could be used. No water-power of sufficient capacity could be developed on either of the small streams flowing through this township. Summer frosts occur nearly every month, but they do not injure the grain where the seed has been grown in the district. The fuel of this part of the country is poplar and willow. No coal seams have been found neither are there stone quarries nor minerals known to exist there. Outside of the prairie wolf, game is very scarce. This township is best adapted to mixed farming, the growth of coarse grain and stock raising being best suited to the condition existing. It is very possible that minerals will be found and a large population will require all kinds of produce in the adjacent hills to the south, as well as in the foothills of the Rocky mountains where large deposits of coal and other minerals have already been found. Settlement cannot advance very fast without better means of transportation to the markets, for the produce which can be grown in this beautiful country.—*Henry W. Selby, D.L.S., 1907.*

75. This township, according to the Indian legends, was once under the water of Lesser Slave lake, but through the process of time it has been built up by the deposit or sediment brought there by the rivers and creeks, all of which flow from the west and southwest draining the higher lands. The northeasterly ten sections are partly flooded at the time of high water but not for very long, since upon these sections large quantities of hay are annually put up for the use of the settlement. Sections 29, 30, 31 and 32 are at present too rough and hummocky and have too much willow and dead timber lying upon them to be of much use, although through it all there is a fine growth of hay which cannot be cut. The rest of the township is high enough to make good farms for mixed farming with a depth of fourteen to eighteen inches of black loam on a sandy clay subsoil. Many prairie spots are found through this

Range 15—Continued.

portion and the bush is mainly willow with bluffs of poplar and occasionally a few spruce, but there is little timber of any commercial value, and what little there is will not be sufficient for the needs of the settler. What is called the Prairie River road enters the township in section 4 and running northeasterly, leaves it in section 24. There are other wagon roads used by hay makers and others and in fact there is very little difficulty in opening roads in this township anywhere on account of the many openings in the willow brush. Two small creeks run through the township in a northeasterly direction to the west arm of Lesser Slave lake and are slightly alkaline. The actual water running is probably not more than three feet wide and three inches deep but there are many places where the water lying in the bed of the coulées in which these creeks run is three or four feet deep and from sixty to one hundred links in width The banks of these coulées rise from the water near their outlet, to about fifteen feet at the south boundary of the township. Two squatters were found on sections 7 and 18 at the time of survey and since then three others have begun breaking and building on sections 6 and 8. These squatters had one hundred and five acres in crop this year, and have large numbers of horses and cattle besides the necessary buildings. The surface being so nearly level no outcrops of coal or stone were found, and except duck and geese no game was seen.—*Henry W. Selby, D.L.S., 1907.*

77. The south one-third of this township is composed of gently rolling land at an elevation of about two hundred and fifty feet above Lesser Slave lake. It is conveniently situated for farming purposes, the Peace river road cutting across the southwest corner of sections 5 and 6. The richness of the soil is shown by the luxuriant growth of grass, peavine and vetch which grow in the open lands. The ridges are lightly covered with poplar and a few scattered spruce, and between the ridges bunches of willow, and a few willow sloughs. Most of these sections when cleared ought to make beautiful farms. Sections 5, 6 and 7 have had fires on them which has left parts of them almost cleared. A large muskeg lies to the north of these sections which occupies the northerly part of the township and from it several fine streams of water of good quality take their origin. No stone, rock or coal was found and no hay lands, as the timber grows quite evenly over these sections. There are a few spruce around section 10 which would make building timber or sawlogs. No game of any kind was seen.—*Henry W. Selby, D.L.S., 1907.*

Range 16.

52. This township is rolling or gently rolling land, the surface being a succession of low ridges with brulé, having a growth of poplar and willow brush, or young jackpine and intervening swamps with spruce and tamarack, from three to eight inches in diameter. In some of the lower or swampy portions of the township, brulé is also met with, and in some of the brulés there is a good deal of windfall, Moose creek runs through the southwestern portion of the township and in its vicinity there is a considerable portion of fairly open land with clumps of medium sized spruce. This creek is a fine stream of good water, about twenty feet wide and from one to four feet deep. It flows on a stony bed in a valley about sixty feet deep, and half a mile wide, and along its banks a large amount of good sandstone is exposed. The soil in this township varies from clay to light sandy loam on the ridges, and in the swamps it is black muck or peaty loam, with a clay subsoil. Many of these swamps can no doubt be readily drained and will in time become desirable agricultural land, but at present, or in the near future, much of this township could not

Range 16—Continued.

he classed as a desirable location for settlers. The soil on the ridges is in general suitable for growing small fruits or for gardening, and in the latter part of July and the first part of August, when the north boundary of the township was surveyed, a fine crop of ripe strawberries was found on all these ridges, where the brulé was light or comparatively open. The Yellowhead pass trail runs through this township near its northerly boundary, and takes an occasional loop into township 53, north of it.—*Geo. Ross, D.L.S., 1907.*

53. The southeastern part of this township is mainly swamp, with spruce and tamarack from three to six inches in diameter. This swamp is not in one continuous stretch, but is broken or divided up into smaller areas by low ridges, having a growth of jackpine or spruce about five inches in diameter, though in many places the ridges are covered with brulé having a small amount of windfall and a growth of poplar and willow brush. The southwest part of the township is principally light brulé or partly open land with patches of poplar and spruce. In the south halves of sections 5 and 6 there are some peculiar ridges about ten or fifteen feet high composed of drift sand. McLeod river runs through the northwestern part of the township, but I did not explore the land in its vicinity nor the northern part of the township. The greater portion of the southern half of this township is rather too swampy to make good agricultural lands, though there are some tracts of good second class land in it, with a clay subsoil under a shallow covering of black loam that when cleared would be suitable for grain growing.—*Geo. Ross, D.L.S., 1907.*

53. One can pass anywhere in this township with pack horses. The soil is mostly black loam and clay. It is suitable for farming. The surface is gently rolling except near the mouth of Wolf creek, where it is broken. It is covered with poplar, willow, small jackpine, spruce and tamarack, but there is no timber. Plenty of hay is found in the flats of McLeod river, which runs through the centre of this township. Wolf creek also passes through this township. It is a stream about one hundred feet wide and varying from two to six feet in depth. The water is fresh. Water-power could be developed either on Wolf creek or McLeod river by damming The weather was fine at the time of survey (November) with frosts. There are plenty of dry poplar, spruce, tamarack and jackpine, but no coal was seen. Some sandstone was found along McLeod river, but no minerals were seen. Game consists of moose, bear, deer, wolves, &c—*J. C. Baker, D.L.S., 1907.*

54. One can pass anywhere in this township with pack horses. The soil is mostly black loam and clay. It is suitable for farming. The surface is gently rolling and covered with small poplar and willow, but there is no timber. Plenty of hay can be obtained in the flats along McLeod river, which flows through this township. It is a fine stream, being about five hundred feet wide, containing fresh water and varying from one to ten feet at low water mark. Muskeg river also flows east, through this township and empties into the McLeod. It is a small stream about sixty feet wide, two to six feet deep and contains fresh water. The McLeod can be used to develop water-power. There was fine weather at time of survey (November) with frosts. Fuel consists of plenty of dry wood, poplar, jackpine and spruce, but no coal, stone quarries nor minerals were found. Game consists of moose, bears, deer, wolves, &c.—*J. C. Baker, D.L.S., 1907.*

77. The southeast quarter of this township will make first class farms. The soil is clay and black loam on clay subsoil, and grows peavine vetch and grass where the timber is not too thick. The Peace river road passes in a northwesterly direction through these sections, and the timber along this road is open poplar bush and willow

Range 16—Continued.

bunches. Several open prairie spots occur while the whole is well watered with small streams of fresh water. The timber on the rest of the surveyed portion of this township is mainly poplar two to twelve inches in diameter with scattered spruce, and willow between the ridges. A few large spruce were seen on section 10 being around a portion of a large spruce muskeg extending into the southwesterly portion of the township. Another road has been cut from the Big Prairie settlement northerly through sections 2, 11 and 14 to the Peace river road which is used by freighters and others to shorten the distance coming from the south and west. No rocks, coal or hay lands of any size nor game were seen.—*Henry W. Selby, D.L.S., 1907.*

Range 17.

51. This township is mainly a series of ridges of brulé, and intervening valleys of very soft muskeg. The ridges are about thirty or forty feet high, but some of them rise to a height of about one hundred and fifty feet. Though the ridges in general are brulé one instance was noticed of a ridge about two miles long, being heavily timbered with jackpine about two feet in diameter.—*Geo. Ross, D.L.S., 1907.*

52. McLeod river flows through the northern part of this township, entering it at the northwest corner of section 31 and flowing out northerly at the northeast corner of section 35. The river has an average width of about four hundred feet in this vicinity, and in general has steep banks about fifty or sixty feet high, and from the top of the banks the land has a gradual upward slope for some distance back. In some cases, the river runs in a valley in which there are wide flats and good hay meadows. The surface of the northern part of the township in general is high and rolling and the greater portion of it is brulé, being well burnt off, and now contains little timber of much value, although there are scattered small areas of medium sized spruce. The brulé in general has a small amount of fallen timber and a growth of either poplar or jackpine brush. The south one-third of the township is mainly a succession of muskegs, lying between a series of brulé ridges, with small poplar and jackpine, and this portion of the township is not suitable for settlement. The soil is mainly light sandy loam or sand, and in the swampy or lower lands in the northern part of the township the soil is black muck with a clay subsoil. In the northern two-thirds of the township, there are considerable areas of fairly desirable agricultural lands, but the greater portion of it is rather too light for successful grain growing. The Yellowhead pass trail runs through the northern part of this township and crosses McLeod river by a ford about one and a half or two miles west of the east boundary of the township. This township is well watered by many small creeks which flow into McLeod river.—*Geo. Ross, D.L.S., 1907.*

53. I reached this township by making my own pack trail. 'Jock's trail' passes along the west boundary of this township. It is in fine condition. The soil is black loam and clay. It is suitable for farm purposes. The surface of this township is level except near the McLeod where it is rolling. It is covered with poplar, willow, spruce and tamarack. It is very heavy in the northern part but there is no timber in the township. There are no hay lands. McLeod river flows through the southern part of the township. There are also some creeks. The water is fresh in all. Water power may be obtained by damming McLeod river. Fine weather existed at time of survey (November) with frosts. Fuel consists of plenty of dry wood such as tamarack, spruce, poplar and jackpine. Small pieces of coal were seen along McLeod river Some sandstone along the McLeod river might be used for building purposes. No

Range 17—Continued.

minerals were seen. Game consists of moose, deer, bears and wolves.—*J. C. Baker, D.L.S., 1907.*

53. McLeod river runs through the southeasterly corner of the township, and along its southeastern bank there is an outcrop of sandstone about twenty feet thick; on the northwestern bank the outcrop of sandstone is about eight feet thick. The face of this sandstone is weathered and rather soft, but no doubt good building stone can be easily quarried here. Moose creek also runs northerly through section 1, in a wide and deep valley, on its way to join the McLeod. Along its banks also there is an outcrop of sandstone. In the vicinity of McLeod river the land is inclined to be high rolling and hilly. The whole southern portion of the township, in general, is high, dry and rolling, but there are a few depressions where the land is comparatively low and moist and in the southeast corner of the west half of section 3 there is a small lake, surrounded by marshy land having a growth of tamarack and spruce from four to eight inches in diameter. With the exception of the swamp mentioned, and a few small areas of spruce of medium size, the southern part of the township is mainly brulé, having a moderate amount of windfall and a growth of willow brush, or young poplar and jackpine. In the southern part of the township, particularly in the vicinity of McLeod river there is a good deal of light sandy soil, but interspersed through this part of the township are also areas of clay or clay loam and although a cursory inspection would indicate that the soil in general is rather too light for successful farming operations, I have no doubt the greater part of the township will be found to contain considerable areas on which grain growing and gardening can be carried on successfully.—*Geo. Ross, D.L.S., 1907.*

Range 18.

52. This township in general is high and rolling and wooded with poplar, spruce and jackpine, from three to seven inches in diameter. McLeod river meanders through the western part of it in a wide and deep valley in which there are several good hay meadows. All along the river are found many clumps of spruce, the trees averaging about ten inches in diameter, and running to a height of about sixty feet, but the timber in general is only fit for fuel or fencing, though the better portion of it is suitable for building log houses. The soil is mainly clay loam, but several sandy ridges are met with, and in the eastern part of the township a considerable number of swamps with tamarack and spruce are to be found. The greater portion of the township is well fitted for settlement, and when cleared will be found to be well adapted for grain growing and mixed farming.—*Geo. Ross, D.L.S., 1907.*

53. A loop of McLeod river runs through the southern part of this township flowing in at the south through the west part of section 4 and returning south again through the east half of section 2. The river in this township flows mostly through an open flat, or valley in which there are good meadow and farm lands. Sundance creek flows into McLeod river a short distance south of the point where its most northwesterly loop takes a sharp bend to the east, forming an eddy in the river, and on the high bank of the river, to the north overlooking this eddy a store in which general merchandise is sold, was opened, about two years ago. This place is called 'big eddy;' and on the bottom lands, on the north side of the river, just east of 'big eddy' Mr. A. Sinclair, who squatted here, has erected a good log house and stable, and has a nice garden, where he successfully grew last season, onions, lettuce, cabbages, carrots, parsley, potatoes, &c., and had also a fine crop of wheat on a small patch which he sowed as an experiment. Mr. B. Berthoux, the storekeeper also had

Range 18—Continued.

good success with a garden, which he cultivated on the upland adjoining the store. To the north of the river and Sundance creek the land is high and rolling and in general is covered with a growth of small or medium sized poplar. In going north from the top of the steep bank of the river at big eddy the land has an upward slope for a distance of about thirty chains and there attains a height of about two or three hundred feet above the river then for about half a mile farther north the surface is fairly level, with scattered medium sized poplar, then going farther north, the land is heavy rolling, with thick poplar and willow brush, and scattered groves of jackpine from four to ten inches in diameter. A few swamps with spruce and jackpine are also to be found and towards the central part of the township a steep ascent of two or three hundred feet is met with, which takes one up to a higher plateau, which is more or less rolling and covered with brush, the surface being broken by an occasional valley with thick brush or a ridge with balsam poplar. The southwestern part of the township is watered by Sundance creek and its tributaries. This creek flows through a wide and deep valley in which there is a good deal of land that is more or less open, and covered with a fair growth of grass, that makes it of value as a grazing ground. Sundance creek is a fine stream of pure water, about twenty feet wide, and from about two to five feet in depth, flowing with a fairly rapid current. In the vicinity of the creek, groves of fair sized spruce and jackpine are met with. Going southwesterly from the creek the land rises to a height of more than a hundred feet above it, the surface being considerably broken by spruce and tamarack swamps. The higher land or ridges separating these swamps is mainly brulé. The portion of this township lying north of McLeod river and Sundance creek, is well adapted to agricultural purposes in general, the soil being mostly a rich brown loam. The southwestern portion, south of Sundance creek is not so desirable for farm lands, as it is more broken and is rated as third class land. The Yellowhead pass trail traverses this township passing through big eddy, and generally keeping a short distance north of McLeod river and Sundance creek. The surveyed line of the Grand Trunk Pacific railway also goes through this township, passing in the immediate vicinity of 'big eddy.'—*Geo. Ross, D.L.S., 1907.*

54. This township is somewhat similar to the northern part of township 53, adjoining it on the south, but heavier rolling. The soil in it is mainly clay loam and well adapted for agriculture, but is rather too heavy rolling.—*Geo. Ross, D.L.S., 1907.*

Range 19.

52. This township is traversed by McLeod river and broken by numerous swamps muskegs and shallow lakes. The northeastern portion of the township consists of a succession of low ridges on which there is a growth of poplar from two to six inches in diameter, with intervening marshes, muskegs, and shallow lakes. There is also an occasional area covered with spruce and jackpine. In the northern part of section 36 there is a fine lake which also extends north into section 1, township 53. This lake is rather less than a mile across, and on its south side there is high, hilly land, well wooded with spruce and jackpine. In running the fourteenth base line west from the east boundary of range 13, no true muskegs were met with till this township was reached; and in this township the greatest chainage across any muskeg was about twenty-two chains. The land improves in the northwestern portion of the township and in the north part of section 32, in the vicinity of Whitemud, there is a considerable tract of good open meadow land. Whitemud creek, which is about seven feet wide and three feet deep, running with a fairly rapid current, flows through this meadow, and empties into McLeod river in section 31. On the banks of this creek,

Range 19—Continued.

in the valley of McLeod, a short distance above its junction with that river, are the ruins of a few shacks or log houses, which mark the site of a small village or trading post in which several half-breed families, principally engaged in trapping, lived some years ago. Near these ruins is also a small cemetery. The surveyed line of the Grand Trunk Pacific does not pass very far from Whitemud, and I have no doubt, that in the near future, Whitemud will spring into new life and become the centre of a thriving settlement. The Yellowhead pass pack trail, after turning northerly away from McLeod river, at big eddy, again approaches the river at Whitemud and follows it westerly, more or less closely, to 'the leavings' in range 21. In the valley of McLeod river, in the vicinity of Whitemud, are considerable areas well wooded with spruce and jackpine averaging ten or twelve inches in diameter. I did not examine the southern portion of this township but consider that it is somewhat similar to the northern part, which is rather too much broken to be well fitted for good agricultural lands. The soil is mostly a light sandy loam but there are considerable areas, such as is to be found in the vicinity of Whitemud, that will prove to be well adapted for farming. The timber is suitable for fuel, fencing, building, log houses, &c.—*Geo. Ross, D.L.S., 1907.*

53. This township is traversed by Sundance creek, which enters it some distance south of the northeast corner, then flows southeasterly to a point about a mile north of its south boundary, and two and a half miles west of its east boundary, then it turns and flows northeasterly into range 18, on its way to enter McLeod river at 'big eddy.' Sundance creek flows through a wide and deep valley, in which there are some small areas of high dry prairie land, and also some groves of fair sized jackpine. In the central portion of the township, along Sundance creek, there are some large swamps, partially open muskeg and partially wooded with tamarack. The southeastern portion of the township lies at an elevation of about a hundred feet above Sundance creek, and consists mainly of a succession of ridges, brulés, with second growth poplar, or poplar brush, and intervening swamps with spruce or tamarack, averaging about five inches in diameter. The south portion of section 1 is broken by a lake having a considerable area of marsh and muskeg along its north shore. In the southeastern portion of the township there are also a number of open marshes, about thirty or forty acres in extent, covered by two or three feet of water and having a growth of coarse grass. The south central portion of the township is broken by a number of small shallow lakes, and muskegs, which lie between ridges covered with brulé, having a considerable amount of windfall, and occasional poplar bluffs. In the southwest and central portion of section 6, is a wide ridge, well wooded with poplar. North and south of this ridge are fairly open flats, or meadow land with a growth of grass and small scrub. The south half of this township though considerably broken contains many areas of good agricultural land that can be readily cleared and brought into cultivation. The soil is mainly sandy loam or sandy clay, suitable for grain growing or gardening. The timber is mainly fit for the ordinary purposes of settlers, such as providing fuel, rails for fencing, and timber for the construction of log buildings. The Yellowhead pass trail traverses the southeasterly part of the township, and the surveyed line of the Grand Trunk Pacific railway also passes through the township. The northern portion of this township was not explored by me.—*Geo. Ross, D.L.S., 1907.*

52. McLeod river flows from west to east through the northern part of this township, keeping at an average distance of a little more than a mile south of its north boundary. It runs in a wide and deep valley, in the flats of which are several good hay meadows, but in general they are timbered with spruce, jackpine and cotton-

Range 19—Continued.

wood from eight to twelve inches in diameter. From the north boundary of the township to the top of the bank of the valley a distance varying from about a quarter to three-quarters of a mile, the land is nearly level or gently rolling, and is mainly brulé, with light scrub, but occasional areas of spruce, jackpine and poplar from two to five inches in diameter are to be found. The soil varies from light sandy loam to clay loam, on the higher lands, and in the swamps it is black muck or peaty loam. In the river valley, the soil varies from a rich dark alluvium to gravel. The portion of the township north of McLeod river is well fitted for settlement, and when cleared, and cultivated, will prove to be an area on which grain growing or mixed farming can be carried on successfully. The Yellowhead pass trail runs through the township from east to west, keeping a short distance north of McLeod river, and the surveyed line of the Grand Trunk Pacific railway follows along about the top of the north bank of the valley of this river.—*Geo. Ross, D.L.S., 1907.*

53. The southern portion of this township is mainly light brulé, through which run narrow belts timbered with poplar, spruce and jackpine, from two to five inches in diameter. The surface is rolling or gently rolling. Near the centre of the south boundary of section 6 a creek about twenty feet wide and one foot deep, with a very rapid current is crossed. This creek is the outlet of a small lake lying about a mile and a half north of the south boundary of the township, and as this creek has a heavy fall and a steady flow of water it would be readily available as a small water-power. The timber found in the township is only valuable for fencing or fuel. The soil varies through the grades of light sandy loam, clay loam and clay, and in a few small areas it is gravelly. The township as a whole is well fitted for settlement and when cleared, grain growing and mixed farming can be carried on in it with general success.—*Geo. Ross, D.L.S., 1907.*

Range 21.

52. McLeod river flows through the northerly part of this township from west to east, in a wide valley, depressed about sixty feet below the level of the adjoining lands. Along the river in the flats of this valley, there are several fine open hay meadows, varying in width from ten to forty chains. Other portions of the valley are wooded with spruce, averaging ten inches in diameter, or cottonwood from eight to fourteen inches in diameter, also in places, the valley is broken by ridges of gravel. In going north from the river, after crossing the bottom lands one passes up the bank of the valley, about forty feet high, then through a poplar wood about twenty chains wide, the trees averaging about eight inches in diameter, then through a belt of swampy land with spruce, then over a ridge about fifteen chains wide, timbered with poplar, next through a strip of mossy swampy land, wooded with spruce, then over an area of high brulé with a good deal of windfall, and a growth of small jackpine, and on the whole the greater part of this township is brulé, interspersed with small areas of poplar, spruce and jackpine, averaging about five inches in diameter though in places as already mentioned trees of larger size are met with. 'The leavings' on McLeod river in the western part of the township is an open flat or meadow, about forty chains long and thirty chains wide. At this place the Yellowhead pass trail leaves McLeod river, and runs westerly towards Athabaska river. From 'the leavings' also another loop of the trail, runs in a northerly and northwesterly direction into township 53, range 22, and passes around the northerly end of the high plateau or divide between McLeod and Athabaska rivers, and again turns southerly and southwesterly along the southeasterly side of Athabaska river, till it again joins the old trail near Sandstone creek. That portion of the trail between

TOWNSHIPS WEST OF THE FIFTH MERIDIAN.

Range 21—Continued.

'the leavings' and Sandstone creek, has not been much travelled during the past few years, having become blocked up by fallen trees and the travel went over the northerly loop, however during last season the more southerly and direct route was reopened and travel is now divided. The soil in township 52, range 21, is mainly light sandy loam, interspersed with small areas of stony clay, black muck, &c. In the valley of McLeod river, the soil is mainly a rich dark alluvium. The township as a whole is fairly well adapted for agricultural purposes. The timber is only suitable for the ordinary uses of settlers such as providing fuel, fencing and logs for buildings. The surveyed line of the Grand Trunk Pacific railway passes through the northern part of this township.—*Geo. Ross, D.L.S., 1907.*

53. This township is broken considerably by a number of lakes and swamps. Along the southern boundary, sections 1 and 2 are light brulé with second growth poplar, section 3, stony land with second growth poplar and jackpine, sections 4 and 5 are mainly light brulé, and the southwesterly part of section 5 is broken by a small lake. Section 6 is mainly mossy swampy land. The soil is principally sandy loam, with interspersed areas of stony clay. I did not explore the northern portion of this township, but apparently considerable areas of fairly good agricultural land are to be found scattered through it.—*Geo. Ross, D.L.S., 1907.*

84. (Peace River Landing settlement.) This settlement, situated east of Peace river and near North Heart river is on a flat about fifteen feet above the river. It is surrounded on the east and south sides by hills of six hundred to eight hundred feet above the river. There are ten lots of different sizes in the settlement. The soil is a deep black sandy loam resting on a clay and sandy clay subsoil. Grain and vegetables grow well. Good water is plentiful all through the settlement and wood for fuel is close by. This settlement is reached by the Lesser Slave lake and Peace River Landing wagon trail. There is no water-power, nor stone quarry, and no mineral of any description has been found there during the progress of the work. The people of the place cut their hay on top of the hills along the wagon trail. The Northwest Mounted police have their quarters south of North Heart river, farther up Peace river.—*J. B. Saint Cyr, D.L.S., 1907.*

Range 22.

52. The greater portion of this township is rough and broken; the northeastern part of it is swampy with spruce, five inches in diameter, or brulé, with a good deal of fallen timber, and a growth of young jackpine. The western part of the township is occupied by the high ridge, or divide between McLeod and Athabaska rivers. The greater part of this divide is covered with heavy brulé, on which there is a thick growth of young jackpine, though in places the jackpine is replaced with poplar and willow brush, or by a growth of spruce. Section 33 and the northwest quarter of section 34 on this divide is heavily timbered with spruce and jackpine from six to twenty-two inches in diameter, this tract of timber stretches southwesterly for a distance of about two miles. The easterly side of this high ridge or divide trends southwesterly parallel to McLeod river and forms the northwesterly bank of its valley. The valley of the McLeod, which occupies the southeasterly part of the township is the most desirable part of it and is well adapted for mixed farming or grazing lands. The soil in the valley, is a rich, dark alluvial deposit, and in the remainder of the township it is mainly a light sandy loam, fairly well adapted for grain growing. The timber on section 33 and the northwest quarter of section 34 is suitable for lumber, but in general the timber to be found is mainly suitable for fuel, &c.—*Geo. Ross, D.L.S., 1907.*

Range 22—Continued.

53. The southeastern part of this township is rather low and swampy, and also broken by small lakes, surrounded with green spruce or tamarack, varying from three to six inches in diameter, but there is also a good deal of brulé to be met with. The southwestern portion of the township is occupied by the northerly end of the high ridge or divide lying between McLeod and Athabaska rivers. Section 4 on this divide is heavily timbered with spruce and jackpine from six to thirty inches in diameter and scattered poplar from ten to eighteen inches in diameter. About the north end of section 4, the timber is mainly spruce from eight to twenty-four inches and scattered poplar up to eighteen inches in diameter. In going northerly from the north boundary of section 4, the land slopes downward for the distance of about sixty chains, where a ravine fifty or sixty feet in depth, and heavily timbered with spruce and jackpine up to three feet in diameter is reached. In the bottom of this ravine a stream about two feet wide and fifteen inches deep runs easterly with a rapid current. From the top of the bank on the north side of this ravine the land has a gentle slope downwards towards the north and is timbered with spruce, jackpine and poplar from twelve to thirty inches in diameter, and about a mile north of the ravine another stream about two feet wide and eighteen inches deep runs northeasterly with a rapid current. Going north from this creek the land still slopes downward and the timber is smaller running into spruce about six inches in diameter. Here the survey lines of the Grand Trunk Pacific railway are met with, as they curve around to the north, to avoid the heavy grade that would be necessary, if the direct route across the divide were taken. Another creek about three feet wide and one foot deep, flowing northerly with a rapid current, is met with in the smaller spruce. Sections 5 and 6 are covered with heavy dry standing timber and section 6 and the west half of section 5 are on the westerly side of the divide, and slope northwesterly towards Athabaska river. North of sections 5 and 6, the land is brulé, and descends towards the Athabaska for the distance of about a mile, then gradually rises into a high ridge, which is timbered with spruce and jackpine of medium size. Athabaska river runs through the northwestern part of the township in a wide and deep valley. The soil in this township is light sandy loam interspersed with areas of yellow sandy clay, and would be fairly well adapted for agricultural purposes. On the south central portion of the township as previously referred to there is a considerable area of timber suitable for lumbering purposes.—*Geo. Ross, D.L.S., 1907.*

52. Athabaska river flows through the northwestern corner of this township in a deep valley in which the bottom is rather narrow and confined, being wooded or brulé rather than hay flats, however on the northwesterly side of the river, both in the valley and on the plateau above, there is a considerable stretch of brulé, in which there is a good growth of grass. This portion of the township, on the northwestern side of the river is principally light brulé, with second growth poplar, and scattered small areas of medium sized spruce and jackpine, and is mainly high dry land ascending towards the west, and is broken by the deep valley of a creek running southeasterly into Athabaska river. All the central part of this township on the southeasterly side of Athabaska river slopes northwesterly towards the river, and forms the southeasterly side of its valley. In the vicinity of the river on this slope are considerable areas of live spruce and jackpine, but fire has made many inroads into the timber, leaving lanes and patches of brulé with a large amount of fallen timber. Back of the live timber farther up the slope of the valley the central portion of the township is mainly heavy brulé. The southeastern part of the township is on the top of the divide between McLeod and Athabaska rivers and is brulé with interspersed small areas of live spruce and jackpine. The soil in this township is light

Range 22—Continued.

sandy loam, and interspersed areas with yellow sandy clay, or gravelly soil. The surface is well watered with many small and medium sized creeks and when cleared should make good agricultural or grazing lands.—*Geo. Ross, D.L.S., 1907.*

53. Athabaska river flows northeasterly through this township and cuts off its southeast corner in the form of a triangle, having its south and east sides each about four miles in length. The whole of this triangle, except minor undulations, slopes northwesterly towards the river and forms part of the bank of its valley. The greater part of this triangle is brulé with a large amount of standing dead timber, but near the river, in the southern part of the township, there is a tract about two miles long and half a mile wide, wooded with poplar, spruce and jackpine from six to twelve inches in diameter. The northerly loop of the Yellowhead pass trail, which comes around by the northerly end of the high divide between McLeod and Athabaska rivers passes through this woods. A medium sized creek, flowing in a deep valley, cuts into the southwest corner of this township and a short distance north of this valley, the easterly side of a high hill or ridge projects into this township from the west, and its top, which rises to the height of one thousand feet above Athabaska river, is very light brulé, or nearly open prairie. The northwesterly part of the township is high rolling, and broken by a number of high ridges, partly wooded with spruce and partly very light brulé. soil in this township is mainly light sandy loam, but there are tracts of clay with a stony or gravelly subsoil. Some portions of this township are rather rough and high rolling, but large parts of it when cleared will make good agricultural or grazing lands, and the township is well watered throughout, with many small and medium sized creeks. The timber is suitable only for meeting the ordinary requirements of settlers. Athabaska river in this township averages about five hundred feet in width.—*Geo. Ross, D.L.S., 1907.*

Range 24.

51. Athabaska river flows northeasterly through the northwest corner of this township, and the Yellowhead pass trail runs through it, parallel to the river, keeping about half or three-quarters of a mile s utheast from it. In the vicinity of the trail there is a fine stretch of prairie bottom land, with good grass, the soil being a rich brown loam. Between this strip of prairie land and the river, is a belt of second growth jackpine, and the northwesterly side of the river rising with a fairly steep, but gradual ascent, is also clothed with second growth jackpine. On the southeasterly side of the river, the bank of the valley rises to a high plateau, with light brulé, nearly open in many places, but generally with scattered poplar and jackpine. The valley on the southeasterly side of the river is a desirable location for homesteading, being well adapted to grain growing or mixed farming and the township as a whole will no doubt prove to be well adapted for these purposes. The survey line of the Grand Trunk Pacific railway runs through the township not far from the Yellowhead pass trail.—*Geo. Ross, D.L.S., 1907.*

52. Athabaska river flows northeasterly through the southeasterly part of this township, but there is little or no bottom or grazing land in its valley on either side of the river in this township. The northern part of the township is mainly heavy rolling land with a general ascent to the west, away from the river, and continues to rise, till near the northeast corner of section 31, where the top of the plateau or 'mountain' is reached, it attains an elevation of 4850 feet, or about 1750 feet above Athabaska river. The greater part of this township is more or less rolling and covered with brulé, having scattered areas of second growth poplar, or groves of medium sized

Range 24—Continued.

spruce, but in the northwest corner of the township on the top of the plateau or 'mountain' is a heavy growth of spruce from six to twenty-two inches in diameter. In this township the comparatively level plateau or 'mountain' extends only about twenty or thirty chains south of the north boundary of section 31, and then slopes southerly down to the valley of the Athabaska. On the shoulders of this slope is a good deal of medium sized spruce and jackpine. The soil varies from sandy loam in certain portions of the township to yellow clay in others, and the greater portion of the township will no doubt be found to be fairly well adapted for grain growing or mixed farming. The timber generally is fit only for the ordinary purposes of settlers except at the northwest corner of the township where it is suitable for lumber.—*Geo. Ross, D.L.S., 1907.*

53. A creek about fourteen feet wide and seven inches deep flows through the southeasterly part of this township in a wide valley, about a hundred feet deep on its way to join Athabaska river. Immediately north of the valley of this creek in section 1, the land rises into a high hill, which attains an elevation of about four thousand one hundred feet or about one thousand feet above Athabaska river in its vicinity. The top of this hill is very light brulé or nearly open prairie. Sections 1, 2, 3, 4 and 5 in this township are principally rolling and ascending land, brulé with a few areas of poplar and spruce, but towards the west side of the south boundary of section 5 at the top of a steep ascent, a heavy spruce wood is entered, and the easterly slope of this ascent sweeps northerly and easterly in a crescent form and circles back easterly to the shoulders of the high hill rising in section 1, striking it about two miles north of the south boundary of the township. The top and southerly slope of this hill, which thus extends in crescent form from west to east are clothed throughout with a heavy growth of spruce from six to twenty-two inches in diameter. This heavily timbered land stretches to the north forming an area that is suitable for lumbering operations. The brulé and more open parts of the township will no doubt prove to be well adapted for ordinary agricultural purposes. The soil varies from light sandy loam in places, to clay that is more or less stony in other parts of the township.—*Geo. Ross, D.L.S., 1907.*

Range 25.

30. This township is traversed by Columbia river. It is mostly mountain side and high bench land, timbered with fir. There is an extensive flat off the west side of Columbia river below the mouth of Beaver river, timbered along the river with spruce.—*Jos. E. Ross, D.L.S., 1907.*

31. Columbia river traverses the westerly half of this township. It is mostly mountain side with high benches. There are some flats along the river timbered with spruce.—*Jos. E. Ross, D.L.S., 1907.*

51. Athabaska river flows northeasterly through this township, dividing it into two nearly equal parts. All the central part of the township is occupied by the valley of this river, in which there is a large amount of nearly open land, with a good growth of grass, and well adapted for grazing. The river here is about four hundred feet wide, and runs with a rapid current in a rocky bed. The banks between the river and the first flats of its valley vary in height from four or five feet to fifty or sixty feet. On the northwesterly side of the river, and back from it about a mile and a half or two miles, the valley has in places rocky banks about forty or fifty feet high. The northwesterly part of the township is rolling land, mainly brulé with poplar brush and some areas of small spruce. In the vicinity of Prairie creek on the southeasterly side

Range 25—Continued.

of the river the first flat adjoining the river is about six to eight feet above it being a stretch of nearly open prairie, about fifteen or twenty chains wide, then after ascending a bank about forty feet high, one reaches the second flat a wide tract of comparatively open land, very light brulé, with some scattered poplar brush. All the southeast part of this township is somewhat similar to this tract, the soil being a rich dark brown loam well adapted for grain growing or grazing. Some good seams of coal are also found in this portion of the township, which is traversed by the Yellowhead pass trail, and the surveyed lines, of the Grand Trunk Pacific railway are also run through it.—*Geo. Ross, D.L.S., 1907.*

52. The northern part of this township forms part of a high and heavily wooded plateau, or 'mountain' which extends westerly to Whitefish lake, in the western part of range 26. On this high plateau, sections 35 and 36 are covered with a heavy growth of spruce from eight to twenty-two inches in diameter, mixed with balsam from eight to twelve inches in diameter. Sections 33 and 34 also on this high elevation of land, are less heavily wooded with spruce and jackpine from six to eighteen inches in diameter. Sections 31 and 32, also on the 'mountain' are wooded with spruce from five to fifteen inches in diameter, but in sections 31, 32 and 33, there are several areas of partially open land, with a fair growth of grass. These sections are also well watered by several creeks from one to two feet wide and by one or two wider creeks up to twelve feet in width. The creeks in general run in stony beds with a fairly rapid current, in a northerly or northeasterly direction. The heavy woodland in the northern part of this township appears to have not been injured by fire for at least two hundred and fifty years, as many of the spruce trees have reached that age and growth rings counted on some of the balsam show that they were over two hundred years old. A few ponds, and open grass marshes, from one to twenty acres in extent are met with in the northern part of this township. The southern part of the township is mainly brulé, and has a general southerly descent towards Athabaska river. The soil in the northern part of the township where the land is well timbered, is mainly clay subsoil, under a fair depth of black loam, and would be well adapted for grain growing. The timber on the northeastern part of the township is suitable for lumber. On the remaining part of the township, the timber would only be suitable for fuel, fencing, &c. or the ordinary uses to which settlers would put medium sized trees.—*Geo. Ross, D.L.S., 1907.*

53. Sections 1 and 2 are heavily timbered with spruce from eight to twenty-two inches in diameter, sections 3 and 4, are timbered with spruce and jackpine from six to eighteen inches in diameter, and sections 5 and 6 have a fairly thick growth of spruce from five to fifteen inches in diameter, but on sections 4, 5 and 6 there are a few areas of limited size which are comparatively open and have a fair growth of grass. The southern portion of the township as described, is also well watered by many small and medium sized creeks flowing in a north, or northeasterly direction. The northern part of the township was not explored by me but it appears to have a general rolling descent to the northeast, and to be wooded with medium sized spruce. The soil is mainly clay, under black loam, and the surface being rolling, the greater portion of it when cleared would be very suitable for the ordinary purposes of agriculture. The timber on the eastern or southeastern part of the township is suitable for being manufactured into lumber, and on the remaining portion of the township it is valuable for fuel, or for meeting the ordinary requirements of the settlers.—*Geo. Ross, D.L.S., 1907.*

TOWNSHIPS WEST OF THE FIFTH MERIDIAN.

Range 26.

31. Columbia river traverses the northeast corner of this township. The country is mountainous Along the river there are some small flats timbered with spruce of from ten to twenty inches in diameter—*Jos. E. Ross, D.L.S., 1907.*

32. This township is traversed by the Columbia river. There are at the mouths of Bush and Gold creeks which flow into the Columbia from opposite sides, large flats marshy towards the middle and mostly timbered with spruce along the river. On the east side of Surprise rapids there is some low hilly land with high mountains in the rear. The river is winding with crosscut and back channels forming small islands.—*Jos. E. Ross, D.L.S., 1907.*

52. Whitefish lake, a beautiful sheet of fresh water about twenty-five chains wide, stretches north and south through the central part of sections 29 and 32, and also extends northerly into township 53, in this range. A creek varying from ten to twenty feet in width and from one to five feet in depth, flows northerly, through a valley with bottom lands, about half or three-quarters of a mile wide into the south end of Whitefish lake. At several points in this valley the creek broadens out into small lakes or ponds. The bottom land along the creek is mainly open meadow, with a good growth of grass and peavine but it also contains patches of scrub and groves of poplar and young jackpine. On the east side of Whitefish lake is a valley about twenty chains wide, brulé more or less open and broken by gravelly ridges and on the east side of this valley is a cliff, or terrace of sandstone about one hundred and twenty-five feet high. The cliff extends south of the southerly limit of Whitefish lake along the easterly bank of the valley of the creek formerly mentioned for a distance of about two or three miles. From the top of the sandstone cliff east of Whitefish lake the land ascends to the east into a high plateau or 'mountain' attaining an elevation of about one thousand feet higher than the lake. The 'mountain extends east occupying the northeastern part of this township as well as the portions of ranges 25 and 24 previously referred to. The greater part of the plateau in this township is heavy brulé with scattered areas of spruce except in section 36, on which there is a fairly thick growth of spruce from three to fifteen inches in diameter. . The southern portion of the township below this 'mountain' is rolling land being mainly brulé with young poplar, and interspersed with areas of small spruce. The part of the township west of the valley running south from Whitefish lake is inclined to be hilly, and is covered with brulé, and intermingled areas of medium sized spruce. Immediately west of Whitefish lake, in sections 31 and 32, there is a considerable tract of very light brulé, or almost open prairie, but the soil is rather gravelly to make good agricultural land. The central portion of section 31 is occupied by a fine dry open hay meadow about one hundred acres in extent. The northern portion of Whitefish lake is quite shallow, but it is not marshy, and the southern part of the lake is in general very deep. This lake contains great quantities of large whitefish and pike, and several families of beaver apparently flourish here. The Smoky river trail, running northwesterly from Prairie creek to Smoky river, crosses the southwestern part of this township, runs northerly through the valley extending south from Whitefish lake, passes along the west side of the southern part of that lake and then turns northwesterly. This trail is in fair condition, but it is not much travelled. Considerable areas of this township are quite desirable for settlement, being well adapted for agricultural purposes, the soil being clay or clay loam underlying a few inches of black loam, but light sandy loam and gravelly areas are quite numerous. The valley running south from Whitefish lake, though rather confined in area, is probably the most desirable location in the township.—*Geo. Ross, D.L.S., 1907.*

Range 26—Continued.

53. This township is mainly brulé, with occasional areas of young spruce, jackpine and poplar. The surface is heavy rolling and consists mainly of a series of high ridges with intervening deep valleys. Whitefish lake extends northerly, from township 52, into section 5, for about three-quarters of a mile. This northern portion of the lake is quite shallow, a good deal of it being only two or three feet deep, but not marshy, although in other parts of the lake, the depth is quite great. A creek varying in width from about forty to one hundred feet, and about three feet in depth flows northerly out of the north end of the lake with a slow current. Along this creek, are low flats, about twenty chains wide, having a growth of short wiry grass. In this flat, the creek enlarges into an occasional pond, but about half a mile below the point at which it issues from the lake, it is well confined to its banks. Immediately west of the creek flats, there is a second flat, which is about twenty feet above the creek, being nearly open prairie and about twenty chains wide, west of this is a similar flat about twenty feet higher, and west of that again a hill, or ridge rises to the height of about one hundred and fifty feet above the creek. On the east side of the flats of the creek the sandstone cliff or terrace which extends northerly from township 52, rises to the height of about three hundred feet above the lake. About two and a half miles below the point at which it leaves the lake, the creek narrows down to a width of about fifteen or twenty feet, and runs with a rapid current, over a stony bed. This creek trends in a northeasterly direction and flows through a deep valley, having the sandstone cliff on the east side and a high steep clay or gravelly bank on the west side of its valley. The land in the vicinity of the creek is brulé with scattered groves, or clumps of second growth spruce and jackpine. In this township, the soil, on the ridges is sandy or gravelly loam and in the lower or bottom lands between the ridges it is black muck or black loam. In these bottom lands there are also considerable areas with a good growth of grass. The land generally is well watered with many small streams, and large areas when cleared would be better adapted for grazing lands, than for grain growing.—*Geo. Ross, D.L.S., 1907.*

Range 27

52. The surface of this township is in general, high rolling or hilly and the greater portion of it is brulé with scattered areas of spruce. It is well watered with many small creeks, and Hay river, a fine stream of pure water about fifty or sixty feet wide, and from two to five feet deep flows with a rapid current through the northwest part of the township. In the bottom of the valley of this river are groves of poplar, cottonwood and spruce from six to fifteen inches in diameter. The slopes of the valley are covered with brulé and scattered areas of medium sized spruce. The Smoky river trail runs through the northeastern part of the township, and it is in fair condition, but there is very little travel on it. The older trails as shown on previous departmental maps, are now apparently obliterated. The soil is mainly light sandy loam, but there are considerable areas with clay loam and stony clay. At the northeast corner of the township there is a tract of good agricultural land, but on the whole the township is not well adapted for settlement.—*Geo. Ross, D.L.S., 1907.*

53. This township is mainly brulé interspersed with a few areas of medium sized spruce and jackpine, and consists of a series of high ridges, and deep valleys. Hay river flows diagonally through the southeast part of the township in a wide and deep valley, in which there are some bottom lands with good grass, and Smoky river trail runs northwesterly through the southwestern part of the township. This township is not well adapted for settlement, being on the whole rather rough, and high

TOWNSHIPS WEST OF THE FIFTH MERIDIAN.

Range 27—Continued.

rolling with the exception of two or three sections at the southeast corner. The soil is mainly sandy loam. Fractional township 52 and 53 in range 28 are mainly brulé and rather too high rolling and broken to be of much value for settlement.—*Geo. Ross, D.L.S., 1907.*

TOWNSHIPS WEST OF THE SIXTH MERIDIAN.

Range 2.

23. *(Section 21.)* The section can be reached by a rough wagon road running southerly from the sawmill at the 'big eddy' of Columbia river, on the main line of the Canadian Pacific railway. The northeast quarter of the section is rocky, and rising towards the west. It has a light covering of earth, generally stony. A growth of hazel, willow and poplar scrub with a few second-growth white pine covers the ground. The north half of the southeast quarter is similar to the northeast quarter. The south half has a southerly slope. While broken with rocky ridges there is a considerable area of sand and gravelly soil that would probably make good fruit land, but in dry seasons lack of moisture would be a drawback, as owing to the roughness of the surface and its elevation it is impossible to irrigate it. Second-growth white pine trees are scattered over the quarter section and if not injured by fire they will when mature be valuable. They are from five to nine inches on the stump. The north and east halves of the northwest quarter are rocky with a light covering of soil, light scrub and second-growth pine. The southeast quarter is broken with rocky ridges. Between the ridges there are areas of flat land, generally marshy, with clear spaces that when drained will be ready for cultivation. The remainder is covered with a thick growth of scrub and fallen timber, the result of fire. A few cedar and hemlock trees of small size growing in clumps will furnish considerable firewood. There is no land producing hay, other than a space of about five acres that has been sown in timothy by the former settler mentioned herein. Springs of fresh water that are probably permanent will provide water for domestic purposes. The flat land is covered with water in the spring but clearing and a simple system of drains will prevent flooding. There are no water-powers. The climate is equable, being similar to that of Revelstoke. There is deep snow from December to the end of March, or later. Rainfall is generally sufficient without irrigation. I do not think summer frosts prevail. Rock exposures are broken up and are not suitable for structural purposes. There are no veins of coal or lignite, or minerals of economic value so far as known. Bear and grouse are plentiful. The remains of two cabins and a small clearing show that the place has been occupied at one time, but the improvements are now in ruins, and it has evidently been abandoned for some time.—*J. A. Kirk, D.L.S., 1907.*

Range 3.

77. Two-thirds of this township is thickly timbered with spruce, jackpine, poplar, birch and large willow, being on the Birch hills. There are a few creeks coming out of those hills running until the middle of summer. The surface on section 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11 and 12 in that township is prairie and bluffs. The soil is very good, and game such as bears and moose are plentiful in that part of the country. Twenty or thirty settlers could locate in the south portion of that township when subdivided. This township can be reached by Egg lake wagon trail.—*J. B. Saint Cyr, D.L.S., 1907.*

78. This township can be reached by the Egg lake and Spirit river wagon trail. With the exception of sections 1, 2, 3, 4, 5 and 6, where patches of prairie are met

Range 3—Continued.

with, this township is thickly timbered with poplar, spruce and large willow. The country north of the wagon trail is level and the surface soil is very thin, overlying a clay and hard subsoil. On sections 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17 and 18 spruce suitable for lumbering purposes is plentiful. Brulé river, running in a deep ravine, crosses this township about three miles southeast of the northwest corner of section 31. There are no water-powers nor stone quarries, and water outside of Brulé river is rather scarce. Bear and moose seem to be plentiful in that district. Oxide of iron has been found in the cutbanks along the river at different places and principally in the neighbourhood of the mouth of Spirit river. Hay is not very plentiful in this township and can be procured in some sloughs towards the northeast corner of section 36. The northeast portion of this township is rolling, and the land adjoining Brulé river is very hilly. A few settlers could find enough open land in the first row of sections in the south of this township to make a good farm. The climate is the same as at Spirit river and early summer fosts are not very frequent.—*J. B. Saint Cyr, D.L.S., 1907.*

79. This township lying south of Peace river is all thickly timbered with poplar, large willow and spruce. The soil is comparatively poor. Brulé and Spirit rivers cross this township through its south portion. The hills of Brulé river are from three hundred to four feet in height and those of Spirit River are about two hundred feet high. There is no way of reaching this township at present unless by Peace river, but even by this way a road would have to be made to go up the hills. —*J. B. Saint Cyr, D.L.S., 1907.*

80. The surface in this township is prairie and bluffs. The soil is good. Wood for fuel is plentiful and timber for building purposes can be procured almost everywhere in this township. There are a few creeks there flowing to Peace river nearly all summer. This township can be reached by Peace River Landing and Dunvegan wagon road. Settlers will find there good locations when the subdivision of this township is made.—*J. B. Saint Cyr, D.L.S., 1907.*

Range 4.

80. The western half of this township is thickly timbered with poplar, spruce and large willow, while the remaining portion is prairie and bluffs. Very little of this township is surveyed. The soil appears to be fairly good. The country in the western portion of this township is hilly and rolling. The eastern half is nearly level. There are a few good sections here and there. The climate is very good all through that country and early summer frosts are not very frequent.—*J. B. Saint Cyr, D.L.S., 1907.*

Range 6.

19. A part of Shuswap river was traversed to complete a former survey. There is little level land along the river fit for settlement. While a good deal of it is gravelly and stony, there are some patches of good land.—*Jos. E. Ross, D.L.S., 1907.*

71. This township can be reached by Spirit river and Dunvegan wagon road. As in township 72 the country is undulating and the soil is a deep black loam or a deep black sandy loam resting on a clay or sandy clay subsoil. The surface in that portion of the township surveyed is prairie and bluffs. Lake No. 2 situated on east boundary of section 36 is very small. Bear creek crosses this township from section 33 to section 11. The supply of water furnished by the lakes and streams of this

Range 6—Continued.

township is permanent but the best water of all is found in Bear creek.There are no water-powers and no stone quarries in this township. No mineral of any description has been found there during the progress of the work. Hay can be procured in good quantities all through this township. Wood for fuel is plentiful and timber for building purposes can be procured along Bear creek and towards the southeast portion of this township. Ducks and geese are plentiful in the spring and autumn on the lakes of this township. The climate is very good all through Grande prairie. Last summer there were two frosts in August, but the people of the place say that generally there are no early frosts in the summer. Grain and vegetables are successfully raised on Grande prairie. Flyingshot Lake settlement is included in this township. This settlement comprises sections 9 and 16 with eastern halves of sections 8 and 17 and western halves of sections 10 and 15, nearly two miles square. In the middle of this settlement is a small lake called Flyingshot lake. The survey of this settlement commenced on August 2 and was completed on the 20th. The surface is bluffs and prairie and the soil is composed of a deep black loam resting on a sandy clay subsoil. About three-quarters of the surface covered by the settlement is thickly timbered with poplar and large willow with a few spruce here and there. A small quantity of hay is cut around Flyingshot lake. Potatoes are raised successfully every year in that settlement and this summer small fields of oats were looking very fine. Flyingshot lake is very shallow and its water is not very good. Wood for fuel is plentiful in the settlement. There are no water-powers, and no mineral of any description has been found there. As in Spirit River and all through the west, two frosts were felt also at Flyingshot Lake settlement, but the people of the place say that the frost comes always later than that. The supply of water is permanent and more than sufficient for the needs of the settlement. Ducks and geese are plentiful in the spring and autumn around the lake. The climate is good and the autumn is generally long and fine. The country around the lake is undulating and rolling. There are no stone quarries. Most of the hay is cut outside of the settlement. The people of Flyingshot Lake settlement communicate with Saskatoon lake, Bear creek and Spirit river by two fairly good wagon roads in the prairie country, but through the timber between Grande prairie and Spirit river the road is in a very bad condition. These will improve with time for I was told in the fall that the government had men opening a new road on a better location. Flyingshot Lake settlement is in a low place and mostly surrounded with timber. The country is much nicer north of the settlement and near Bear creek.—*J. B. Saint Cyr, D.L.S., 1907.*

72. This township can be reached by Spirit river and Dunvegan wagon road which crosses this township from section 36 to section 1. The country is undulating and the surface is prairie and bluffs. The soil is a deep black loam resting on a clay or sandy clay subsoil. Hay is plentiful, a large quantity can be procured around Clairmont lake on the east boundary of this township and around Fergusson lake on sections 27 and 22. There is also a large hay slough or marsh on sections 20, 21, 28 and 29, and hay can be procured in good quantity near lake No. 1 and on section 19. Bear creek crosses sections 19, 20, 17, 8, 9, 4 and 3. Spruce creek which empties into Bear creek on section 19, coming from the north is a good-sized creek. The water in the lakes and streams of this township is permanent and good. Wood for fuel is plentiful. There are no water-powers, and no mineral of any description has been found in this township. There are no stone quarries. Ducks and geese abound in the spring and autumn in the lakes and streams of this township. This summer Grande prairie had a fine appearance; better grazing land cannot be seen anywhere else. Settlers will find there everything to meet their requirements. Frosts were felt here last summer also, but generally there are no early summer frosts. The climate is

Range 6.—Continued.

very good and grain and vegetables are raised with success by the few scattered settlers of Grande prairie.—*J. B. Saint Cyr, D.L.S., 1907.*

78. *(Spirit River settlement.)* The survey of this settlement commenced on May 17, 1907 and was completed on June 19. Spirit river, which is a very small stream crosses the settlement from west to east. The soil is of good quality being composed of a black loam resting on a sandy clay subsoil. The surface is prairie and bluffs. The country is level with the exception of that portion of the settlement situated south of Spirit river. Wheat, oats and vegetables are successfully raised there, since a few years. The prairie furnishes a good pasture. The people here, cut their hay mostly outside of the settlement. Wood for fuel is plentiful. There is no water-power and no mineral of any kind has been found during the progress of the survey. The settlement comprises fifty-nine lots of different sizes. Nearly all the lots bordering on Spirit river are occupied by squatters. There are three good bridges on Spirit river, one on lot 16, one on lot 12 A and one on lot 9. The water supplied by Spirit river is not permanent. The river flows between two high banks, varying from fifteen to forty feet in height. The water is fairly good in the spring but towards the fall it is alkaline, owing to the alkaline springs coming out of the banks in different places. The climate is good with generally no early frosts, but last summer, in August, there were two frosts which injured the grain a little; these have been felt all over the west, I believe, and I was told also that the frost comes generally later than that. The country around Spirit river has a fine appearance. Every traveller that came there last summer appears to like the country and to have great faith in the futue of that district. I never witnessed such fine weather as we had until late last fall. Some of the residents of the place are making arrangements with firms in Edmonton to procure a sawmill and boring outfit to reach water; the only drawback of that country during the dry years. Mr. James Brooks and others say that they will certainly find good water at a comparatively small depth. The boring will begin next spring. From this settlement there is a wagon road going to Grande prairie, and one to Dunvegan and Peace River Landing. There are no stone quarries. Game is not so plentiful as it used to be around here. Between Spirit river and Dunvegan lies a tract of very good land. It is undulating and rolling in some places.—*J. B. Saint Cyr, D.L.S., 1907.*

Range 7.

19. There is a little level land along Shuswap river fit for settlement.—*Jos. E. Ross, D.L.S., 1907.*

Range 8.

18. The section (6) surveyed is mostly steep rocky sidehill partly timbered and partly covered with brush. It is not fit for agricultural purposes.—*Jos. E. Ross, D.L.S., 1907.*

Range 9.

17. Only a small strip of land adjoining the provincial lots in sections 24 and 25 is fit for agriculture. The timber has been burnt off. The southeast corner is occupied by a high mountain.—*Jos. E. Ross, D.L.S. 1907* .

18. The part surveyed is rolling hilly ground. Most of the timber has been burnt off and the country is now grown up with brush. It is fairly well watered. The soil is rather light but is suitable for fruit growing.—*Jos. E. Ross, D.L.S., 1907.*

TOWNSHIPS WEST OF THE SIXTH MERIDIAN.

Range 9—Continued.

19. The part surveyed consists of gently sloping hills having considerable land, nearly level, lying between them. Thick brush now occupies the place where previous to a fire of some twenty years ago heavy timber grew. The land is in general well watered, but the soil is rather light. There are places for a few settlers here.—*Jos. E. Ross, D.L.S., 1907.*

Range 10.

17. Most of the land surveyed lies on a small mountain at an elevation above the valley of from five hundred to fifteen hundred feet. It is partly open sidehill. The higher part is rolling and hilly, timbered with small mixed woods. The soil is fairly good but the water is bad and rather scarce.—*Jos. E. Ross, D.L.S., 1907.*

18. There is about a section of good land on the west side of Salmon river. It is low rolling timbered hills with some gradual slopes. A settler has located on section twelve. The west of this section and sections ten and eleven is for the most part sidehills, open timbered range land. All the land in this township fit for settlement is probably surveyed.—*Jos. E. Ross, D.L.S., 1907.*

19. The part surveyed is on the westerly slope of mount Ida. The small amount of agricultural land here would hardly warrant the making of a road. It is well watered and would be suitable for a stock range during the summer. The remaining unsurveyed land in this township is apparently not fit for agricultural purposes.—*Jos. E. Ross, D.L.S., 1907.*

Range 11.

17. Section thirty-six is fairly good land but it is pretty heavily timbered.—*Jos. E. Ross, D.L.S., 1907.*

18. The several sections surveyed lie in Warren creek valley. This valley is about half a mile wide, is thickly wooded and almost enclosed by high hills.—*Jos. E. Ross, D.L.S., 1907.*

Range 12.

18. There is very little agricultural land, the country being in general hilly, rough and broken. There is a gypsum deposit in the northeast quarter of section ten. —*Jos. E. Ross, D.L.S., 1907.*

Range 14.

18. The part surveyed lies around Monte lake. It is hillside with open timber and a few small benches. The quarter sections at the south end of the lake are best suited for farming.

19. The land is at an elevation of at least two thousand feet above the valley. It is a hillside slope thickly wooded with small timber.—*Jos. E. Ross, D.L.S., 1907.*

Range 15.

19. This is range land. Three settlers have been located here for several years and have apparently been successful in growing grain.—*Jos. E. Ross, D.L.S., 1907.*

TOWNSHIPS WEST OF THE SIXTH MERIDIAN.

Range 18.

20. This township lies immediately west of the town of Kamloops on the main line of the Canadian Pacific railway. Thompson river traverses the township providing an abundant supply of good water. The level bottom lands within the river valley are divided into lots and furnish superior grazing premises. The soil in these lots varies from sand to sandy loam and when irrigated is well suited to the cultivation of fruit and vegetables. Irrigation, however, is very costly. The land also is in danger of being flooded in times of exceptionally high water. To the south the country rises rather abruptly to a height of 1,800 feet above the valley. The hills are very sparsely timbered with fir and bull-pine The soil is shallow, underlain with rock, and the surface stony with frequent rock exposures. The township is suited only for grazing purposes. Several mining claims have been staked though no mines were in operation at the time of the survey (June). The Iron Mask copper mine in township 19 has been worked to a considerable extent and extensive improvements made on the property. There are no stone quarries and no coal or lignite veins. Water-power could be developed on Thompson river at great expense. Hay is lacking except along the river flats mentioned above. Game is wanting. A limited quantity of fuel is provided by the timber on the southern tier of sections.—*A. G. Stacey, D.L.S., 1907.*

Range 19.

20. This township is traversed by Kamloops lake, the main line of the Canadian Pacific railway and the wagon road from Kamloops to Savonas. On the northeast shore of Kamloops lake, comprised of lots 341, 342 and 343, is some excellent agricultural land irrigated by Tranquille river. With this exception all the country adjacent to the lake on either side is very hilly with frequent rock exposures. There is some scattered pine and fir, though much of the surface is open. These hills are suited only for grazing purposes. Copper has been found within the township and some mining has been done though none was in progress at the time of survey (August). Considerable gold dredging has been done near the mouth of Tranquille river.—*A. G. Stacey, D.L.S., 1907.*

Range 20.

20. This township lies immediately to the south of Kamloops lake and is traversed by the main line of the Canadian Pacific railway and by the wagon road from Kamloops to Savonas. To the south of the lake in sections 13, 24, 25, 26 and 27 is some good bench land. The soil, though gravelly, is very productive when irrigated. In the vicinity of both Duffy and Cherry creeks excellent crops are obtained. At present the remainder of the bench land is used only for grazing purposes, chiefly as a winter range. It is unfortunate that water cannot be readily procured for this land since the character of the climate and the nature of the soil are favourable to the most successful culture of fruit and vegetables. To the west and south the country rises rapidly. The open bench land gives place to high wooded hills timbered chiefly with bull-pine though scattered fir occurs throughout, becoming more plentiful as the altitude increases. The timber averages about fourteen inches in diameter and is of fair quality, though the growth, in places is rather scattered. These hills are free from undergrowth and furnish good grazing lands. Towards the western boundary of the township the valley of Threemile creek furnishes a narrow strip of fine agricultural land in which several good ranches are located. Hay is obtained only by irrigation in the valleys of Cherry, Duffy and Threemile creeks. All the ponds, lakelets and small mountain streams seem to be alkaline though the water in Cherry,

Range 20—Continued.

Duffy and Threemile creeks is of fair quality. There are no water-powers, stone quarries, coal or lignite veins. An abandoned mine near the mouth of Cherry creek was the only indication of mineral seen. Fuel is plentiful. Game is scarce though deer, lynx, bears and cougars are occasionally seen near the southern boundary of the township.—*A. G. Stacey, D.L.S., 1907.*

21. The surface for the most part, covered with sage brush, is extremely rough, with much rock exposures. Bench land suitable for cultivation is confined to two or three very small triangular portions in sections 9 and 18. The hills furnish poor grazing lands. The timber is of very little value being small and very scattered. There are indications of mineral wealth in section 18. Copper is the ore found in greatest abundance in the locality. No hay, game, water-powers, stone quarries, coal or lignite veins were seen. The old government pack trail along the north shore of the lake is now very little used and is in poor state of repair.—*A. G. Stacey, D.L.S., 1907.*

Range 21.

19. The provincial wagon road from Savonas, a town on the main line of the Canadian Pacific railway, to the Nicola valley crosses the township providing a splendid means of access This township lies on a plateau on the divide between Thompson and Nicola rivers. With the exception of the eastern tier of sections the surface is undulating, timbered chiefly with jackpine interspersed with a few spruce and fir. A number of alkaline lakes are located in the central portion of the township. The largest of these are Tunkwa lake and another designated lake A in sections 9 and 16. About the lakes in sections 2, 3, 4, 5, 8, 9, 10, 11, 15, 16, 17, 20 and 21 are a number of open patches, some of considerable extent. The eastern tier of sections is very hilly and heavily timbered with a fair percentage of fir from one to four feet in diameter. The timber however is not very suitable for milling as it branches freely and grows only to a very moderate height. As the creeks are too small to float the material, considerable expense would also be incurred in hauling the timber or lumber to the railway. The township is well watered by the left branch of Threemile creek, numerous tributaries of the right branch in the southeastern part of the township, and Guichon creek in the southwestern portion. Both of these streams have a good flow of splendid water. The soil is a shallow loam and very stony. The country is admirably adapted for grazing. Summer frosts are frequent owing to the high altitude making the cultivation of ordinary vegetables and cereals impossible. There are no stone quarries, no hay meadows and no minerals of economic value, though prospectors have invaded the township in search of copper.. There are no water-powers. Ducks and geese are very plentiful on the lakes, attracting a great many sportsmen during the open season.—*A. G. Stacey, D.L.S., 1907.*

21. The portion of this township lying to the south of Kamloops lake is comprised of hilly grazing land bearing considerable sage brush. Some excellent agricultural land is found in lots 367 and 368 near the mouth of Threemile creek where irrigation is possible. The country along the north shore is very rough with considerable rock exposure. The hills are sparsely timbered with fir and pine and suitable only for grazing purposes. In sections 13, 14 and 24 are a number of mineral locations. Copper is the principal ore. These hills seem to be rich in mineral wealth, though no mines are at present being worked. Capital is needed both for the development of the mines and for the erection of a smelter, in the vicinity for treating the ore.—*A. G. Stacey, D.L.S., 1907.*

TOWNSHIPS WEST OF THE SIXTH MERIDIAN.

Range 22.

16. This township is reached by way of an Indian pack trail leading from the Nicola valley to Mamit lake. The trail here follows the valley of Skuhun creek which crosses the southern part of the township. The country is very rough and hilly reaching an elevation of nearly 7,000 feet above sea level. Sections 5, 6, 7 and 8 are covered with bull-pine and fir. Sections 1, 2, 3, 4, 9, 10, 11 and 12 are covered mostly with jackpine though a few firs are found near the east boundary of the township. In some sections large areas have been fire swept and are now very sparsely covered with small scattered jackpine from two to six inches in diameter. No stone quarries, minerals,coal or lignite veins were seen. Game consists of deer, lynx, bears and grouse. —*A. G. Stacey, D.L.S., 1907.*

20. Sections 35 and 36 are for the most part, open and very hilly, suitable for grazing. The bench land lying between the railway and the river is nearly level and is covered with a heavy growth of sage brush. There is some fire-killed timber along the river bank. The soil appears to be good and would probably if irrigated, prove very productive. Irrigation, however, by means of water from Thompson river would be costly and could be made use of with advantage only by the installation of a large plant serving a much more extensive area.—*A. G. Stacey, D.L.S., 1907.*

Range 23.

15. Nicola river, a good wagon road and a newly constructed line of the Canadian Pacific railway crosses this township. Most of the bottom lands in the river valley lie within Indian reserves though three fairly good ranches are located in this township, between the reserves. Skuhun creek crosses the northern part of the township. The valley of this creek is narrow and covered with bull-pine averaging twelve inches in diameter. Small patches along the stream could be cultivated. The surface, however, is stony and the soil a mixture of sand and gravel requiring an abundance of water to render irrigation successful. A settler has located in section 36. The remainder of the township is very rough, hilly and covered with a forest of fir and bull-pine. A wagon road has recently been constructed from the Indian village at the mouth of Skuhun creek to the centre of section 27. No stone quarries, coal or lignite veins were seen. Copper ore has been discovered in section 35. Game consists of deer, coyotes, lynx and grouse.—*A. G. Stacey, D.L.S., 1907.*

16. The junction of Skuhost and Skuhun creeks occurs in section 1 of this township A settler has located on the southeast quarter of this section and made some small improvements. The section is covered with bull-pine and a few fir. The remainder of the township appears to be very rough and hilly.—*A. G. Stacey, D.L.S., 1907.*

20. This township which lies on a plateau, immediately to the south of Thompson river valley, is reached by a fairly good wagon road from Ashcroft. Barnes creek, a rapid stream of fine fresh water averaging about twenty links in width traverses the township from east to west, entering near the southeast corner and leaving by way of section 19. The surface is hilly with numerous rock exposures in the northern part of the township. Considerable open country is to be found in sections 9, 10, 11, 14, 15, 16, 22, 23, 34, 35 and 36. A splendid ranch irrigated from Barnes creek, is located in section 19. Another ranch in sections 27 and 34, irrigated by means of a small stream flowing north into Separating lake, was unoccupied at the time of survey. Fairly good bull-pine averaging twelve inches in diameter is found in sections 20, 34 and 35. Some large fir is located in sections 15, 21, 22, 25, 26 and 28. A thick forest of smaller fir averaging twelve inches in diameter covers the northern slope of

Range 23—Continued.

Barnes creek velley in sctions 8, 9, 17 and 18. Natural hay meadows are wanting though a few places good meadows could be developed at a moderate expense. The country is most suitable for grazing purposes. A small alkaline lake is situated in section 14 and another in section 22. There is also a chain of small lakes in sections 24, 35, 36, 26 and 25. No minerals, stone quarries, coal or lignite viens were seen. Considerable water-power could be developed in the western part of the township, on Barnes creek. Game consists chiefly of duck and geese, though deer are occasionally seen.—*A. G. Stacey, D.L.S., 1907.*

21. The portion of this township lying to the south of Thompson river is very rough and hilly with the exception of some bench land between the railway and the river in sections 12, 9 and 16, and a very narrow strip in section 6. This land is covered with sage brush and is valueless unless irrigation is employed. The soil is a deep rich clay. Thompson river apparently furnishes the only available source of water supply and irrigation from this source is costly. To the south the country rises continuously, changing gradually from prairie to a forest of pine and fir. The hills provide good grazing lands.—*A. G. Stacey, D.L.S., 1907.*

Range 24.

20. Those portions of sections 29, 30, 31 and 32 lying outside of lot 406 and the Indian reserve are very hilly. The surface is prairie and the country suitable for grazing.—*A. G. Stacey, D.L.S., 1907.*

Range 25.

17. Thompson river, the main line of the Canadian Pacific railway and the old Yale and Cariboo wagon road cross the southeastern part of this township Several good ranches are located along the river. Opposite the little town of Spence Bridge extensive apple orchards have been planted from which excellent returns are realized. Sections 14, 15, 22 and 23 are very hilly and with the exception of a few small patches of open country are covered with a forest of bull-pine and fir averaging fourteen inches in diameter. A few acres of improved land lie in the northwest quarter of section 23 and the southwest quarter of section 26. No stone quarries, minerals, coal or lignite veins were seen.—*A. G. Stacey, D.L.S., 1907.*

22. Bonaparte river and government wagon road into the Cariboo country cross this township. The rich bottom lands in the river valley constitute valuable ranching properties. In some places these lands are still covered with a dense growth of poplar, willow, alder and cottonwood. The hills, which are rocky and in some places precipitous, are covered with bull-pine and fir. Between the hills and the bottom lands are stretches of rolling, open country used as summer range lands. The river though rapid is not suitable for power development as the banks here are low and the valley lands too extensive. No stone quarries, coal or lignite veins were seen. Mineral is plentiful in the northern part of the township where prospectors have located a great many claims. Copper is the mineral found in greatest abundance. Game is scarce and consists of coyotes, lynx, deer and grouse.—*A. G. Stacey, D.L.S., 1907.*

23. This township lies on the limit of the railway belt and is traversed by Bonaparte river and by the government wagon road into the Cariboo country to the north. The bottom lands in the river valley are occupied by ranches though some of this property is as yet covered with poplar, alder, willow and cottonwood. The hills on either side are very rough and covered with a forest of fir and bull-pine. A huge

Range 25—Continued.

exposure of limestone formation occurs in section 20. Mineral is plentiful in the southern part of the township. The Maggie copper mine has been developed to a considerable extent though the plant was closed at the time of the survey. Small water-power could be developed on the river near the north boundary of the township. No stone quarries, coal or lignite veins were seen. Coyotes, lynx, deer and grouse are ocasionally seen.—*A. G. Stacey, D.L.S., 1907.*

Range 26.

19. Valuable meadow lands forming a part of lot 1072 extend southward into section 31 of this township. Southward beyond this lot are situated two or three ranches, beyond which the valley narrows and the rich bottom lands disappear. The remainder of the township is probably very rough and hilly. The upper termination of Hat creek wagon road is in this township.—*A. G. Stacey, D.L.S., 1907.*

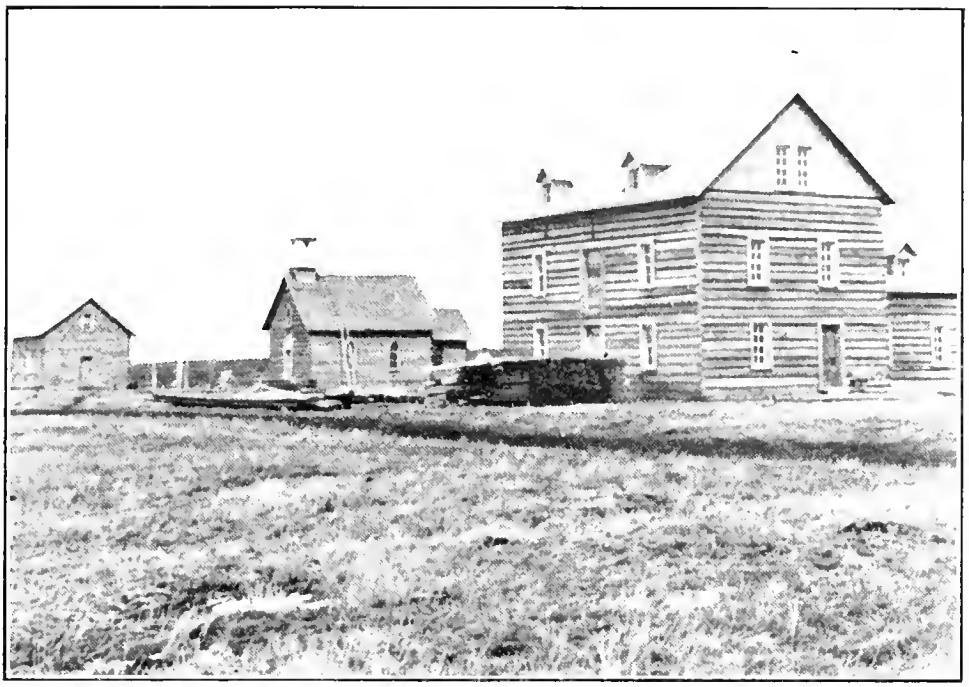
20. Some valuable ranching properties are located near the southwest corner of this township where the valley of Hat creek widens considerably. Smaller holdings are found northward along the valley. The hills here are not very pronounced. They are sparsely timbered and are used as summer range lands, for which purpose they are admirably adapted. A good wagon road follows up Hat creek valley through this township.—*A. G. Stacey, D.L.S., 1907.*

21. The land suitable for cultivation in this township lies in the narrow valley of Hat creek and is for the most part, covered by an Indian reserve. The greater portion of the township forms part of a large plateau which appears to be very sparsely timbered. Large open stretches of good grazing land seem to be plentiful. The surveys in this township consisting of only one-half of section line on the east boundary of section 33, observations, concerning the character of the country, were made while journeying to township 19 by way of Hat creek wagon road.—A. G. *Stacey, D.L.S., 1907.*

22. This township is for the most part very hilly. The narrow valley of Hat creek, which crosses the southeastern part of the township and along which a good government wagon road has been constructed, furnishes the only land suitable for cultivation, with the exception of a small area in section 6 and 7. Most of the land in Hat creek valley lies within an Indian reserve and is consequently not cultivated. The hills in the southern part are rough and covered with fir and bull-pine. Some limestone formation occurs in sections 5 and 8. Hat creek averaging about thirty links in width is a rapid stream of fresh water. No stone quarries, minerals, coal or lignite veins were observed. Game is scarce.—*A. G. Stacey, D.L.S., 1907.*

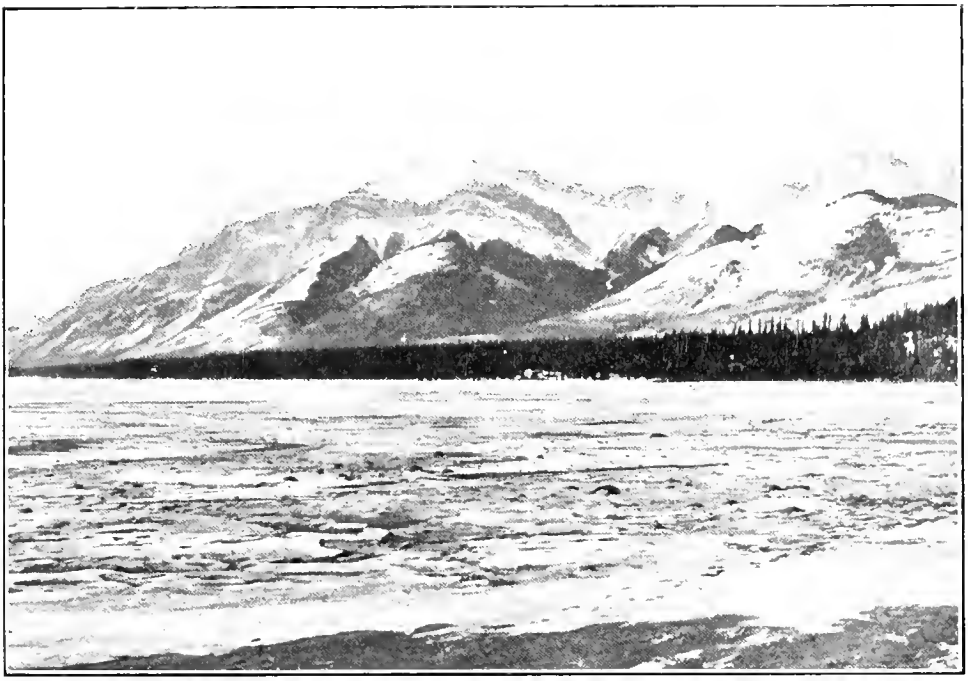
Range 29.

2. In this township there is a valley about nine hundred feet above Fraser river comprising parts of sections 26 and 27. This land has been overrun by fire and a dense young growth of willow, alder and fir has grown up over it. The hillsides throughout the township have been burned in most places so that there is little large timber left alive, although much dead timber is still standing. In section 22 and in the southwest quarter of section 27 there is some good land in benches suitable for growing fruit. This land is not hard to clear as the fire has made a much cleaner sweep than in section 26 and other parts of section 27. The month of August was very wet this year which even in this district is very unusual. There is a marble quarry in section 21 of this township.—*A. W. Johnson, D.L.S., 1907.*

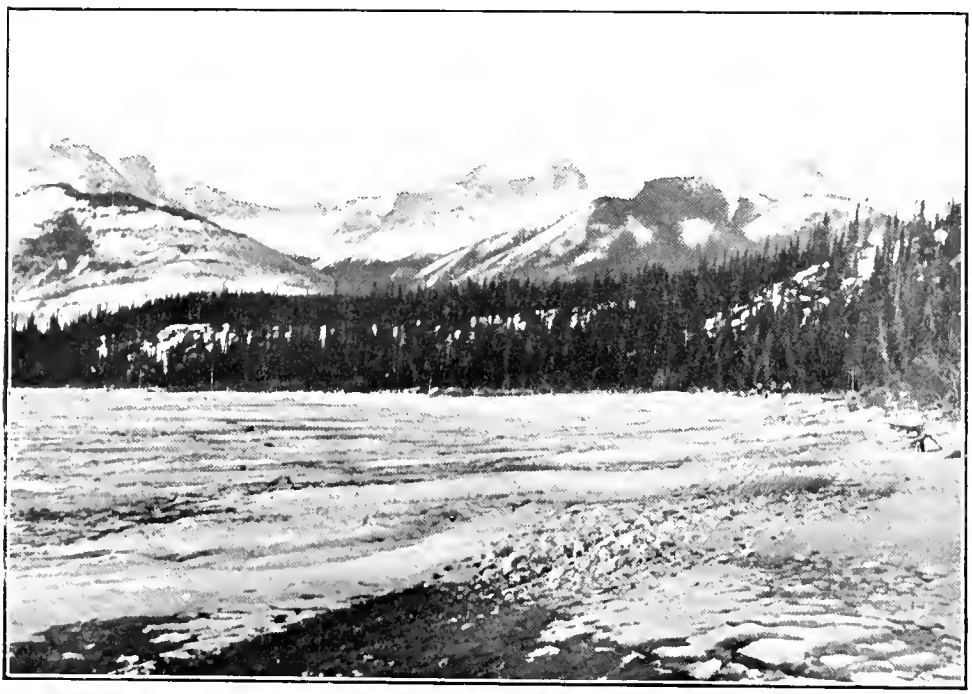


Roman Catholic Mission at Sturgeon Lake. Photo. by A. Saint Cyr.

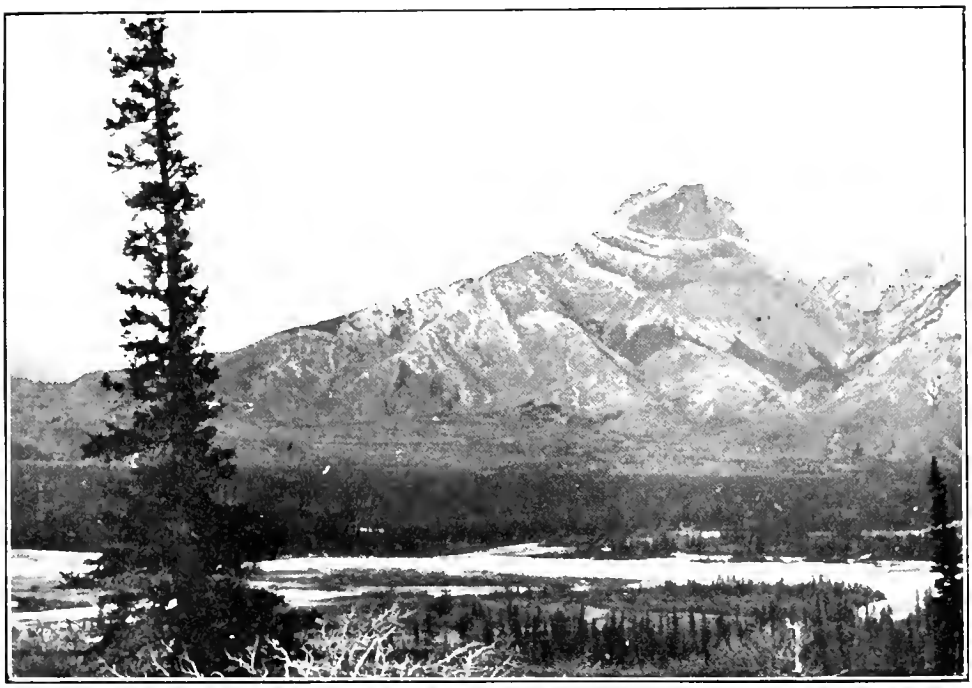
 Hudson's Bay Company's Trading Post at Sturgeon Lake. Photo. by A. Saint Cyr.



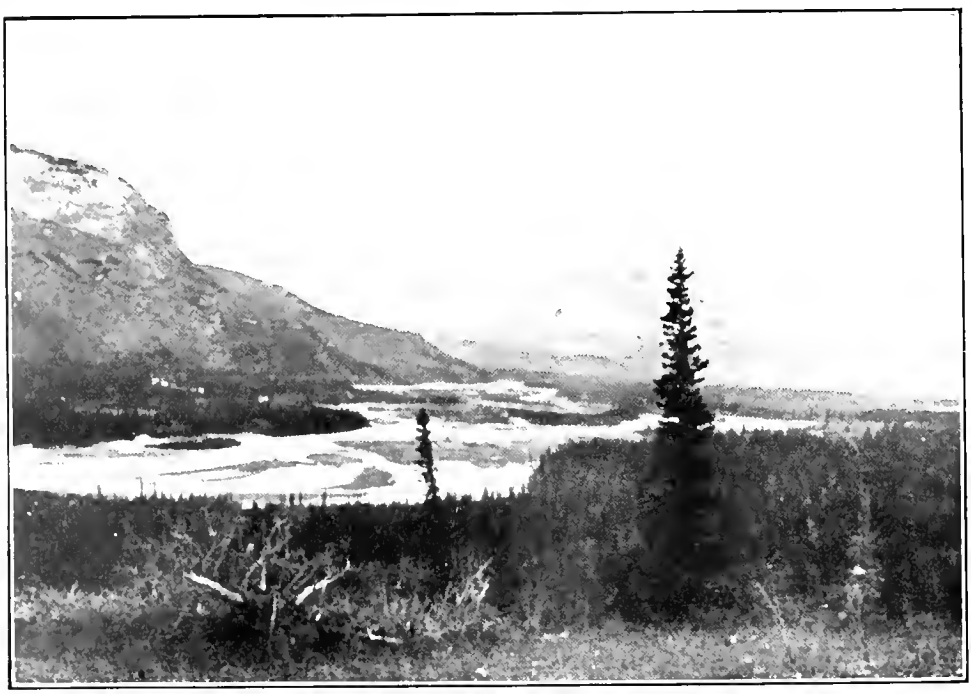
Brulé Lake and Bullrush Mountains. Photo. by A. Saint Cyr.



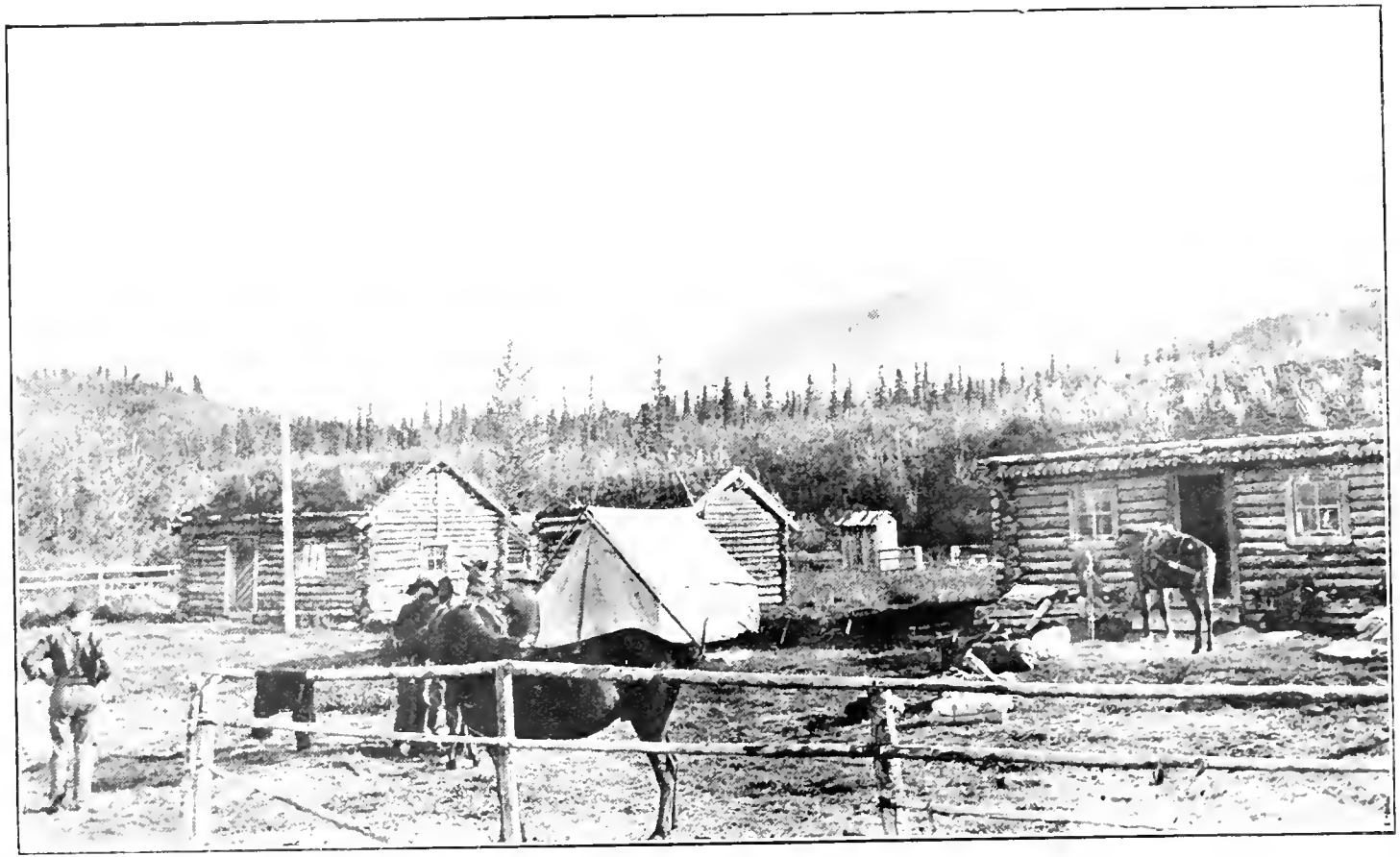
Brulé Lake and Bullrush Mountains. Photo. by A. Saint Cyr.



Roche Miette. Photo. by A. Saint Cyr.



Ford across Athabaska River near Jasper House. Photo. by A. Saint Cyr.

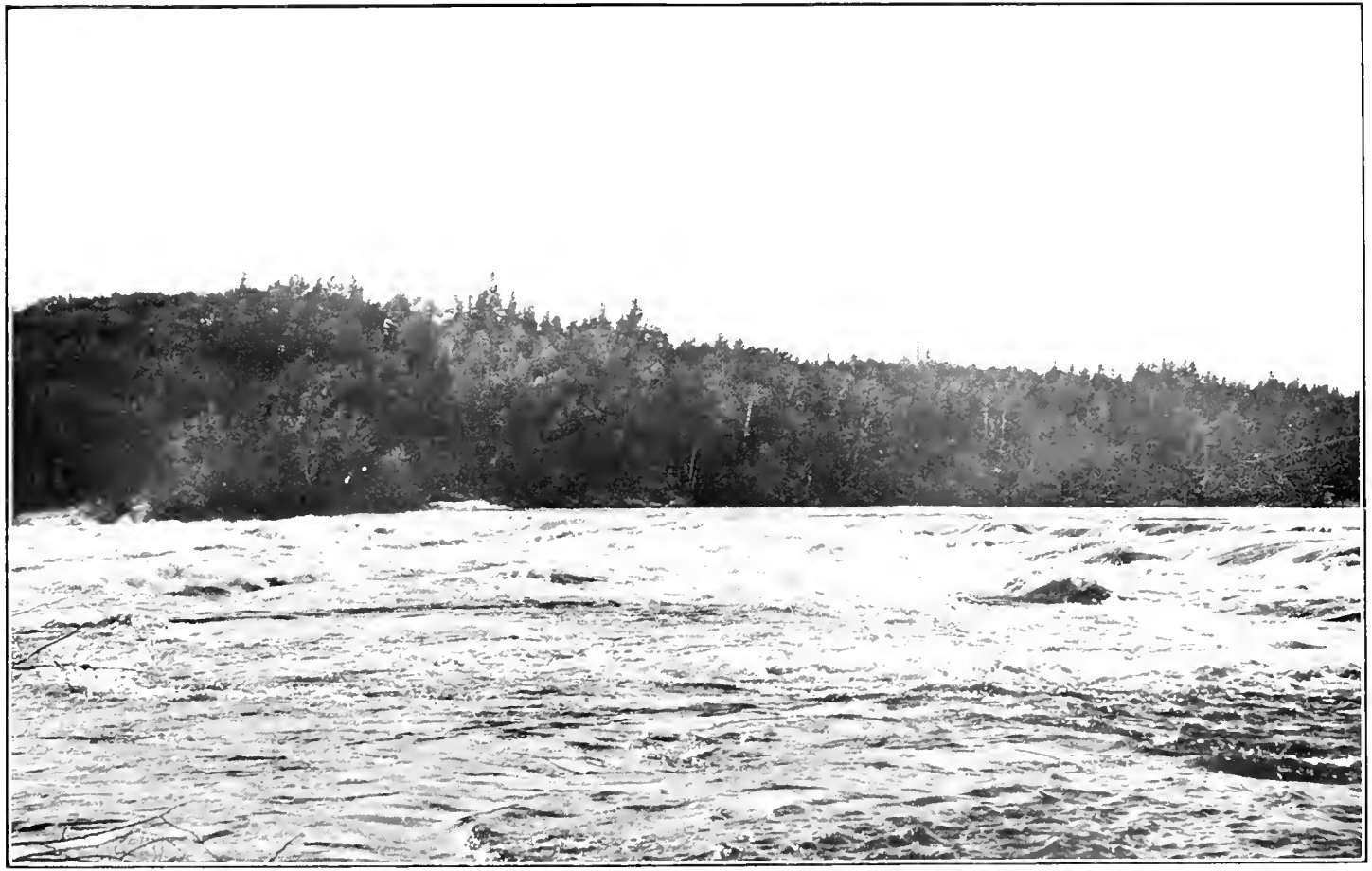


Dutton Post. Photo. by J. N. Wallace.

Stone Mound on the B. C.-Y. T. Boundary. Photo. by J. N. Wallace.

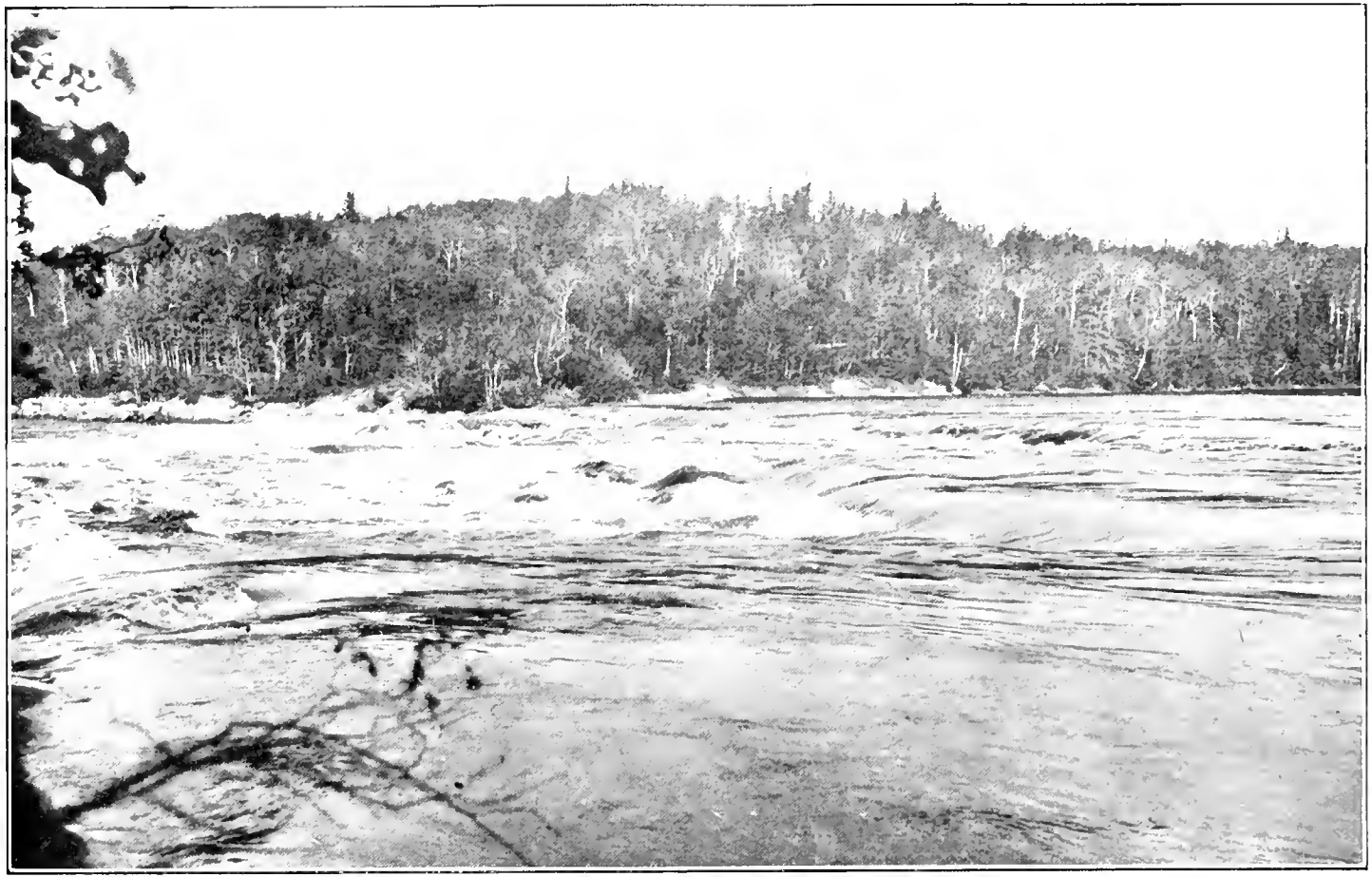
Earth Mound on the B. C.-Y. T. Boundary. Photo. by J. N. Wallace.

Stone Cairn and Signal on Storm Mountain, B.C. Photo. by P. A. Carson.

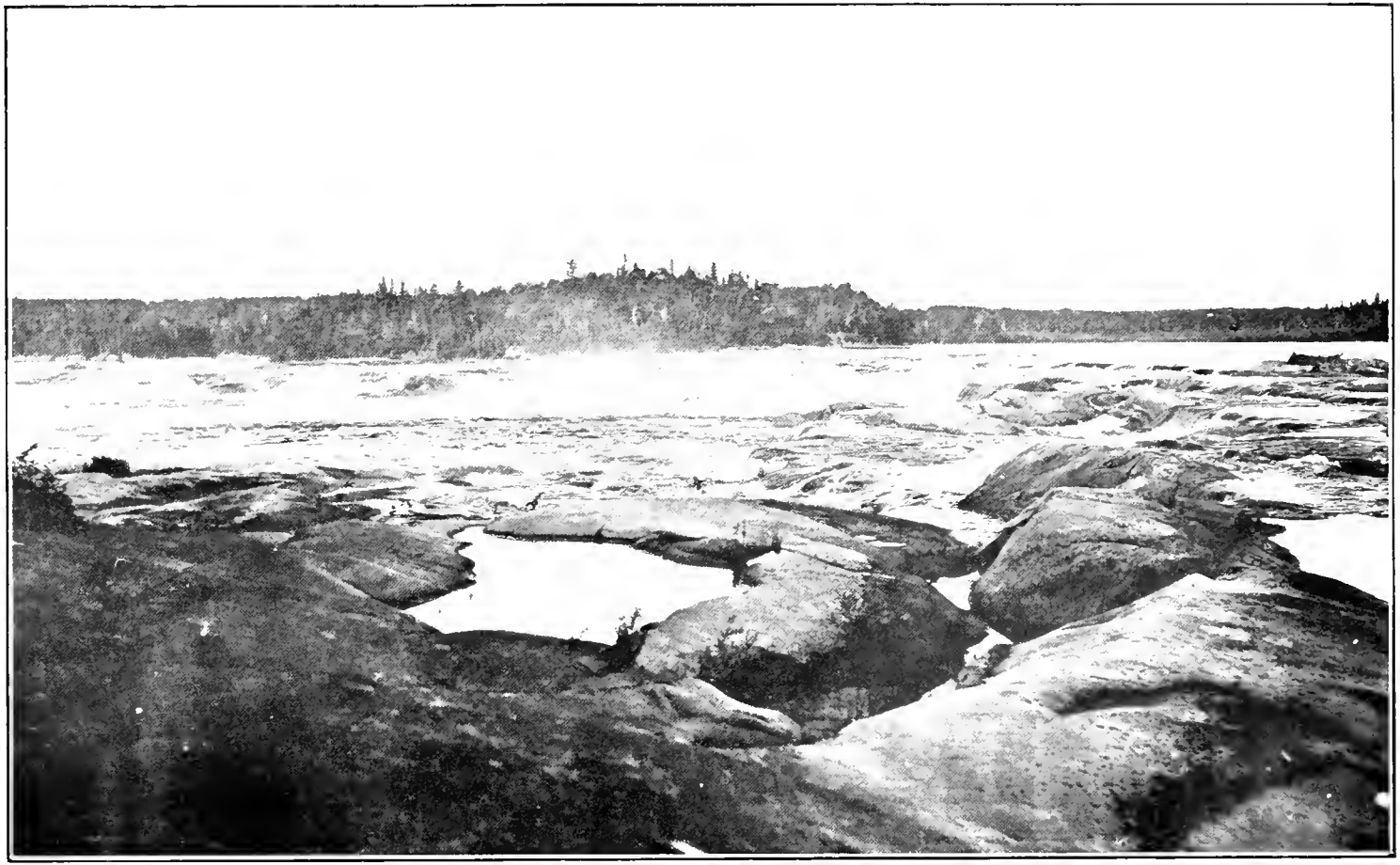


First Fall on the Winnipeg River, east of the Manitoba Boundary. Photo. by W. Thibaudeau.

First Fall on English River. Photo. by W. Thibaudeau.

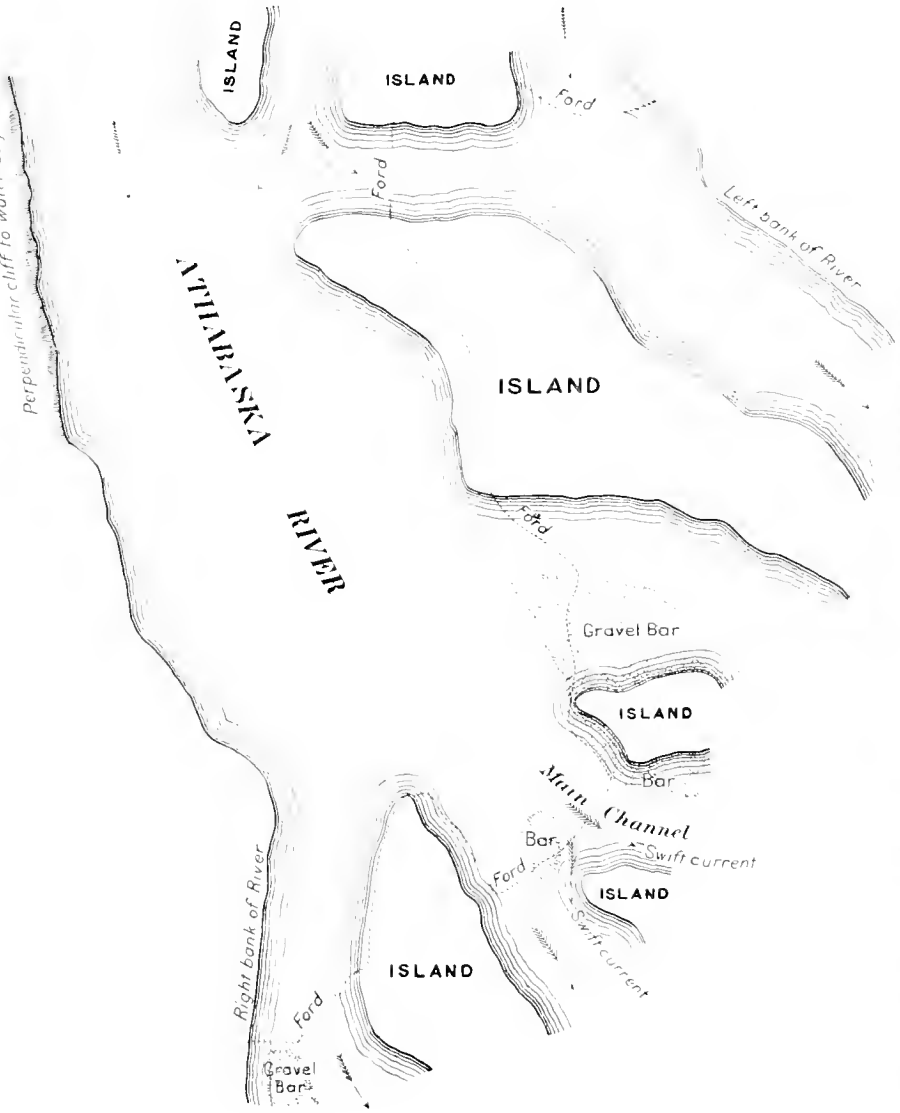


Lamprey Falls. Photo. by W. Thibaudeau.



Silver Falls. Photo. by W. Thibaudeau.

SKETCH OF FORD
across the
ATHABASKA RIVER
3 miles below Jasper House



CORRESPONDENCE AND PAPERS

INCLUDING FINANCIAL STATEMENT

RELATING TO

SEED GRAIN DISTRIBUTION

OF

1908

IN THE PROVINCES OF SASKATCHEWAN AND ALBERTA

PRINTED BY ORDER OF PARLIAMENT

OTTAWA
PRINTED BY S. E. DAWSON, PRINTER TO THE KING'S MOST EXCELLENT MAJESTY
1909

[No. 25c—1909.]

CORRESPONDENCE AND PAPERS

INCLUDING FINANCIAL STATEMENT

RELATING TO

SEED GRAIN DISTRIBUTION OF 1908

IN THE PROVINCES OF

SASKATCHEWAN AND ALBERTA

REGINA, November 15, 1907.

Hon. FRANK OLIVER,
Minister of the Interior,
Ottawa.

DEAR SIR,—I am receiving from various parts of the province visited by early September frosts, representations setting forth the requirements of each district in the matter of securing governmental assistance in providing seed grain for the coming spring.

As I am personally aware of the exact situation in many localities, I would strongly urge upon the federal authorities the advisability of adopting the same relief measures that they have on several former occasions since 1887 deemed necessary in order to tide over the present difficulty of obtaining good seed grain for those at present unable to pay for it.

Will you kindly give this matter your earliest attention before too much of the grain is shipped forward to the lakes; besides the supply of good seed oats even now is so limited that it is doubtful if there is sufficient within the province to meet its own requirements.

I am forwarding for your information several copies of communications received on this subject.

Yours faithfully,
(Sgd.) W. R. MOTHERWELL,
Commissioner of Agriculture.

ARCOLA, November 2, 1907.

Hon. W. R. MOTHERWELL.

SIR,—I suppose it is needless to inform you that our crops in this district have suffered severely with the frost and that there are a great number of our farmers who will have absolutely no seed for next spring. I am, therefore, writing you at the request of the members of the Arcola Agricultural Society, who have gone to a great deal of trouble to ascertain just what condition the farmers in the district are in in this respect. I estimate, therefore, that it will take at least 75,000 bushels of seed wheat to supply the farmers from Arcola to Forget. There are countless cases where

from 150 to 250 acres of wheat have been sown and where absolutely nothing marketable has been harvested. We have, of course, a large majority of farmers who are in a position to raise money on their land to purchase seed, but we have a large percentage who are now heavily mortgaged and who will find it absolutely impossible to put in a crop next year without your assistance. We feel that this matter ought to be taken up at once by your department, as it would be a deplorable thing to have many thousand acres of our excellent land lying idle next season. Our society feels very strongly on this subject and feels confident that the interest you have always shown to us here will not be lost at this time.

We are aware, of course, that it will be out of the question for your government to obtain first mortgages from the needy settlers; but we are of the opinion that it would be possible to pass legislation whereby your government would place a seed grain tax or something of that nature against the land, and although the same would not appear as a mortgage, still it might stand against the property as a special tax, and would appear on the tax register of the province as indebtedness which would be collectable any time after the first of October, 1908. I am aware, of course, that a suggestion of this nature would be of little benefit to you, as you yourself will be more familiar with methods of security which you would be able to obtain from an Act of legislature; but in the event of no easy method I believe it would be possible to have mortgage companies and others holding mortgages against the land to consent to have your lien or mortgage have precedence. The Canada Permanent Mortgage Corporation holds upwards of 300 mortgages in this district, which were placed by myself, and I feel satisfied that they would consent to an arrangement of this nature.

Of course it is quite possible that your government will not have sufficient funds available for this purpose to supply this and any other districts which may need your assistance, but we feel that the department at Ottawa ought to make you a loan for this purpose, and we are having Mr. Turriff, M.P., come to Arcola within a few days and intend taking this matter up with him. We already have his assurance that he will use his utmost efforts to have the department at Ottawa assist your government in this.

I should like to have your reply stating your views, and if you think it would be advisable to send a representative to investigate this matter, we shall be glad to give him all the assistance in our power to have him come to a correct appreciation of the condition.

Awaiting your early reply, I am,

Your obedient servant,

(Sgd.) ROBERT H. COOK,
President Arcola Agric. Soc.

SALTCOATS, November 9, 1907.

Hon. WALTER SCOTT,
Regina.

DEAR SIR,—In view of the fact that the majority of the farmers in the northern part of Saskatchewan have had a failure of the crop, and that there is very little available for seed, and also that many, especially new settlers, will not have the means to purchase seed—which would be a calamity—do you not think that measures should be taken at once, if possible, to arrange for a supply of good seed grain, to be distributed amongst those absolutely requiring it, those securing to give proper security for refunding the cost? Is it a matter for the Dominion or province? I have written Mr. Turiff.

Yours truly,

(Sgd.) THOS. McNUTT.

GLENLOGAN P.O., VIA SOUTH BATTLEFORD, SASK., November 6, 1907.

Hon. W. R. MOTHERWELL,

DEAR SIR,—I have broken up a large portion of my homestead this summer, and owing to unforeseen circumstances I am not in a position to purchase seed for it next spring.

Will you kindly advise me whether under the above conditions the government will give me any assistance, there being no seed wheat in this district at all.

Thanking you in anticipation of an early reply.

I remain, yours sincerely,

(Sgd.) P. ROWLAND.

OTTAWA, November 25, 1907.

Hon. W. R. MOTHERWELL,
Minister of Agriculture.

DEAR SIR,—Yours of November 15 to hand with inclosures, copies of letters to yourself from Robert H. Cook, Thomas McNutt and P. Rowland.

In this connection I beg to say that to my mind it would be well that there should be a thorough and amicable understanding between the provincial and Dominion governments in regard to the distribution of relief seed before any commitments are made. It has been the custom for the Dominion government as being responsible for immigration, and as holding the ownership of the land until the settler acquires patent, to supply relief when the occasion required.

As I understand it on the present occasion the destruction of crop rendering necessary the supply of relief seed has not, generally speaking, occurred amongst the settlers who could fairly be classed as immigrants or who are occupying lands to which they have not yet received or have not yet become entitled to patent. The Areola and Yorkton districts are amongst the oldest settlements in the province of Saskatchewan, and I am bound to assume that the people affected either hold their patents or are entitled to patents.

In such a case it seems to me that the people cannot be classed as immigrants for whose position and condition the Dominion government is in any sense responsible, but must rather be considered as citizens of the province to whom the provincial government is responsible if any responsibility exists. Registration of liens on properly owned property rests with the provincial government, therefore any security taken for advances must be taken by and through that authority. If those are the circumstances, I would respectfully suggest that the government of Saskatchewan take full knowledge of the situation and provide means to meet it.

I notice that Mr. Cook's letter has reference almost entirely to instances in which the people who have lost their crop are owners of their land, and the land is already under mortgage. Mr. McNutt's letter alludes to the northern part of Saskatchewan. My information is that there has not been a total failure of crop such as would warrant general relief measures in that section, while Mr. Rowland's letter states a case that I fancy neither the local nor Dominion government would be warranted in undertaking to meet.

Yours very truly,

(Sgd.) FRANK OLIVER.

EXECUTIVE COUNCIL, SASKATCHEWAN,
REGINA, November 27, 1907.

Hon. FRANK OLIVER,
Minister of the Interior,
Ottawa.

DEAR MR. OLIVER,—As time goes on I continue to get applications for assistance from many parts of the province in the matter of obtaining seed grain for the coming

spring. In my estimation the situation warrants the immediate attention of your department, particularly in the matter of securing seed oats. If the unfrozen seed oats in the country are permitted to go forward to the lake front I fear by spring it will be practically impossible to secure sufficient seed here for the requirements of the province. I would, therefore respectfully and strongly again urge upon you the needs of many unfortunate districts in Saskatchewan in this regard, and for your further information I am sending you herewith extracts from the correspondence of various parties relative thereto.

Trusting that you will give this matter your personal attention.

I am, yours faithfully,

(Sgd.) W. R. MOTHERWELL,
Commissioner of Agriculture.

OTTAWA, December 5, 1907.

Hon. W. R. MOTHERWELL,
Minister of Agriculture,
Regina, Sask.

DEAR SIR,—Yours of November 27 to hand with inclosures. I have no doubt that the situation is quite as serious as you say, and I think it would be unfortunate that it should culminate in disaster next season, as it may if not dealt with.

At the same time, as stated in my former letter to you, it is not clear to me that the responsibility for dealing with the situation rests upon the Dominion government. So far as I am yet able to see that responsibility rests upon and may be most conveniently discharged by your government. I shall be glad to be advised of the view taken by your government in regard to my former letter on this subject.

Yours very truly,

(Sgd.) FRANK OLIVER.

OTTAWA, December 18, 1907.

Hon. W. R. MOTHERWELL,
Commissioner of Agriculture,
Regina, Sask.

DEAR MR. MOTHERWELL,—With regard to the applications that have been made for advances of seed grain on the part of the settlers in the province of Saskatchewan, who were unfortunate with their last season's crops, I may say that I find that it has not been the practice of the department in the past to make any distribution of seed grain to needy settlers in the province of Manitoba, when general distributions were made some years ago in the old territories. If you will look up the Revised Statutes of Manitoba you will see that Chap. 154 provides for the purchase of seed grain by municipalities, and also for the granting of advances of seed in unorganized districts. This law has been in force since as far back as 1890, and I have no doubt that it has proved very satisfactory in its operations. Where the grants are made to settlers living in unorganized districts, special provision is made so that the matter may be dealt with through the municipal commissioner. It seems to me that the provinces of Saskatchewan and Alberta might well adopt a similar system in case it should be found necessary to advance seed grain to needy settlers in the spring.

Yours faithfully,

(Sgd.) FRANK OLIVER,
Minister of the Interior.

SESSIONAL PAPER No. 25c

EXECUTIVE COUNCIL, SASKATCHEWAN,
REGINA, December 20, 1907.

DEAR SIR,—On my return to the city I find your favour of the 5th instant, already acknowledged by our Mr. Auld, awaiting my attention.

I am pleased to note that your government and this government are at one as to the absolute necessity for some provision being made whereby seed be supplied to settlers in certain districts that are in temporary financial difficulty owing to the unusual weather conditions during the past season.

Very many of these settlers are in good circumstances in the matter of real and personal property, and could borrow money and finance their own requirements, but for two unusual conditions that confront them at the present time—the financial stringency which makes it practically impossible to borrow, no matter how good the security; and the fact that in some districts suitable seed cannot be obtained locally even though money were available. In the latter districts it will be necessary to ship in seed from outside points; and this can be much better done by organized effort than by each farmer making individual inquiry and shipping his own seed in small lots.

While the Federal government has always in the past recognized its obligations in the matter of providing seed grain for new settlers in similar circumstances on unpatented lands, and while I am free to admit that certain reasons may be advanced why the provincial government should take care of the older settlers whose lands are patented, I think that you cannot but agree with me that if two governments should engage in the distribution of seed with probably different methods of distribution and different methods of securing and collecting payments, it would almost inevitably lead to dissatisfaction and confusion.

The necessity for assistance is not confined to portions of Saskatchewan alone, but it also exists throughout certain other portions of the west, and it has assumed such proportions and significance that it seems to invite national rather than provincial attention and aid.

Furthermore, the Federal parliament, having jurisdiction in the matter of our public lands, grain trade, and immigration, seems to point to the conclusion that a crisis like the present in the west, in which all Canada is deeply concerned, should be taken care of by the Federal government, which has not only the necessary resources, but also the machinery to undertake the work promptly and to complete it efficiently.

This department will be pleased to co-operate with your government in the way of securing information as to the requirements of the various districts, as to where good seed grain can be procured, and as to how it can be best distributed, and also in the other important matter of working out some practicable scheme whereby satisfactory security can be obtained for seed supplied to owners or tenants of patented lands.

I shall be pleased to go to Ottawa early in February to confer with you on this large and important question if you think such a conference advisable to work out a prompt and satisfactory solution to the many problems involved.

Awaiting your early reply, I am,

Yours very truly,

(Sgd.) W. R. MOTHERWELL,
Commissioner of Agriculture.

OTTAWA, December 27, 1907.

Hon. W. R. MOTHERWELL,
Commissioner of Agriculture.
Regina, Sask.

DEAR SIR,—Yours of the 20th instant to hand regarding supply of seed grain. From all I can learn it is altogether desirable that a policy should be decided upon at

the earliest possible date. I would be glad if you would discuss the matter fully with your colleagues, and then would like to have the opportunity of discussing it with you, in January rather than February, as I would like either to be absolved from responsibility or to have every opportunity to discharge the responsibility satisfactorily.

There should be a good deal of seed testing done, and there is not more than time to do it between now and seeding. The position we take is that our responsibility absolutely ceases once a settler has got his patent, and as it has already been pointed out to you, this view is accepted in Manitoba where arrangements are made by the province for the distribution of seed under circumstances such as are now before us.

Yours faithfully,

FRANK OLIVER.

OTTAWA, January 7, 1908.

DEAR SIR,—In further reference to your letter of December 20th in regard to relief seed grain, I have considered the matter very carefully and beg to assure you that the Dominion government not only has no desire to shirk any proper responsibility but is desirous as a matter of sound public policy of having all available land in the West cropped during the coming season.

At the same time there are limitations which even governments must recognize. So far as I can see the Dominion accepts responsibility in regard to settlers on unpatented lands, but it cannot accept the same responsibility in regard to settlers on patented lands, because it has not the same means of discharging the responsibility in regard to them.

I quite agree with you that it would be an unwarranted expense and complication to have the Dominion and provincial governments carrying on a seed grain distribution at the same time, but the Dominion government cannot issue seed grain without security for its payment, and it is not in a position to take security on patented lands. If the provincial government will agree, however, I think it can be arranged that the Dominion government will purchase the grain, will arrange for its distribution, will take the necessary security on unpatented lands, and will sell to holders of patented lands on the provincial government becoming security for the repayment, it to make such arrangements as it may see fit and as it is able to do with the person receiving the grain and holding the land.

If your government will agree to this we will be in a position to at once begin arrangements for the purchase of grain to the amount necessary to meet requirements on both patented and unpatented lands. Until we hear from you, however, we will go on arranging for grain for distribution on unpatented lands only.

There is not a moment to spare between now and seeding to meet the requirements of the case. It is desirable, therefore, that we should hear from you definitely regarding the foregoing with the least possible delay.

Yours very truly,

(Sgd.) FRANK OLIVER.

REGINA, January 7, 1908.

Hon. FRANK OLIVER,
Minister of the Interior,
Ottawa.

DEAR SIR,—In reply to your favours of December 18 and 21. *re* seed grain, I beg to confirm my telegram which I sent you yesterday which read as follows:—

'Expect to leave here for Ottawa on the 13th January *re* seed grain problem.'

In the meantime I am engaged in looking into the various phases of this many-sided and very large question with the hope of being able to present to you and your

government some feasible solution on my arrival at Ottawa. I was in Winnipeg last week in connection with this question and am in conference with some of the leading farmers of Saskatchewan relative to the matter.

I am, yours faithfully,

(Sgd.) W. R. MOTHERWELL,
Commissioner of Agriculture.

OTTAWA, January 20, 1908.

Hon. FRANK OLIVER,
Minister of the Interior,
Ottawa.

DEAR SIR,—As intimated to you in my letter of the 7th inst., and wire of the previous day, I and my colleagues have prepared a statement of the seed grain situation in the province of Saskatchewan as it appears to us, which statement is submitted herewith in the form of a memorandum for your consideration and action.

Yours very truly,

(Sgd.) W. R. MOTHERWELL,
Commissioner of Agriculture.

MEMORANDUM *RE* SEED GRAIN LOAN TO THE FARMERS OF THE PROVINCE OF SASKATCHEWAN.

Crop Conditions, 1907.—The winter of 1906-7 was unusually long and severe with heavy snowfall and a large amount of resultant moisture. These conditions together with prolonged low temperatures during the months of March and April brought about a very backward spring. As a consequence the great majority of the farmers of Saskatchewan did not commence seeding operations till towards the middle of May, a date that usually finds wheat seeding completed and germination well advanced. Throughout the growing season and even up till harvest, precipitation was copious except in a small portion of the southeastern part of the province. This, together with a marked absence of heat and sunshine so usual and necessary during the month of August, prolonged growth and retarded maturity till September 12, on which date a severe frost visited many localities and found much of the crop still uncut and indeed quite immature.

Crop Produced, 1907.—Notwithstanding the conditions referred to above many favoured districts in the province where the rainfall was less and the soil lighter and warmer produced beautiful crops. As a consequence and especially owing to the high prevailing prices, the farmers in these regions have experienced a most profitable year. On the other hand, however, the producers residing in the extensive areas visited by frost before the grain had ripened, have experienced the worst season in the last two decades.

The estimated crop area and yield therefrom for the whole province for the year 1907 is as follows:—

	Wheat.	Oats.	Barley.
Area	2,000,000 acres.	772,000 acres.	60,000 acres.
Yield	29,000,000 bush.	28,000,000 bush.	1,850,000 bush.

Of the 29,000,000 bushels of wheat it is estimated that 10,000,000 bushels have graded 3 Northern or better, 9,000,000 bushels have graded 'Feed,' and the balance 4, 5 and 6 wheat. Of the 28,000,000 bushels of oats it is estimated that at least 75 per cent will grade 'rejected,' and though much of the crop is good plump feed oats it is entirely lacking in germinating qualities, and is therefore totally unfit for seed.

In addition to the damage by frost during the past season the damage done by hail was far in excess of that of any former year. This is evidenced by the fact that the provincial government in the administration of its system of government hail insurance has paid out in indemnities some $80,000 more than it received in premiums. In no former year has the loss to the province approached anything like this amount.

Estimated Crop Area, 1908.—Basing the increase of acreage that will be prepared for this season's crop on the actual percentage of increase during the three years previous, it is estimated that the crop area of 1908 will be in round numbers as follows:—

Wheat	2,500,000 acres.
Oats	1,000,000 "
Barley	75,000 "

Total Seed Required.—To seed the above area the farmers of the province will require five million bushels of wheat, two and a quarter million bushels of oats and two hundred thousand bushels of barley. Of these amounts it is estimated that farmers, owing to the conditions already referred to, will be required to purchase somewhere and somehow at least 2,000,000 bushels of wheat 1,500,000 bushels of oats, and practically all the barley needed for seed.

Financial Situation.—It may be exceedingly difficult for those not conversant with the peculiar conditions now existing in Saskatchewan to understand why the suggestion should be made that the farmers of the West are in need of temporary assistance, as a result of one partial crop failure and especially as the preceding ones for a number of years were so bountiful and of such uniform excellence. But the very prosperity that the succession of good crops brought about encouraged such development, expansion and investment in the many substantial and alluring enterprises that abound in a young and rapidly growing province such as Saskatchewan, that practically all the accumulated earnings and profits of the people have been used in extending and improving their agricultural operations and therefore have not been laid by as a reserve for any contingency that might arise. While it may be said that a great majority of the farmers of Saskatchewan are in comfortable circumstances, still, owing to a peculiar combination of events, it is believed to be necessary to furnish many of them, by way of a loan, with the seed required for this season's crop. The partial crop failure of some regions and the almost total failure in others, together with the present world-wide financial stringency and the predisposition on the part of our farmers to enlarge and improve their agricultural holdings are some of the primary causes which have contributed to bring about the existing situation.

While it is to be admitted that many reasons may be advanced to the effect that the provincial government should assume all responsibility in regard to seed grain advances or loans, it must be remembered that a large sum of money is involved and that the present time is not opportune for a young province such as Saskatchewan to approach the money markets of the world for the loan that would be required. Besides it is exceedingly important that the matter should be dealt with at once and for this reason even if it were admitted that the provincial authorities should assume all responsibility much valuable time would necessarily be lost in an endeavour to arrange for the funds required. On the other hand, the farmers of Saskatchewan cannot expect at present to secure the assistance they require from the various financial institutions operating in the West. Doubtless a number of these institutions are, or will be prepared to relieve the situation to some extent, but it cannot be expected that any assistance they may render will reach any considerable number of persons and particularly those in need of such assistance. Under the circumstances it would appear to be the duty of the Federal government to provide whatever funds

are needed for the purpose and to take such steps as may be necessary to secure the repayment thereof.

Estimate of Seed to be Provided.—As no actual canvas has been made to ascertain the quantities of seed that will have to be distributed, it is only possible to make an estimate. The whole problem has been carefully investigated and considered from various standpoints and the conclusion has been reached that if the lands of the province which will be ready for this season's crop are to be seeded it will be necessary to purchase and distribute by way of loan the following quantities of the various cereals, viz.: 1,200,000 bushels of wheat, 1,200,000 bushels of oats and 200,000 bushels of barley. It is estimated that these are the minimum quantities that will be required.

Quantity of Seed, &c.—In securing the seed needed it is exceedingly important that a number of matters should receive careful consideration. In the first place it is imperative that all seed should be of the highest class procurable consistent with reasonable expense. As far as practicable all seed should pass the inspection of Chief Inspector Horne and should be thoroughly cleaned, sacked and labelled under the strict supervision of his staff. Especial care should be taken to see that the grain is free from noxious weed seeds and with this object in view, it should, if arrangements can possibly be made, be put through warehouse cleaning plants.

In case it is found impossible to secure the necessary supply of seed oats and barley in western Canada the wisdom of seeking supplies of first-class seed of moderately early maturing varieties in Britain—preferably in northern Scotland—is worthy of consideration.

Freight Rates.—In order to keep down the cost of seed to the farmer and because of the direct interest railway companies have in the crops of western Canada it would not appear unreasonable to expect these companies to provide transportation west of Fort William free of charge, and in case it is found necessary to import seed from eastern Canada or elsewhere the railways in view of all the circumstances, should be willing to reduce their present rates east of Fort William by 50 per cent.

Responsibility of Provincial Government.—If upon consideration of the circumstances herein mentioned the Dominion government does not see its way clear to assume the entire responsibility of collecting from the farmers the loans advanced them, it would seem that this duty must fall upon the provincial authorities. It is assumed, of course, that the federal government will protect itself in so far as the owners of all unpatented homestead lands are concerned. As regards all others it will doubtless be necessary for the provincial legislature to pass at its next session such legislation as may be required to secure advances made.

In case it is finally decided that the province must bear its share of the responsibility for repayment of loans, then it should have a corresponding supervision over all matters pertaining to the selection, purchase, cleaning and distribution of seed. While it is recognized that it is desirable to have the whole problem administered by one authority in order to prevent confusion and misunderstanding, it is equally important and desirable that the provincial authorities should have in addition to the supervision above alluded to, a careful check on all expenditures. These are details that can doubtless be satisfactorily arranged upon consultation of the representatives of the governments interested.

Urgency of Action.—In view of all the circumstances herein set forth it is exceedingly important that the whole problem should be dealt with immediately. The seed required should be secured as quickly as possible and all arrangements for its distribution should be made in ample time to have it reach the farmers' hands by April 10 at the very latest; as the light snow fall and mild winter in Saskatchewan are both percursors of an early spring.

Conclusion.—While it may not be generally thought so, the problem herein discussed is probably the most serious one that has ever confronted the people of Saskatchewan. Unless solved satisfactorily it would result in a tremendous loss not only to western Canada, but to the whole Dominion as well. Consequently it is believed that the problem has assumed a national character, and that being the case, the hope is expresssed that it will be dealt with as such. Within the limited powers at its disposal the provincial government stands ready to render any assistance of which it is capable.

In the event of this admittedly important far-reaching problem being satisfactorily solved and adjusted then the temporary check to development that some portions of the province have suffered as a result of last season's unfavourable climatic conditions, may, by the importation of new and suitable varieties of coarse grain and the establishment of a more stable and diversified system of farming, be seized upon as the opportunity of laying a surer foundation upon which to build up an even more successful and more permanent system of agriculture than has been.

(Copy.)

A letter written on official paper of the Minister of Agriculture, Alberta, was received in the Minister's office, Department of Interior, January 6, 1908. As the original was not signed it has been handed to the Deputy Minister of Agriculture for Alberta, Mr. Harcourt, to take back to Edmonton for signature, and the following copy put on the file pending receipt of signed letter.

(Sgd.) J. B. H.

(Copy.)

EDMONTON, December 30, 1907.

HON. FRANK OLIVER,
Minister of the Interior,
Ottawa.

DEAR SIR,—My department is just in receipt of intimation from Mr. W. D. Scott, Superintendent of Immigration, that your department is prepared to issue a reasonable amount of seed grain to needy settlers in Alberta who were homesteaders, and asking to be furnished with a list of such settlers as have made application for seed grain, or are known to be in need of same. I am indeed pleased to know that your government are preparing to supply seed grain in this way, because frost did general damage to wheat, oats and barley in the portion of the province lying north of Calgary. In this district, not only the homesteaders but a great many of those who have obtained their patents are going to be in a bad way for seed grain, because, like the homesteaders, they are unable to pay for it. In other cases again there is absolutely no seed grain in the district, and all farmers, whether poor or rich, will have to buy seed grain. The whole question presents a very difficult situation to deal with. Were the local government to purchase grain for seed purposes there would very likely be some confusion arising from the fact of the two governments distributing same. I have, therefore, to suggest the advisability and desirability of your department undertaking the work of supplying seed grain to all farmers actually needing it, whether they have already obtained their patents or not, or have purchased land from the railway companies.

With regard to supplying a list of such settlers as have made application for seed grain advances, or are known to be in need of seed grain, I will be pleased to take steps to have you supplied with same, and I may say further in this connection that my department will be pleased to co-operate with your department, or assist in

any way it can, in ascertaining the names of those farmers who are actually in need of seed grain.

Trusting you will be able to give this matter your favourable consideration, and wishing you a very happy and prosperous New Year.

I am, yours very truly,

MINISTER OF AGRICULTURE.

(Copy.)

OTTAWA, January 8, 1908.

DEAR SIR,—Yours of December 30 to hand regarding seed in Alberta.

I am afraid that Mr. Scott has somewhat misunderstood the position so far taken by this government. We are seeking information as to the conditions. In case we find that action looking towards the issue of relief seed is necessary we would wish to consult with the Alberta government as to what responsibility or share of responsibility your government would assume.

Although the Dominion government has in other instances issued seed grain in the West it was before there was provincial organization and it does not seem now that there is provincial organization that the responsibility should rest upon the Dominion. On the other hand, settlers who have not yet received patent for their land are not in a position to give security for advances of seed grain made them except under arrangement with this government as to liens upon their homesteads.

Unless the need of seed grain is very great and very widespread I would strongly urge that the provincial government take full charge and responsibility for the purchase and distribution of relief seed, this government merely making the necessary arrangement to secure the advances by liens on homesteads for which patents had not been issued.

As the time intervening between now and spring is little enough to make arrangements if seed is to be supplied on any large scale, I would be glad to hear as definitely as possible from you as to what view your government is prepared to take.

Mr. W. D. Scott is now in the west and has instructions to visit Edmonton and discuss the subject personally with the Alberta government, but Mr. Scott has no authority to make any arrangements. He is merely in the west for the purpose of getting information.

Should it be the case that settlers who have received their patents are in need of relief seed it would be impossible for this government to take security from them for any advances made. Therefore under any circumstances the responsibility would have to rest upon the provincial government so far as relief seed on unpatented lands was concerned.

Yours very truly,

(Sgd.) FRANK OLIVER.

(Copy Canadian Pacific Railway Company's Telegraph.)

EDMONTON, ALTA., January 11, 1908.

Hon. FRANK OLIVER,
Ottawa.

Has any further decision been reached *re* seed grain by letter December thirtieth; season advancing; anxiously awaiting answer.

W. T. FINLAY.

(Copy.)

(Telegraph.)

DEPARTMENT OF THE INTERIOR,

OTTAWA, January 14.

Hon. W. T. FINLAY,
Edmonton, Alta.

Wrote you reply on 8th instant.

F. OLIVER.

OTTAWA, January 23, 1908.

Hon. FRANK OLIVER,
Minister of the Interior,
Ottawa.

SIR,—I have been appointed by the government of the province of Alberta to lay before you certain conditions which exist in the province at the present time with regard to seed grain and the need there is for immediate action of some kind for supplying farmers and homesteaders with sufficient grain to seed their land. This unfortunate situation is due to the peculiar climatic conditions which prevailed throughout the province during the past year and which have been fully and accurately set forth in the memorandum laid before you by representatives of the Saskatchewan government on the 20th inst. Those portions of the province growing winter wheat were able to get this crop off with comparatively little damage, but in that portion of the province lying to the north of Calgary great damage was done to all spring-sown crops, many fields never being cut at all. While practically all the grain was more or less damaged by frost, oats suffered most severely. There are very few farmers north of High River that will have oats of the 1907 crop that are safe to sow.

It is estimated that in addition to the grain of the 1906 crop still in farmers' hands, together with such as may prove suitable for seeding of the 1907 crop, there will be required for seed 100,000 bushels of spring wheat, 450,000 bushels of oats, and 100,000 bushels of barley.

The Saskatchewan memorandum of the 20th inst., accurately sets forth the financial situation as well as the necessity for immediate action of some kind. The further views expressed in this memorial are in accord with the situation in Alberta. It is hoped, therefore, that in view of these extraordinary conditions, your government will interest itself in the matter.

Yours respectfully,

(Sgd.) GEO. HARCOURT.

(Copy.)

OTTAWA, January 24, 1908.

Memorandum:

Mr. OLIVER.—When I was in Winnipeg I interviewed Hon. R. P. Roblin, Premier for Manitoba, regarding seed wheat for that province. Mr. Roblin, after going carefully into the matter with me, advised me that he was making inquiries through the municipalities and would advise me later on. I attach herewith his telegram in which he intimates that the municipalities will be given power to deal with the matter.

(Sgd.) W. D. SCOTT.

(Copy—Canadian Pacific Railway Company's Telegraph.)

WINNIPEG, MAN., January 24, 1908.

W. D. SCOTT.
Immigration Agent,
Ottawa, Ontario.

Provision will be made vesting authority in municipal councils to provide all seed necessary for farmers who may require it in this province.

(Sgd.) R. P. ROBLIN.

Copy—Telegram.

OTTAWA, January 22, 1908.

To each of the following:—

Sir Thomas Shaughnessy, F. W. Thompson, Ogilvie Milling Company, Robert Meighen, Lake of the Woods Milling Company, Montreal—

I shall be obliged if you will favour me with any information you have as to need of seed grain in Manitoba and Northwest. If your company is making any arrangement to supply seed I should be glad to have information of that also.

(Sgd.) W. S. FIELDING.

Copy—Telegram.

MONTREAL, January 22, 1908.

Hon. W. S. FIELDING,
Ottawa.

Sir Thomas Shaughnessy is out of town until to-morrow. Mr. Whyte, our second vice-president, now in Ottawa, is fully conversant with subject of your telegram, which have repeated to him. He will doubtless communicate with you.

E. ALEXANDER.

Copy—Telegram.

MONTREAL, January 23, 1908.

Hon. W. S. FIELDING,
Ottawa.

On his way west Mr. Whyte stopped at Ottawa and had full discussion seed grain matter with Minister of Interior and representatives of Saskatchewan and Alberta. It has not been the intention of the company at any time to provide seed grain, but Mr. Whyte was authorized to promise low rates for carrying it to points on our line. It is my impression that the largest quantity will be required at points on the Canadian Northern, but Minister of Interior probably fully informed about this.

T. G. SHAUGHNESSY.

Copy—Telegram.

MONTREAL, January 22, 1908.

Hon. W. S. FIELDING,
Minister of Finance,
Ottawa.

Telegram received, writing you fully to-day.

F. W. THOMPSON,
Commissioner of Agriculture.

THE OGILVIE FLOUR MILLS CO., LTD.,

The Honourable W. S. FIELDING,
Minister of Finance,
Ottawa.

DEAR MR. FIELDING,—Answering your telegram to-day, I will say that according to the information I have, the requirements for seed, outside of those who already have their seed now in hand, will approximate one million bushels of wheat, a large quantity of oats and some barley.

The large proportion of this, I understand, is required in the territory served by the Canadian Northern Railway. As a matter of fact, Sir Thomas Shaughnessy told me Saturday night last that, according to the replies received from all points on their system to which they had sent inquiries, something less than 200,000 bushels would be required for their lines.

As to our own company, I may say that we are not making any arrangements to supply seed, and frankly I do not see how we could very well do so. I, of course, would be glad to render any assistance possible, but I personally think that this question of providing seed is one with which the local government must deal through their own organizations.

The question may, of course, arise as to their ability to provide the necessary funds. If they are unable to do so, might I suggest that the Dominion government assist them financially, a precedent for this having been established many years ago under somewhat similar conditions; the only difference being that the Northwest Territories, at the time I speak of, were not organized, but were under federal control. The purchases of seed at that time were made through the Dominion Lands offices, and the distribution made through their organization.

In my judgment, no individual or company could undertake to perform a service of this kind satisfactorily to all concerned, altogether apart from the question of financing it.

I fully recognize the importance of providing good seed for the farmers of the Northwest, where it is absolutely required. It is not advisable to take chances on sowing low grade or frosted wheats, the germinating quality of this wheat being so inferior to sound wheat. Besides, poor seed inclines to develop a weak plant, which is naturally unable to withstand the vicissitudes of the weather.

In closing, I may say that there are now in store at Fort William and Port Arthur the following quantities of wheat suitable for seed:—

35,000	bushels	No. 1 Hard.
550,000	"	1 Northern.
1,350,000	"	2 Northern.
1,400,000	"	3 Northern.

A portion of these grades have been purchased for milling purposes, but I have no doubt a sufficient quantity could be obtained for seed requirements, although it is difficult to locate the ownership of this grain.

In addition to the above there is undoubtedly a fair quantity of similar grades in interior elevators, owned by the different elevator companies who are operating principally for export. Detailed information in respect to this could, I think, be obtained privately from Mr. Castle, the warehouse commissioner at Winnipeg.

If there is any further information which I can obtain for you with respect to this subject I shall only be too pleased to place the services of our organization at your disposal.

Yours faithfully,

(Sgd.) F. W. THOMPSON.

SESSIONAL PAPER No. 25c

MONTREAL, January 22.

Hon. W. S. FIELDING,
Minister of Finance,
Ottawa.

Have wired our Winnipeg office for full particulars, will reply to you later.
ROBERT MEIGHEN.

LAKE OF THE WOODS MILLING COMPANY,
MONTREAL, January 22, 1908.

Hon. W. S. FIELDING,
Minister of Finance,
Ottawa.

DEAR SIR,—I received at noon to-day your telegram as follows:—

'Shall be obliged if you will favour me with any information as to need of seed grain in Manitoba and North, if your company is making any arrangement to supply seed. I shall be glad have information on that also.'

To which I replied:—

'Have wired our Winnipeg office for full particulars. Will reply to you later.'

I wired our Winnipeg office the following:—

'Have received following telegram from Honourable W. S. Fielding, Finance Minister, Ottawa:' 'Shall be obliged, &c.' 'Wire me full particulars as to foregoing.'

I now inclose you our General Manager, Mr. G. V. Hastings' reply, which speaks for itself.

Our company would be very willing to assist in any way it possibly could in supplying seed to the farmer, but you can readily understand at the moment we have no high grade wheat to spare and the Grain Act is very stringent. We do not think that in distributing the seed grain we could conform to the Grain Act.

Yours very truly,
(Sgd.) ROBERT MEIGHEN.
President,
Lake of the Woods Milling Co.

Copy—Telegram.

WINNIPEG, MAN., January 22, 1908.

ROBERT MEIGHEN,
President, Lake of the Woods Milling Co.,
Montreal.

Message received. Manitoba will not require seed wheat. The northern part may want seed oats. Saskatchewan, north of Qu'Appelle river and east of South Saskatchewan river, will likely require seed oats and wheat. Southern Alberta has sufficient seed in that district both wheat and oats. Northern Alberta wants both. Will likely get wheat from Moosejaw district or Regina line north of Lumsden. There will be more trouble in getting good oats for seed than either wheat or barley. We cannot spare any good wheat and on account of Seed Grain Act would not advise promising any supply for that purpose. Opinion here is that any wheat number five or over which is fairly plump will do for seed.

GEO. V. HASTINGS,
General Manager,
Lake of the Woods Milling Company, Ltd.

Copy.

THE CANADA MALTING COMPANY, LTD.,
TORONTO, ONT., January 21, 1908.

Hon. W. S. FIELDING,
Minister of Finance,
House of Commons, Ottawa.

DEAR SIR,—We were pleased to learn of the proposed action of the government to take up the question of the supply of seed grain to the farmers of the western provinces.

Newspaper reports of the discussion in the House indicated that it was considered seed wheat and seed oats were only needed, but our experience in handling the western barley this year in malting operations would indicate that the germinating qualities of the barley had also been seriously impaired.

For the western farmer to continue the policy of mixed farming and rotation of crops it will be necessary for him to sow barley of good germinating quality in order to obtain satisfactory results from his crops.

Those who handle Canadian barley for use in this country are very much interested in having a satisfactory quality of barley grown in the west, and there is, furthermore, always a good export demand for all western barley that is suitable for malting purposes.

We have already forwarded this year some Ontario barley to the west for seeding purposes. If the government decide to act in the matter we would be very glad and would co-operate in any way possible for the supply of a further quantity which may be needed for seeding next spring.

We might mention that we would not take this matter up with the idea of making a profit in supplying seed, but simply to insure the quality of the western barley being maintained at the standard existing before last year's crop.

Yours truly,
(Sgd.) W. L. MATTHEWS.
The Canada Malting Co., Limited.

MINISTER OF FINANCE.
OTTAWA, January 24, 1908.

DEAR SIR,—I beg to acknowledge receipt of your letter of the 21st instant on the subject of seed grain for the Northwest, which will have due consideration.

Yours faithfully,
(Sgd.) W. S. FIELDING,
Minister of Finance.

W. L. MATTHEWS, Esq.,
Canada Malting Company,
Toronto.

THE OGILVIE FLOUR MILLS CO., LIMITED.
MONTREAL, January 27, 1908.

DEAR MR. FIELDING,—I was very much pleased to have a call from Mr. Castle on Thursday last, with whom I had a very frank and interesting conversation. He was with me for over two hours and we thoroughly threshed out the question of supplying the farmers in the Canadian Northwest, who are unable to obtain requirements for themselves, with seed grain.

I thought it would strengthen your hands to know, from a firm like ours, whose business it is to know from day to day the conditions in the Northwest, that we thoroughly concur in the action the government is taking in this matter, and I

personally believe the government could not have put the carrying out of this matter in more capable hands than Mr. Castle's. I can quite understand that however judiciously this matter is handled, there will be more or less unfair criticism, but you may rest assured that the matter will be carried out by Mr. Castle to the very best advantage and in a thorough businesslike and straightforward manner.

With a view to accomplishing the end which the government has in view, I have given instructions to all our grain buyers and elevator people throughout the Canadian Northwest to place their services at Mr. Castle's disposal wherever required, and I also assured Mr. Castle that he could at all times rely upon our cordial co-operation.

Believe me, &c.,

(Sgd.) F. W. THOMPSON.

Hon. W. S. FIELDING,
Minister of Finance,
Ottawa.

Copy.

OTTAWA, January 28, 1908.

DEAR MR. THOMPSON,—I beg to acknowledge receipt of your letter of the 27th instant on the subject of the need of seed grain for the Northwest.

I beg to thank you for the information that you have furnished and for your kind assurance of co-operation in any efforts the government may make to meet the difficulty.

Yours faithfully,

(Sgd.) W. S. FIELDING.

F. W. THOMPSON, Esq.,
The Ogilvie Flour Mills,
Montreal.

OTTAWA, January 25, 1908.

Hon. FRANK OLIVER,
Minister of the Interior,
Ottawa.

SIR,—From the conversation which we had with you this morning it is understood that you wish to have the memorandum already submitted by the representatives of Saskatchewan and Alberta supplemented by further statements regarding certain matters involved in the problem of seed grain advances.

In the first place we may state that the memorandum referred to may be regarded as setting forth the views of the provincial governments concerned except in so far as amended by the statements or suggestions contained herein.

Upon further consideration of the question as to the quantities of seed grain to be supplied we have respectively arrived at the conclusion that arrangements should be completed to distribute in Saskatchewan 1,200,000 bushels of wheat, 1,200,000 bushels of oats, and 200,000 bushels of barley, and in Alberta 100,000 bushels of wheat, 450,000 bushels of oats, and 100,000 bushels of barley.

In reference to the administration problem you will remember that our first suggestion was that it should be transferred to a board of three commissioners especially appointed for the purpose and that the board should have the assistance and advice of the officials of both the Dominion and provincial governments.

However, as it was pointed out that much valuable time would undoubtedly be lost in arranging for the appointment of such a board and as the board itself, if appointed, would be certain to meet with vexatious delays in securing an adequate

staff, we concur in the conclusion reached that the problem must be dealt with immediately by either the provincial or Dominion authorities making use of such machinery as already exists and is available.

In view of the fact that the solution of the problem involves the purchase and distribution of over three million bushels of grain before April 10 next, and the expenditure of about $3,000,000, it is imperative that immediate action should be taken. The whole question is so involved and complicated and there is such a multiplicity of detail to be attended to at once that any delay in setting the machinery to work may result in a hopeless failure to meet the situation.

It may be argued with a good deal of force that the duty of handling the problem which is largely local in its nature should rest solely on the provincial authorities. Still it must be remembered that the vast army of homesteaders who have poured into Western Canada during the past three or four years and who have not as yet secured the patents for their lands, are, in a sense, wards of the Dominion government. Heretofore they have always been regarded as such and when they required assistance or relief it has been their custom to look to the Dominion authorities. To this extent, therefore, it would appear to be the duty of the Dominion government to interest itself directly in the matter and thereby continue the general policy that has been pursued for many years. It must therefore be admitted that so far as homesteaders are concerned the Dominion should accept the whole responsibility.

The homesteader, however, is not the only person requiring assistance in the way of seed grain. Owing to a peculiar combination of circumstances which now exist for the first time in the history of Western Canada thousands of farmers who have their patents must also be temporarily accommodated with seed. Doubtless the responsibility of providing for these, rests at the door of the provincial governments and that responsibility they are prepared to assume.

Then again, it may be asserted that notwithstanding any direct responsibility that the federal authorities may have in the matter it would be preferable to transfer that responsibility to the provincial authorities on the ground of local interest and on the understanding that the provinces would be amply secured, for advances made to homesteaders. Under certain circumstances such an arrangement would be quite satisfactory, but it is submitted that owing to existing conditions this plan could not be seriously considered.

As already pointed out, 'time' is of the very essence of the problem in hand. A few weeks ago it was not thought that the need of our farmers was so widespread. In fact it was confidently expected that it would be largely if not altogether confined to residents on unpatented lands. While it was generally assumed that many of our older settlers were short of cash there was good reason for believing that the banks and the loan companies and other financial institutions would come to their relief when the prevailing shortage of money sufficiently disappeared as it was recently hoped it would. For this reason and on account of the presumably larger interest of the federal authorities in the matter, no active measures were taken by either provincial government to create an organization capable of administering the problem. For some weeks past the officials of the provincial departments of Agriculture have been actively engaged in securing the fullest reliable information regarding the situation, and this information has been transmitted to the Minister of the Interior, who it was assumed would take charge of the distribution of the seed needed, thereby carrying out the general policy that had been inaugurated many years ago and acted upon on several occasions.

Such was the situation when we arrived in Ottawa about a week ago. And as it is now generally recognized, and we think rightly so, that there is not a moment to be lost in setting the machinery to work to deal with the problem, it appears to us that such machinery as is now available should be utilized. In discussing the matter with you and your officials the conclusion was reached that in any event it would be necessary to employ your land agents, sub-land agents, the officials of your

emigration branch, the officials of the grain inspection branch of the Department of Trade and Commerce, the grain warehouse commissioner and his staff and the officials of the seed branch of your Department of Agriculture.

Doubtless the Dominion would be willing to instruct all these officials to assist the provincial authorities in dealing with the purchase and distribution of the grain, but there are reasons which appear to us to be obvious which make such a course impracticable, the danger of friction from the divided allegiance required being the most apparent.

We are therefore of the opinion that it is advisable for the Dominion authorities to assume the undivided responsibility of handling the whole problem upon such terms and conditions as are eventually agreed upon by the governments concerned. Otherwise it will be necessary for the two provincial governments to create separate organizations especially for the purpose. At this late stage it seems to us that such an alternative should not be seriously considered owing to the fact that its adoption would in all probability involve such loss of time as to render the successful solution of the problem impossible.

The question of finance and security will be discussed in a later memorandum after we have an opportunity of seeing the Minister of Finance with whom you have been good enough to make an appointment for a meeting on Monday.

Yours very truly,

(Sgd.) GEO. HARCOURT,
For the Province of Alberta.

(Sgd.) J. A. CALDER,
For the Province of Saskatchewan.

OTTAWA, January 27, 1908.

HON. FRANK OLIVER,
Minister of the Interior,
Ottawa.

SIR,—We inclose herewith copy of letter to-day addressed by us to Mr. Fielding. We also desire to reiterate the views already expressed by us as to the acceptance by the government of the Dominion of the responsibility of the administration of the seed grain problem subject, however, to the terms and conditions mutually agreed upon with regard thereto. The necessity of this seems to us all the greater after the further very serious consideration which we have given to the matter as a result of the very full discussion had with you and Mr. Fielding this morning. While in the main agreeing that the views advanced on behalf of sole provincial management are, if the homesteaders were eliminated from consideration, logically accurate, we think that on further consideration of the practical side of the question it will be admitted that the course suggested by us is the only available solution of the difficulty of administration and if not adopted we fear there is exceedingly great danger of the situation not being satisfactorily met or the contemplated relief failing of its purpose.

From the very outset it was understood that there should be uniformity in administration, that two sets of machinery should not be put into operation and had we known that there was any possibility of the Dominion government insisting upon the provincial authorities accepting the whole responsibility of administration we would have made our arrangements accordingly. We submit therefore that at this late date and on account of the necessity of immediate action the view indicated by us should be adopted.

Yours very truly,

(Sgd.) GEO. HARCOURT,
For the Province of Alberta.

(Sgd.) J. A. CALDER,
For the Province of Saskatchewan.

OTTAWA, January 27, 1908.

Hon. W. S. FIELDING,
Minister of Finance,
Ottawa.

SIR,—Having had an opportunity of discussing the question of financing the seed grain problem with Mr. Oliver and yourself to-day, we now at your suggestion put in writing what we understand, as a result of the conversation, to be the minimum of security which you will consider for the repayment of any moneys advanced for the required purpose.

It is estimated that there will be required the following sums:—

(*a*) For the province of Alberta the sum of $550,000.

(*b*) For the province of Saskatchewan the sum of $2,300,000.

It is also estimated that of these amounts there will be required for advances to homesteaders the sum of $110,000 in Alberta, and $475,000 in Saskatchewan. And as it is assumed your government will take all responsibility with regard to advances to homesteaders, these latter amounts may be deducted from the amounts already mentioned, leaving $440,000 required for advances in Alberta, and $1,825,000 for advances in Saskatchewan.

We therefere, in accordance with the suggestions already referred to, make application for an advance by the government of Canada, to the government of Alberta of the sum of $440,000 and to the government of Saskatchewan of the sum of $1,825,000, such amounts to be advanced in the manner and at the times to be arranged when the question of the administration of the fund is finally agreed upon.

We agree on behalf of our respective governments to repay the amounts in accordance with the arrangement to be hereafter completed within one year from the date of the advances together with interest thereon at the rate of 5 per cent per annum until paid.

We also agree in case of non-payment within the year, the amounts loaned to the respective provinces shall be a first charge on all subsidies, grants, allowances, or other moneys which may from time to time be owing by the Dominion to the provinces respectively.

We also agree if this proposition is accepted to procure an Order in Council from our respective governments authorizing the entering into of this arrangement.

For the reasons already stated in the correspondence we can accept no responsibility with regard to advances to homesteaders.

As you have intimated that some days may unavoidably elapse before the necessary authority can be obtained to enable you to make payment of any sum of money for the purchase of grain we would ask that steps be taken as quickly as possible to secure options upon say 800,000 bushels of wheat, 100,000 bushels of barley and as much oats as it will be possible to secure.

Yours very truly,

(Sgd.) GEORGE HARCOURT,
For the Province of Alberta.

(Sgd.) J. A. CALDER,
For the Province of Saskatchewan.

(*Copy.*)

RUSSELL HOUSE, OTTAWA, January 28, 1908.

Hon. W. S. FIELDING,
Minister of Finance,
Ottawa.

SIR,—I have wired the government of Alberta asking to be given authority to enter into this agreement on their behalf and have signed it subject to the authority being granted.

Yours truly,

(Sgd.) GEORGE HARCOURT.

SESSIONAL PAPER No. 25c

CERTIFIED *copy of a report of the Committee of the Privy Council, approved by His Excellency the Governor General on the 30th January, 1908.*

On a memorandum, dated 30th January, 1908, from the Minister of Finance, stating that a serious situation exists in the provinces of Saskatchewan and Alberta in regard to the supply of good grain suitable for seeding purposes for the spring's sowing of 1908. This statement is based on representations sent to the government by members and officers of the provincial governments of Saskatchewan and Alberta and is supported and confirmed by officers of the Department of Interior and of Agriculture. The difficulty, according to the information furnished, has arisen through the character of the season of 1907. Owing to a late spring and consequently delayed seeding operations; owing to, in many places continued and prolonged moisture which prevented the early ripening of the crop, and owing to severe frosts affecting the crops in a large portion of these two provinces, the crop of grain is such that in many sections it is wholly unfit for seeding purposes, or is such as would make its use for seeding purposes very inadvisable, and if it is used the crop returns for next season would be imperilled.

It is stated that in certain areas the crop has been abundant and fully matured and is quite satisfactory for seeding purposes, but according to information from the officers of the Seed Division of the Department of Agriculture who have made tests of many samples of the grain, there are other areas in which there is practically no grain fit for the seeding operations of the spring of 1908.

In regard to wheat it has been found that there is probably a sufficient quantity of seed wheat, of fair quality and good vitality, in the country, although there are sections where it is short.

In regard to oats, however, the situation is much worse. There are not enough oats in these two provinces to-day, really fit to be used as seed, to meet the requirements of the coming spring's sowing. This lack is the more difficult to be dealt with from the fact that there is a very large quantity of oats that are plump and heavy and which, to the ordinary examination, appear to be quite good seed grain, but when tested for germinating quality are absolutely lacking in the necessary vitality. There is great danger that these oats will be used by farmers who do not appreciate this difficulty and have no means themselves of testing their seed grain. If such seed should be used the crop of oats of the coming season would be reduced to such an extent that it would be a disaster to the country.

In regard to barley, there is also practically no good seed barley in the country.

The Minister observes that, unless prompt action is taken to cope with this situation, the grain crops of the coming year of the two provinces of Saskatchewan and Alberta will probably be most seriously reduced, and he believes it to be the duty of the public authorities to take immediate steps to avert what would be a disaster affecting the welfare of the whole Dominion. If action should be delayed until the period of the year in which farmers generally arrange for the purchase of their seed grain, it would be impossible for the farmers of these two provinces, by any individual effort, to secure good grain for their spring seeding. What good grain there may be now in the country is constantly moving towards the markets for consumption, and the supply in the country would be depleted before that period of the year. The test of seed grain takes some little time and the staff of the Department of Agriculture, which alone is able to do this work thoroughly, would not be able, in the rush of the spring applications, to meet the demands of the farmers for a proper and sufficiently general test of their seed.

Under the circumstances above outlined it is essential that the seed that is used the coming spring by the farmers of these provinces should be tested so that its quality may be assured.

The Minister, therefore, submits that it is necessary that steps be taken to secure as soon as possible an adequate supply of seed wheat, seed oats and seed barley;

that this grain should be bought as soon as may be, subject to a test to be carried on by the officers of the Seed Division of the Department of Agriculture, and that this grain should be held available to the farmers of these provinces for seeding purposes next spring, and distributed to them in such manner as may be found most convenient and effective.

The Minister also desires to point out that, while many of these farmers are in a good financial standing, it may be found in numerous instances that they will not have the cash available this winter or spring to meet the cost of their seed. This is due largely to the very prosperity of the country which has been maintained during the last few years. The farmers of the provinces of Saskatchewan and Alberta have, until this season of 1907, been so well satisfied with the profits and results of their agricultural operations that they have hastened to invest their surplus cash and earnings in their business, in the way of the purchase of more land, more implements, more stock, and more buildings, and many of them have not laid by for such an unforeseen contingency as has occurred this year.

It is true that where the crop has been saved in good condition, prices have been so high that these farmers have reaped a very good return for their season's work; but in the cases where the seed grain is lacking the farmers have not been able to secure the returns during this season which their success of the last few years might have reasonably entitled them to expect, and the result is that these men, for whom this provision is now proposed to be made, are very short of money and cannot pay cash down for their grain. It is, therefore, felt to be necessary that arrangements His Excellency the Governor General in Council.

The Minister would further submit that the season of 1907 has been so exceptional in its character, and the failure of the crops, in the various sections of the west hereby to be assisted, has been so unexpected in every way, that a condition of affairs has arisen there which calls for extraordinary action to meet the situation.

The Minister observes that, apart from the question of any responsibility that may be said to rest upon the Dominion government as respects the settlers who occupy homesteads under the Dominion Lands Act, the duty of making provision for such supply of seed grain might properly fall upon the governments of the provinces of Alberta and Saskatchewan. The Minister realizes, however, that under present financial conditions the resources of these provincial governments are unequal to the demands of the occasion. Under favourable conditions the provincial governments could probably arrange to obtain the requisite advances from Canadian banks. But while there are signs of improvement, the situation is not such as to warrant a belief that the Canadian banks could be relied on to provide the necessary funds. The provinces, having been but recently organized under their new constitutions, have not yet had time to establish their credit in the money markets of the world. The Minister therefore feels that if this urgent need of seed grain is to be promptly met it will have to be through the co-operation of the Dominion and provincial governments. The Minister therefore recommends as follows:—

1. That a supplementary estimate for the current fiscal year be forthwith submitted to the House of Commons asking for the following appropriations:—

(*a*) To provide seed grain for homestead settlers in the provinces of Alberta and Saskatchewan; the cost of said grain to be repaid by the settlers with interest at the rate of five per centum per annum and until repayment, to be a lien or charge upon the lands of the settler held under homestead entry.. .. .. ..$	585,000
(*b*) Advances to the government of the province of Alberta for the purchase of seed grain for settlers.. ..	440,000
(*c*) Advances to the government of the province of Saskatchewan for the purchase of seed grain for settlers..	1,825,000

2. That the sale and distribution of seed grain to homestead settlers be made under such regulations as may be made by the Minister of the Interior, approved by His Excellency the Governor General in Council.

3. That before any advance for such purpose shall be made to the government of the province of Alberta the Minister of Finance shall require and obtain a duly certified copy of an order in council, approved by His Excellency the Lieutenant Governor of the said province, authorizing the government of the province to borrow from the government of Canada the said sum of $440,000, and agreeing that if the said sum or any part thereof which may be advanced be not repaid to the Dominion treasury on or before the thirty-first day of March, 1909, together with interest at the rate of five per centum per annum, the same shall thereupon become a charge upon any subsidy, allowance, grant or money which for any purpose whatsoever may at any time thereafter become payable by the government of Canada to the government of the said province; and that the government of Canada may appropriate such portion or portions of any such subsidy, allowance, grant or money as it may deem necessary or advisable towards the repayment of such sums and interest; and engaging to recommend to the legislature of the province at the earliest opportunity the enactment of a law approving and confirming such order in council.

4. That before any advance for such purpose shall be made to the government of the province of Saskatchewan the Minister of Finance shall require and obtain a duly certified copy of an order in council approved by His Honour the Lieutenant Governor of the said province authorizing the government of the province to borrow from the government of Canada the said sum of $1,825,000, and agreeing that if the said sum, or any part thereof which may be advanced, be not repaid to the Dominion treasury on or before the thirty-first day of March, 1909, together with interest at the rate of five per centum per annum, the same shall thereupon become a charge upon any subsidy, allowance, grant or money which for any purpose whatsoever may at any time thereafter become payable by the government of Canada to the government of the said province; and that the government of Canada may appropriate such portion or portions of any such subsidy, allowance, grant or money as it may deem necessary or advisable towards the repayment of such sum and interest; and engaging to recommend to the legislature of the province at the earliest opportunity the enactment of a law approving and confirming such order in council.

5. That, inasmuch as immediate action appears to be necessary to obtain the requisite quantity of seed grain at reasonable rates, the Minister of the Interior be authorized, pending the appropriation of funds by parliament, to take whatever steps may be deemed proper to secure options on the quantity of grain required, or any part thereof, such options to be exercised subsequently if parliament makes the necessary appropriations.

The committee submit the same for approval.

AT THE GOVERNMENT HOUSE AT OTTAWA.

THURSDAY, 6TH DAY OF FEBRUARY, 1908.

PRESENT:

His Excellency The Governor General in Council.

His Excellency the Governor General in Council is pleased to approve and doth hereby approve of the following Regulations respecting the purchase, sale and distribution of grain to homestead settlers in the provinces of Alberta and Saskatchewan which have been made by the Minister of the Interior in pursuance of the order in council of the 30th January, 1908, respecting the distribution of seed grain to settlers:—

Regulations Respecting the Purchase, Sale and Distribution of Seed Grain to Homestead Settlers in the Provinces of Alberta and Saskatchewan.

1. All purchases of grain in Canada shall be made by the Warehouse Commissioner of the Department of Trade and Commerce, C. C. Castle, hereinafter called 'The purchasing agent,' and all purchases outside of Canada shall be made by the purchasing agent under the advice, when it is practicable to obtain the same, of the Seed Commissioner of the Department of Agriculture, G. H. Clark.

2. Wheat shall be bought through the ordinary channels of the grain trade at current prices, from day to day at western receiving elevators, at Winnipeg, in transit to Fort William, at Fort William or elsewhere, subject to official grade and weight by proper officers of the Grain Inspection and Weighing Branch of the Department of Trade and Commerce: Grades 1 and 2 Northern only shall be purchased if sufficient of these grades can be procured, but, if not, No. 3 Northern may be purchased from receiving elevators or in transit at Winnipeg, but not in terminal elevators: Grade No. 4 wheat may, if necessary, be purchased wherever it can be purchased, having due regard to its suitability for seed purposes, its grading and cleanliness, but should only be purchased in the event of there not being sufficient of the other grades procurable.

3. Oats shall be purchased through the ordinary channels of the grain trade at western receiving elevators, at Winnipeg, in transit to Fort William, at Fort William or elsewhere including eastern Canada, and shall be of grades Nos. 1, 2 and 3 White oats, as inspected and weighed by the Dominion Grain Inspection and Weighing Officials, provided, however, should such purchases be made subject to a test as to vitality a fixed advance on the market price from day to day may be arranged for by the purchasing agent at his discretion.

4. Barley shall be purchased as in the case of oats and wheat and may also be purchased in eastern Canada, and shall be of grades Nos. 2, 3 extra and 3.

5. Where practicable grain may be purchased in car lots direct from farmers to Manitoba, Saskatchewan and Alberta at current prices from day to day, subject to official grade and weight.

6. All possible precaution shall be taken to have all seed purchased free from smut, noxious weed seeds and other varieties of grain, and with this object in view all such grain shall, if found necessary, be recleaned as thoroughly as possible at such warehouse cleaning plant as can be secured for this purpose.

7. Inspection, cleaning and recleaning shall be done under the direction of the purchasing agent by the Grain Inspector of the Department of Trade and Commerce, David Horn, assisted by such officers as may be appointed for the purpose by the governments of the provinces of Alberta and Saskatchewan, respectively.

8. The seed testing branch of the Dominion Department of Agriculture under the direction of the said Seed Commissioner, assisted by such officers as may be appointed for the purpose by the governments of the provinces of Alberta and Saskatchewan respectively, shall make tests for the purpose of ascertaining the vitality of all seed grain purchased in the west or elsewhere, whenever the same may in the judgment of the Seed Commissioner be necessary and practicable.

9. All grain shall be sacked after recleaning according to its grade by inspection on receipt into store, and each sack shall be distinctly marked with the kind and grade of the grain contained therein, and all such sacks shall be sewn.

10. All grain purchased by the purchasing agent shall, if necessary, be cleaned, and if stored shall be stored according to its inspected grade in a cleaning elevator at such point or points as he may determine, at such rate or rates for storage, insurance, &c., as the purchasing agent may agree with the owner or owners of such cleaning elevator; and all grain shall be shipped for delivery by the purchasing agent on the order of the officer in charge of the central distributing office at Regina hereinafter mentioned.

11. The purchasing agent shall purchase and provide the necessary sacks; arrange freight charges subject to any agreement as to freight rates made by the Minister with the railway companies; certify to weighing and inspection charges, and make all other necessary arrangements for shipment and delivery of the grain as provided in the next preceding clause of these regulations.

12. A homestead settler or homesteader in these regulations shall mean a person occupying under a homestead entry, and who has not received a recommendation for a patent. The price charged for seed grain to homestead settlers shall be the estimated average cost thereof at the point of delivery, such cost to include storage, commission, premium, insurance, sacking, freight and all other proper charges, but not the cost of administration necessary in connection with the matters herein provided for, and in the case of oats imported and oats and barley brought from eastern Canada said settlers shall be charged the actual cost thereof including price paid, cost of sacking, freight, cost of cleaning, storage, commission, insurance, and all other charges exclusive of the said cost of administration.

13. The purchasing agent shall, before any seed is distributed, furnish the officer in charge of the central distributing office at Regina with a statement of the estimated average cost or actual cost as provided in the next preceding clause of each class and grade of grain to be supplied, and such average cost shall include the price paid for grain, the cost of cleaning, storage, commission, premium, insurance, sacking, freight and all other proper charges, and in arriving at such average and actual cost, respectively, the purchasing agent shall take into account the shrinkage or loss arising from cleaning or otherwise, and the proceeds of all screenings or cleanings which he is hereby authorized to dispose of to the best advantage.

14. All matters relating to the purchase and transportation of seed grain not herein provided for shall be in the discretion of the purchasing agent.

15. No application shall be received or accepted from any one applicant for more than 200 bushels of seed grain, including wheat, oats and barley. Every applicant shall be required to state the proportion or quantity of each kind of grain he may desire; provided that no applicant shall apply for more than 50 bushels of barley. Except as in this clause provided no seed grain shall be supplied to homestead settlers who had sown no crop in the season of 1907, nor to homestead settlers whose crop for the season of 1907 was marketable and gave a reasonable return, although not suitable for seed; provided, however, if it is found after all applications have been received that there is more seed grain purchased than is needed to meet applications for advances, sales may be made to such settlers for cash at the same prices as are charged to other applicants.

16. Forms of application shall be furnished by the Minister to the secretary-treasurers of local improvement districts and municipalities, Dominion lands agents, sub-land agents, immigration officials, homestead inspectors, members of the Royal Northwest Mounted Police, secretaries of agricultural societies and grain growers' associations, and Alberta farmers' associations, and no applications for any seed grain advance shall be accepted unless made on the form so supplied.

17. Homesteaders resident in local improvement districts and rural municipalities shall sign and execute their respective applications before the secretary-treasurer of such districts and municipalities upon the forms provided for in the preceding clause.

18. Such secretary-treasurer shall issue and deliver to the applicant a receipt for the application, which receipt shall be retained by the applicant and presented to the railway agent when delivery is made as proof of identification of the applicant in case the application is approved and accepted in whole or in part.

19. There shall be established at Regina and Edmonton central offices in charge of officers appointed by the Minister and each of these officers shall at such central office receive the applications of homesteaders for seed grain made out on the forms hereinbefore referred to. Applications from homesteaders within the province of Saskatchewan shall be forwarded to the officer at Regina, and applications from home-

steaders within the province of Alberta shall be forwarded to the officer at Edmonton. The central office at Regina shall be the office from which distribution for the two provinces shall be directed, and all applications received at the Edmonton office and approved in whole or in part, shall, as soon as practicable, be forwarded to the officer in charge of the central distribution office at Regina.

20. Applications shall be made out in duplicate, one copy of which is to be sent forthwith by the secretary-treasurer to the respective officers at the central offices referred to, to the end that an estimate be speedily made of the total amount of seed grain required for each province, and that it may be ascertained whether the applicant is a homesteader.

21. The duplicate copy shall be retained by the secretary-treasurer and be by him submitted on a day fixed to the council of the local improvement district or rural municipality for its approval, modification or rejection.

22. When applications have been dealt with by the councils referred to they shall be transmitted to the central offices at Regina and Edmonton.

23. The officer in charge of the central distributing office at Regina shall receive all applications approved as herein provided; shall give orders to the purchasing agent for the shipment of seed grain, and shall make all arrangements for the taking of the lien contemplated by these regulations.

24. Homesteaders residing outside of local improvement districts who wish to make application for seed grain shall make application to the Dominion lands agent, sub-land agent, homestead inspector, immigration official, or member of the Royal Northwest Mounted Police, in the district in which the applicant resides, and such officer shall perform the duties assigned to the secretary-treasurers and the councils of local improvement districts and municipalities as herein provided.

25. The secretary-treasurer of a local improvement district who receives application shall be entitled to a fee of 25 cents for each application, and for such fee the secretary-treasurer shall be expected to take the declarations therein provided, and to perform all other work required to be done by them in accordance with these regulations and the instruction issued from time to time.

26. Every reasonable precaution shall be taken to endeavour to supply persons residing in the same locality with the same grade and quality of each class of grain.

27. Homesteaders shall be required upon delivery of seed grain to give security for the repayment of the same as hereinbefore set out, such security to be in the form, as nearly as may be, in Schedule A of these regulations, but slight deviations therefrom shall not vitiate such security.

28. Wherever in these regulations 'the Minister' is referred to, the Minister of the Interior is intended. The administration of these regulations and of all matters pertaining to the purchase, sale and distribution of the seed grain to be provided for the homestead settlers referred to, whether approved for in these regulations or not, shall be carried out under his supervision and direction.

Schedule 'A' attached.

RUDOLPHE BOUDREAU,
Clerk of the Privy Council.

SCHEDULE 'A.'

LIEN NO.....

I, ..., the homesteader of the land hereinafter described, and whose Post Office address is..... .....do hereby acknowledge the receipt from the Minister of the Interior of Canada of advances to the value in all of .....dollars.....being for seed-grain delivered by him or his agent to me, as follows:—

.....Bushels Wheat at..... .....$.....
.....Bushels Oats at..... .....$.....
.....Bushels Barley at..... .....$.....

AND I do hereby agree to pay the said amount of..... dollars.....to the said Minister of the Interior of Canada, or his successors in office, on or before the first day of March, 1909, with interest thereon at the rate of five per centum per annum from the date of these presents and that until the payment thereof is made the said amount shall be and remain a first lien and charge upon my homestead, being the ..... quarter of Section ..... Township ..... Range..... west of the ..... Meridian: And I do further agree that neither I nor my heirs, executors, administrators or assigns, shall be entitled to the issue of letters-patent for my said homestead, until the said amount, with all interest thereon, has been fully paid and satisfied, but that if the said Minister, or any of his successors in office, shall see fit to issue letters-patent for my said homestead the said amount shall continue to be and remain a first lien and charge thereon.

Signed at..... .....

this..... day of .....A.D. 1908.

WITNESS..... .....

Having been first read over and explained before execution .....

.....

To Wit: I,..... .....

of..... .....in the Province of..... make oath and say:—

(1) That I was personally present and saw..... named in the within instrument, duly sign and execute the same for the purposes named therein.

(2) That the same was so executed at..... ....

(3) That I am a subscribing witness thereto;

(4) And that I know the said party.

SWORN before me at.....

in the Province of.....this.....

day of.....A.D. 1908. .....

.....

A Commissioner for taking oaths, &c.

OTTAWA, February 3, 1908.

DEAR MR. OLIVER,—The order in council respecting advances for seed grain in the Northwest having been approved by His Excellency the Governor General, I shall submit to the House to-day a supplementary estimate for the purpose of asking parliamentary authority for such appropriation.

In the case of an amount so large as is involved in this transaction, it is not expedient that any engagement for the actual purchase of grain should be made until the sense of parliament can be taken on the proposal. However, having regard to the urgency of the case and the desirability of securing the grain promptly at a reasonable price, I think you would be quite justified in authorizing Mr. Castle to take immediate steps to secure options on the grain in whatever form and manner may be most convenient and economical.

Yours faithfully,

(Sgd.) W. S. FIELDING,

Minister of Finance.

HON. FRANK OLIVER,

Minister of the Interior,

Ottawa.

Copy of an order in council agreed to be passed by the Provincial Governments of Alberta and Saskatchewan, as a condition of advances mentioned in the Order of His Excellency in Council of the 30th January, 1908.

(Copy.)

FINANCE DEPARTMENT,
OTTAWA, CANADA, February 3, 1908.

ALBERTA.

Memorandum as to Provincial Orders in Council.

Preamble to be in whatever is the usual form, and order to provide,—

That, for the purpose of obtaining funds for the purchase of seed grain for settlers, the Provincial Treasurer be authorized to receive from the government of Canada by way of loan on the credit of the province the sum of four hundred and forty thousand dollars, or such part thereof as may be required for the purpose stated; that the province agrees to repay to the government of Canada any sum so advanced, together with five per centum per annum interest thereon, on or before the thirty-first day of March, 1909; that if any part of said sum and interest shall remain unpaid on the said date the same shall thereupon become a charge upon any subsidy, allowance, grant, or money which for any purpose whatsoever may at any time thereafter become payable by the government of Canada to the government of the province; that the government of Canada may appropriate such portion or portions of any such subsidy, allowance, grant or money as it may deem necessary or advisable towards the repayment of such sum and interest; and further, that the government of the province engages to recommend to the legislature of the province at the earliest opportunity the enactment of a law approving and confirming the order in council.

FINANCE DEPARTMENT,
OTTAWA, CANADA, February 3, 1908.

SASKATCHEWAN.

Memorandum as to Provincial Orders in Council.

Preamble to be in whatever is the usual form, and order to provide,—

That, for the purpose of obtaining funds for the purchase of seed grain for settlers, the Provincial Treasurer be authorized to receive from the government of Canada by way of loan on the credit of the province the sum of one million eight hundred and twenty-five thousand dollars, or such part thereof as may be required for the purpose stated; that the province agrees to repay to the government of Canada any sum so advanced, together with five per centum per annum interest thereon, on or before the thirty-first day of March, 1909; that if any part of said sum and interest shall remain unpaid on the said date the same shall thereupon become a charge upon any subsidy, allowance, grant or money which for any purpose whatsoever may at any time thereafter become payable by the government of Canada to the government of the province; that the government of Canada may appropriate such portion or portions of any such subsidy, allowance, grant or money as it may deem necessary or advisable towards the repayment of such sum and interest; and further, that the government of the provinces engages to recommend to the legislature of the province at the earliest opportunity the enactment of a law approving and confirming the order in council.

SESSIONAL PAPER No. 25c

MEMORANDUM *of agreement between the Honourable Frank Oliver, Minister of the Interior, of the Dominion of Canada, hereinafter called 'The Minister,' and George Harcourt, Deputy Minister of Agriculture of the Province of Alberta, on behalf of said province, and hereinafter called 'the Deputy Minister,' entered into this seventh day of February, 1908.*

Whereas the government of Canada and the government of the province of Alberta recognize that a serious situation exists in a portion of the said province in regard to the supply of good grain suitable for seeding purposes for the season of 1908;

And whereas the deputy minister on behalf of the government of the said province has made application to the government of Canada for an advance of $440,000 for the purchase of seed grain for settlers other than homesteaders residing in the said province, and the government of the said province has by order in council of date February 6, 1908, authorized the said provincial treasurer of Alberta to receive on its behalf by way of loan the said sum;

And whereas the Minister of Finance of Canada as a result of such application, and by authority of an order of the Governor General in Council of date January 30, 1908, has submitted to the House of Commons a supplementary estimate for the current fiscal year to provide for the said advance to the province of Alberta;

And whereas by order of the Governor General in Council of date February 6, 1908, regulations have been approved for the purchase, sale and distribution of seed grain to homestead settlers by the minister, a copy of which regulations is Schedule A to this agreement;

And whereas the same conditions as to the need of seed grain in the province of Saskatchewan prevail in some sections thereof; and an advance by way of loan is being arranged for from the government of Canada to the government of the said province for the same purpose in the province of Saskatchewan as is hereinbefore set out with regard to the province of Alberta; and an agreement similar in terms to this agreement between the Minister and the Commissioner of Agriculture for the said province is being entered into contemporaneously herewith;

And whereas it is desirable that the purchase, sale and distribution of all seed grain should be administered uniformly and therefore that the same regulations so far as is practicable should govern the distribution of seed grain to the holders of patented as well as unpatented lands;

And whereas owing to the near approach of the seeding season it is imperative that there should be the least possible delay in arranging for the distribution of the seed required so far as the same can be provided;

Therefore it is agreed by the Minister and by the Deputy Minister as follows:—

1. The said regulations shall, the necessary changes being made, apply in every respect to the purchase, sale and distribution of seed grain to all approved applicants, other than homesteaders, in the province of Alberta; and copies of all instructions issued by the Minister, for the carrying out of such regulations shall be furnished by the Deputy Minister: Provided, however, that where provision is made herein for the doing of anything and the same is inconsistent with the said regulations the provisions of this agreement shall prevail.

2. The words 'homestead settlers' and 'homesteaders' in this agreement shall mean persons occupying under homestead entry, and who have not received recommendation for a patent.

3. The officials appointed by the Minister to carry out the said regulations shall act as agents for the government of Alberta in securing and supplying seed to all approved applicants in the province other than homesteaders, and such officials shall from time to time as required report to the Minister of Agriculture of said province on any matter relating to the purchase, sale and distribution of seed grain.

4. The officials of the several branches of the public service of Alberta shall render every possible assistance to carry out the provisions of this agreement.

5. Whenever the said loan of $440,000 to the province for the purchase of seed grain is authorized by the Parliament of Canada it is hereby agreed on behalf of the government of Alberta, which agreement in this behalf shall be ratified by the Lieutenant Governor in Council that the said sum or such part thereof as may be required shall be paid from time to time by the Minister of Finance of Canada to such person as may be designated by the minister to be by such person applied in payment of purchases of seed grain and otherwise for the purposes of carrying out the intention of these presents.

6. An officer shall be designated and appointed by the minister to be approved by the Minister of Agriculture of the province of Alberta who shall be the officer to whom payments by the Minister of Finance under the next preceding paragraph are to be made and it shall be the duty of such officer to make all disbursements under this agreement and said regulations and to furnish complete accounts of the same to the respective government on whose behalf such disbursements are made. Such officer shall, whenever practicable, obtain vouchers for all disbursements, and all vouchers and books of account connected therewith shall be open to audit and inspection by the auditors of the respective governments on whose behalf such disbursements are made.

7. Salaries of all officials employed by the governments of Canada, Saskatchewan and Alberta for the purpose of purchasing, selling and distributing seed grain under these presents and said regulations shall be paid respectively by the government of which such official is the appointee and shall not be chargeable to the sum appropriated by the government of Canada or loaned by the government of Canada to the said respective provinces for the purchase, sale and distribution of seed grain.

8. An account of the fees chargeable by the secretary treasurers of local improvement districts under said regulations shall be kept by the officer in charge of the central distributing office referred to in the said regulations and the said fees in respect of the applications of homesteaders shall be paid by the officer in charge of disbursements mentioned in paragraph 6 of this agreement and debited to the government of Canada account, but the same shall not form part of the costs of administration within the meaning of 'costs of administration' in these presents. The fees payable on applications made by others than homesteaders shall be payable by the respective governments of the respective provinces in which such applicants reside.

9. The cost of the grain as defined in regulation 12 of Schedule A charged applicants to whom delivery has been made shall for the purposes of accounting be debited to the government of Canada in the case of homesteaders, and debited to the governments of Saskatchewan and Alberta respectively in the case of applicants other than homesteaders within the respective provinces.

10. All the costs, charges and expenses incurred in connection with the purchase, sale and distribution of seed grain, and which are not embraced in the last three preceding paragraphs, shall be regarded as costs of administration to be paid in the first instance out of the moneys available for the purchase, sale and distribution of seed grain, and when the said distribution is completed and such costs, charges and expenses ascertained, a division of the same shall be made, and the liability of each government in respect thereof shall bear the same ratio to the total cost of administration which the cost of seed grain debited to each government as set out in the next preceding paragraph bears to the total cost of the same to the three governments concerned. The amount payable by the said province of Alberta in respect of said costs of administration shall be paid forthwith on being ascertained to the officer mentioned in paragraph 6.

11. Applicants other than homestead settlers who are advanced seed grain shall be charged therefor at the same price as is charged homestead settlers under the said regulations.

12. The Minister shall give due notice to the Minister of Agriculture of the said province of the person or persons appointed by him to take security for the repayment of all advances of seed grain to homesteaders and upon the approval of the said

Minister such person or persons shall be held to be authorized to act as agent for the government of Alberta in the like capacity.

13. Before seed is distributed to persons other than homesteaders, the applications of such persons shall be approved by or under the direction of the government of Alberta.

14. The Minister shall continue and conclude the negotiations now being carried on with the railway companies concerned respecting the cost of freight, storage and delivery of grain, and shall, when a final agreement is reached, transmit a copy thereof to the said Minister of Agriculture of Alberta.

In witness whereof the parties hereto have hereunto set their hands the day and year first hereinbefore written.

Signed in the presence of:
W. R. MOTHERWELL.

FRANK OLIVER,
Minister of the Interior.

GEO. HARCOURT,
Deputy Minister of Agriculture, Alberta.

MEMORANDUM *of agreement between the Honourable Frank Oliver, Minister of the Interior, of the Dominion of Canada, hereinafter called 'the Minister' and the Honourable W. R. Motherwell, Commissioner of Agriculture of the Province of Saskatchewan, on behalf of said province, and hereinafter called 'the Commissioner,' entered into this seventh day of February, 1908.*

Whereas the government of Canada and the government of the province of Saskatchewan recognize that a serious situation exists in the said province in regard to the supply of good grain suitable for seeding purposes for the season of 1908;

And whereas the Provincial Treasurer of the province of Saskatchewan, on behalf of the government of the said province, has made application to the government of Canada for an advance of $1,825,000 for the purchase of seed grain for settlers other than homesteaders residing in the said province, and the government of the said province has by order in council of date February 4, 1908, authorized the said Provincial Treasurer to receive on its behalf by way of loan the said sum;

And whereas the Minister of Finance of Canada as a result of such application and by authority of an order of the Governor General in Council of date January 30, 1908, has submitted to the House of Commons a supplementary estimate for the current fiscal year to provide for the said advance to the province of Saskatchewan;

And whereas by order of the Governor General in Council of date February 6, 1908, regulations have been approved for the purchase, sale and distribution of seed grain to homestead settlers by the Minister, a copy of which regulations is Schedule 'A' to this agreement;

And whereas the same conditions as to the need of seed grain in the province of Alberta prevail in some sections thereof, and an advance by way of loan is being arranged for by the government of Canada to the government of the said province for the same purpose in the province of Alberta as is hereinbefore set out with regard to the province of Saskatchewan and an agreement similar in terms to this agreement between the Minister and the Deputy Minister of Agriculture for the said province is being entered into contemporaneously herewith;

And whereas it is desirable that the purchase, sale and distribution of all seed grain should be administered uniformly and therefore that the same regulations so far as is practicable should govern the distribution of seed grain to the holders of patented as well as unpatented land;

And whereas owing to the near approach of the seeding season it is imperative that there should be the least possible delay in arranging for the distribution of the seed required so far as the same can be provided;

Therefore, it is agreed by the Minister and by the Commissioner as follows:—

1. The said regulations shall, the necessary changes being made, apply in every respect to the purchase, sale and distribution of seed grain to all approved applicants, other than homesteaders, in the province of Saskatchewan, and copies of all instructions issued by the Minister for the carrying out of such regulations shall be furnished to the Commissioner; provided, however, that where provision is made herein for the doing of anything and the same is inconsistent with the said regulations the provisions of this agreement shall prevail.

2. The words 'homestead settlers' and 'homesteaders' in this agreement shall mean persons occupying under homestead entry, and who have not received recommendation for patent.

3. The officials appointed by the Minister to carry out the said regulations shall act as agents for the government of Saskatchewan in securing and supplying seed to all approved applicants in the province other than homesteaders, and such officials shall from time to time as required report to the commissioner on any matter relating to the purchase, sale and distribution of seed grain.

4. The officials of the several branches of the public service of Saskatchewan shall render every possible assistance to carry out the provisions of this agreement.

5. Whenever the said loan of $1,825,000 to the province for the purchase of seed grain is authorized by the parliament of Canada it is hereby agreed on behalf of the government of Saskatchewan, which agreement in this behalf shall be ratified by the Lieutenant Governor in Council, that the said sum, or such part thereof as may be required, shall be paid from time to time by the Minister of Finance of Canada to such person as may be designated by the minister, to be by such person applied in payment of purchases of seed grain, and otherwise for the purpose of carrying out the intention of these presents.

6. An officer shall be designated and appointed by the Minister, to be approved by the Commissioner, who shall be the officer to whom payments by the Minister of Finance under the next preceding paragraph are to be made, and it shall be the duty of such officer to make all disbursements under this agreement and said regulations, and to furnish complete accounts of the same to the respective governments on whose behalf such disbursements are made. Such officer shall, whenever practicable, obtain vouchers for all disbursements, and all vouchers and books of account connected therewith shall be open to audit and inspection by the auditors of the respective governments on whose behalf such disbursements are made.

7. Salaries of all officials employed by the governments of Canada, Saskatchewan and Alberta for the purpose of purchasing, selling and distributing seed grain under these presents and said regulations, shall be paid respectively by the governments of which such official is the appointee, and shall not be chargeable to the sum appropriated by the government of Canada or loaned by the government of Canada to the said respective provinces for the purchase, sale and distribution of seed grain.

8. An account of the fees chargeable by the secretary treasurers of local improvement districts and rural municipalities under said regulations shall be kept by the officer in charge of the central distributing office referred to in the said regulations, and the said fees in respect of the applications of homesteaders shall be paid by the officer in charge of disbursements mentioned in paragraph 6 of this agreement and debited to government of Canada account, but the same shall not form part of the costs of administration within the meaning of 'costs of administration' in these presents. The fees payable on applications made by others than homesteaders shall be payable by the respective governments of the provinces in which such applicants reside.

9. The cost of the grain as defined in regulation 12 of Schedule A charged applicants to whom delivery has been made shall for the purposes of accounting be

debited to the government of Canada in the case of homesteaders, and debited to the governments of Saskatchewan and Alberta respectively in the case of applicants other than homesteaders within the respective provinces.

10. All the costs, charges and expenses incurred in connection with the purchase, sale and distribution of seed grain, and which are not embraced in the last three preceding paragraphs, shall be regarded as costs of administration, to be paid in the first instance out of the moneys available for the purchase, sale and distribution of seed grain, and when the said distribution is completed and such costs, charges and expenses ascertained a division of the same shall be made, and the liability of each government in respect thereof shall bear the same ratio to the total cost of administration which the cost of seed grain debited to each government as set out in the next preceding paragraph bears to the total cost of the same to the three governments concerned. The amount payable by the said province of Saskatchewan in respect of said costs of administration shall be paid forthwith on being ascertained to the officer mentioned in paragraph 6.

11. Applicants other than homestead settlers who are advanced seed grain shall be charged therefor the same price as is charged homestead settlers under the said regulations.

12. The Minister shall give due notice to the Commissioner of the person or persons appointed by him to take security for the repayment of all advances of seed grain to homesteaders and upon the approval of the Commissioner such person or persons shall be held to be authorized to act as agents for the government of Saskatchewan in the like capacity.

13. Before seed is distributed to persons other than homesteaders, the application of such persons shall be approved by or under the direction of the government of Saskatchewan.

14. The Minister shall continue and conclude the negotiations now being carried on with the railway companies concerned respecting the cost of freight, storage and delivery of grain, and shall when a final agreement is reached transmit a copy thereof to the Commissioner.

In witness whereof the parties hereto have hereunto set their hands the day and year first hereinbefore written.

FRANK OLIVER,
Minister of the Interior, Canada.
W. R. MOTHERWELL,
Commissioner of Agriculture, Saskatchewan.

Signed in the presence of:
GEO. HARCOURT.

MINISTER OF THE INTERIOR,
CANADA.

OTTAWA, February 8, 1908.

DEAR SIR,—I hereby appoint and designate Charles H. Beddoe, accountant of the Department of the Interior, to be the officer to whom payments by the Minister of Finance are to be made under the agreements of yesterday's date entered into between myself as Minister of the Interior and yourself as Minister of Agriculture on behalf of the province of Alberta in respect of the purchase, sale and distribution of seed grain.

Yours very truly,
(Sgd.) FRANK OLIVER,
Minister of the Interior.

Hon. W. T. FINLAY,
Minister of Agriculture,
for the Province of Alberta.

MINISTER OF THE INTERIOR,
CANADA.

OTTAWA, February 8, 1908.

DEAR SIR,—I hereby appoint and designate Charles H. Beddoe, of the Department of the Interior, to be the officer to whom payments by the Minister of Finance are to be made under the agreements of yesterday's date entered into between myself as Minister of the Interior, and yourself, as Commissioner of Agriculture, on behalf of the province of Saskatchewan in respect of the purchase, sale and distribution of seed grain.

Yours very truly,
(Sgd.) FRANK OLIVER,
Minister of the Interior.

Hon. W. R. MOTHERWELL,
Commissioner of Agriculture,
for the Province of Saskatchewan.

MINISTER OF THE INTERIOR.
CANADA.

OTTAWA, February 8, 1908.

DEAR SIR,—I am in receipt of your favour of even date intimating that you have designated and appointed Charles H. Beddoe, Accountant of the Department of the Interior, to receive payments from the Minister of Finance of the money to be advanced by the government of Canada by way of loan to the province of Alberta, and to disburse the same in connection with the purchase, sale and distribution of seed grain.

I hereby, pursuant to the arrangement referred to in your letter, approve of the appointment of Mr. Beddoe to receive and make the disbursements contemplated in the said agreement.

Yours very truly,
(Sgd.) GEO. HARCOURT,
Deputy Minister of Agriculture for Alberta.

Hon. FRANK OLIVER,
Minister of the Interior.

MINISTER OF THE INTERIOR,
CANADA.

OTTAWA, February 8, 1908.

DEAR SIR,—I am in receipt of your favour of even date intimating that you have designated and appointed Charles H. Beddoe, Accountant of the Department of the Interior, to receive payments from the Minister of Finance of the money to be advanced by the government of Canada by way of loan to the province of Saskatchewan, and to disburse the same in connection with the purchase, sale and distribution of seed grain.

I hereby, pursuant to the arrangement referred to in your letter, approve of the appointment of Mr. Beddoe to receive and make the disbursements contemplated in the said agreement.

Yours faithfully,
(Sgd.) W. R. MOTHERWELL,
Commissioner of Agriculture.

Hon. FRANK OLIVER,
Minister of the Interior,
Ottawa.

SESSIONAL PAPER No. 25c

AN ACT RESPECTING SEED GRAIN.

1908—Chapter 21.

(Assented to February 21, 1908.)

Whereas the Lieutenant Governor in Council has had under consideration the recommendation and report of the Honourable the Minister of Agriculture, which report bears date the sixth day of February, A.D. 1908, and sets forth that a serious situation exists in the province of Alberta regarding the supply of good seed suitable for next season; that the condition is due to the weather conditions of last year, the crops not having ripened before the frost; that in many sections of the province the grain on hand is totally unfit for seed; that this is especially true of oats and barley and that prompt attention is necessary to avert possible disaster to the province and Dominion;

And whereas the said report of the Honourable the Minister of Agriculture further sets forth that the farmers individually cannot successfully cope with the situation, and owing to the money stringency the province cannot depend on the Canadian banks furnishing requisite funds, and there is no time for an immediate foreign loan, the credit of the province not yet being established;

And whereas the said report of the Honourable the Minister of Agriculture states that the estimated amount of seed needed is one hundred thousand (100,000) bushels of wheat, one hundred thousand (100,000) bushels of barley, and four hundred and fifty thousand (450,000) bushels of oats;

And whereas the said report of the Honourable the Minister of Agriculture recommends that for the purpose of obtaining funds for the purchase of seed grain for the settlers, the provincial treasurer be authorized to receive from the government of Canada, by way of a loan on the credit of the province, the sum of four hundred and forty thousand ($440,000) dollars, or such part thereof as may be required for the purpose stated, and that the province agree to pay the government of Canada any sum so advanced, together with five per centum per annum interest thereon, on or before the thirty-first day of March, 1909, and that if any part of the said sum and interest shall remain unpaid on the said date, the same shall thereupon become a charge upon any subsidy allowance, grant, or money which for any purpose whatsoever may at any time hereafter become payable by the government of Canada to the government of the province of Alberta;

And whereas the said report of the Honourable the Minister of Agriculture further recommends that the government of Canada may appropriate such portion or portions of any such subsidy allowance, grant, or money as it may deem necessary or advisable towards the repayment of such sum and interest, and that the government of the province engages to recommend to the legislature of the province, at the earliest opportunity, the enactment of a law approving and confirming this order in council;

And whereas it is expedient that the action of the Lieutenant Governor in Council in this regard be ratified by an Act of this province;

Now, therefore, His Majesty, by and with the advice and consent of the Legislative Assembly of the province of Alberta, enacts as follows:

1. It is hereby declared that the Lieutenant Governor in Council shall be deemed to have had power by law to provide by order in council as in the hereinbefore recited order in council provided, and the said order in council is hereby approved, ratified and confirmed.

2. The Lieutenant Governor in Council shall have power and shall be deemed to have had power by order in council to provide for the purchase, sale and distribution among such of the farmers and settlers in the province being owners or occupants of patented land or of land for which the issue of patent has been recommended as apply for the same of the seed grain so purchased in such quantities and upon such terms as to the taking of security for the repayment to the government of the cost

of the seed grain so supplied by way of mortgage upon growing crops or otherwise as shall appear necessary or proper.

3. The amount agreed to be paid by any applicant for seed grain in consideration of the advance to him by the government of such seed grain, together with interest thereon at the rate of five per centum per annum until paid, shall be a charge upon any property, real or personal, of the applicant, whether in the province or elsewhere, having priority over over all other liens, charges and encumbrances thereon, and being capable of enforcement by seizure and sale of such property upon default in payment of the said amount under a warrant signed by the minister, or by any person authorized by the minister to execute such warrant wherever the said property may be found.

4. The amount agreed to be paid by any applicant for seed grain, together with interest as aforesaid, shall be a tax upon such applicant and upon the land for the cultivation of which seed grain has been furnished, and in addition to any other remedies herein contained or otherwise available for the collection of the same, the following provisions in relation thereto shall have effect:

(*a*) The minister may cause to be furnished to the tax commissioner under The Local Improvement Act, a list of persons to whom seed grain has been supplied, together with the addresses of such persons as given in their application for seed grain, a description of the land in respect of which seed grain has been so supplied, and a statement of the amount agreed to be paid by each of the said persons therefor;

(*b*) Upon the receipt of such list the said tax commissioner shall forthwith send by prepaid post to the persons appearing upon such list at the addresses given therein a notice in form A of the schedule to this Act and thereupon the person to whom such notice is addressed and the land in the said notice mentioned shall be taken to be assessed for the amount mentioned in the notice for taxes due to the province, and such taxes shall be payable on or before the 1st day of March, 1909;

(*c*) In default of the payment of the taxes so due, the said tax commissioner may, by himself or his agent, levy the same with costs by distress upon the goods or chattels of the person who ought to pay the same, or on any goods or chattels in his possession wherever the same may be found, or on any goods or chattels found on the land, the property of or in the possession of any other occupant thereof, and may impound the same on the premises where distrained, and no claim of property, lien or privilege shall be available to prevent the sale or the payment of the taxes and costs out of the proceeds of the sale thereof;

(*d*) Any taxes or arrears of taxes due hereunder may be recovered as a debt by suit in the name of the tax commissioner, and in any such suit proof of the sending of the notice in subclause (*b*) hereof mentioned shall be *prima facie* evidence of the debt;

(*e*) The tax commissioner upon recovering any sum of money for taxes due hereunder shall forthwith forward the same to the Provincial Treasurer.

5. No claim of exemption or privilege whether statutory or otherwise shall be available in any proceedings taken under this Act.

6. Upon notification being received by any person or company from the department that any person is indebted to or has agreed to pay the government the cost of any seed grain supplied to him for his benefit the person or company so notified shall retain out of any moneys that may at any time after the receipt by him of the notice be or become payable to the person to whom, or for his benefit as therein stated seed grain has been so supplied, the amount in the said notice mentioned as the cost of the seed grain so supplied, or such portion thereof as shall be payable by the person or company receiving the notice to the other, and shall forward the same to the department, and the minister shall thereupon cause a new notice to be sent to the person or company remitting such sum, stating the balance, if any, still due to the government in respect of the seed grain so supplied, and if there be no balance due so stating, and the amount, if any, mentioned in such new notice shall be so retained and remitted as herein provided.

(2) Any person or company omitting to so retain and transmit to the department any such amount as is in this section mentioned shall be liable to pay to the government the amount, if any, which, after the receipt by him of the notice or new notice, he has paid to or on account of the person mentioned in the notice or new notice as the person to whom seed grain has been so supplied, and such amount may be recovered by suit in the name of the minister.

7. The secretaries of small local improvement districts, and the persons occupying the positions of postmaster in large local improvement districts, Dominion land agents, sub-land agents, homestead inspectors and members of the Royal Northwest Mounted Police, shall have the power to administer oaths and to take statutory declarations in connection with applications for seed grain; and all railway station agents shall have power to administer oaths and to take statutory declarations in connection with the securities by way of chattel mortgage or otherwise that may be taken for the cost thereof.

8. The Lieutenant Governor in Council may make such regulations and prescribe such forms, not being inconsistent with this Act, as shall be found necessary or convenient for the proper administration thereof.

9. In this Act, unless the context otherwise requires—

1. 'Department' means Department of Agriculture;

2. 'Government' or 'Government of the Province' means His Majesty in the right of the province of Alberta;

3. 'Land' means lands, tenements and hereditaments, and any estate or interest therein;

4. 'Minister' means the Minister of Agriculture.

SCHEDULE.

Form A.—Notice of Taxes for Seed Grain.

Take notice that you have been assessed in respect of the land herein mentioned the sum of dollars and cents (*amount in figures*) for seed grain supplied to you by the government of Alberta.

And further take notice that the said amount is payable by you to the government of Alberta on or before the first day of March, 1909, and that in default of payment on or before the said date the said amount may be realized by seizure, distress or suit, as provided for in *An Act respecting Seed Grain*, being chapter of the statutes of Alberta, 1908.

The said amount may be paid to the Provincial Treasurer of Alberta, to the Minister of Agriculture thereof, to any one duly authorized by the said minister to receive the same or to the undersigned.

The land in respect of which you are assessed as hereinbefore mentioned is quarter section , township range , west of meridian.

Dated at the day of 1908.

(Signature of tax commissioner under The Local Improvement Act.)

AN ACT RESPECTING SEED GRAIN.

CHAPTER 8.

(Assented to June 12, 1908.)

His Majesty, by and with the advice and consent of the Legislative Assembly of Saskatchewan, enacts as follows:—

1. The Lieutenant Governor in Council shall have power and shall be deemed to have had power by order in council to provide for the purchase, sale and distribution

during the year 1908 among such farmers and settlers in the province as apply for the same of seed grain in such quantities and upon such terms as to the taking of such security for the repayment of the cost of seed grain so supplied as shall appear necessary or proper, provided that the cost of said grain so advanced to any one applicant shall not exceed $250.

2. The Lieutenant Governor in Council shall have power and shall be deemed to have had power to receive from the government of Canada by way of loan on the credit of the province the sum of $1,825,000 or such part thereof as may be required for the purposes stated and to agree to pay the government of Canada any sum so received together with five per centum per annum interest thereon on or before the thirty-first day of March, 1909, and to agree that if any part of the said sum and interest shall remain unpaid on the said date the same shall thereupon become a charge upon any subsidy, allowance, grant or money which for any purpose whatsoever may at any time hereafter become payable by the government of Canada to the province.

3. Any agreement or order in council heretofore made for any of the purposes aforesaid is hereby approved, ratified and confirmed.

4. The amount agreed to be paid by any applicant for seed grain in consideration of the advance to him by the government of such seed grain together with interest thereon at the rate of five per centum per annum until paid shall be a debt due by the applicant to His Majesty and shall be a charge upon any real property of the applicant whether in the province or elsewhere and upon any crop of any kind hereafter grown on any land by the applicant having priority over all other liens, charges or encumbrances thereon whenever created and in addition to any other remedy which His Majesty may have to enforce payment of the said amount; such charge shall be capable of enforcement to seizure and sale of the said real property or crop when growing or when cut under warrant signed by the commissioner of agriculture by any person authorized by him to execute such warrant whenever any of the said property may be found and in respect thereof His Majesty shall have and be entitled to all the remedies of a mortgagee in the same manner as if the said amount were secured by a registered charge against the said land or a chattel mortgage against the said crop and in priority to all taxes, liens, charges and encumbrances thereon.

5. The commissioner of agriculture shall as soon as conveniently may be send to the registrar of land titles for each land registration district a statement showing in alphabetical order the name of each applicant for seed grain as aforesaid and showing the land for the cultivation of which seed grain has been furnished, the amount agreed to be paid by each applicant for seed grain as aforesaid and the date from which interest is payable and if the said land was on such date owned by the applicant or if the said land is shown in the records of the land titles office by caveat or otherwise to be held under an agreement for sale in favour of the applicant, the registrar shall upon receipt of such statement enter in the register against such land and shall indorse the same upon any duplicate certificate of title thereafter issued therefor a memorandum as follows: 'This land is subject to a seed grain lien in favour of His Majesty as represented by the commissioner of agriculture for the province of Saskatchewan for the sum of dollars and interest thereon at five per centum per annum from the day of 1908'; and in respect of any other land in his land registration district the registrar shall treat each item in the statement as if it were a writ of execution against the lands of the applicant for seed grain as aforesaid for the amount shown thereby to be owing by the applicant, and may use the form herein provided in making the memorandum required to be made by section 129 of *The Land Titles Act.*

(2) Instead of entering a memorandum in the execution docket the registrar may use a separate docket to be known as the 'Seed Grain Docket.'

(3) The commissioner of agriculture shall also cause the said statement to be published in the Saskatchewan *Gazette.*

6. Any registrar of land titles shall, on receiving a letter signed by the commissioner of agriculture directing him so to do, enter a memorandum in the execution docket or in the seed grain docket as the case may be and upon the certificate or certificates of title in the register to the land of the person mentioned in such letter to the effect that such land and all lands of the applicant as aforesaid are released from the said lien, and thereafter such land shall be absolutely released and discharged from the said lien and from any claim under this Act.

7. Notwithstanding anything contained in *The Bills of Sale Ordinance* or in any other Act or law, every document purporting to be a chattel mortgage heretofore or hereafter given or made to or in favour of His Majesty to secure an advance of seed grain shall be capable of registration free of charge under *The Bills of Sale Ordinance* and shall be valid and effective according to the true intent and meaning thereof, and no irregularity, informality or insufficiency therein or in any affidavit made in connection therewith or the failure to make any such affidavit or the failure to file and register the said document or to file or register the same within the time limited by law for that purpose shall render the same invalid; but every such document shall bind the crop therein mentioned as fully and effectually to all intents and purposes as if all the provisions of *The Bills of Sale Ordinance* and of any other Act or law had been strictly complied with and shall have priority over any other mortgage or lien whenever given upon the security of the same crop or any writ of execution against the mortgagor.

8. To remove doubts it is hereby declared that the Lieutenant Governor in Council had power to make the order in council bearing date the tenth day of February, 1908, empowering such persons in the province as may hold the office of secretary treasurer of a local improvement district or municipality, Dominion land agent, sub-land agent, homestead inspector, immigration agent or member of the Royal Northwest Mounted Police to administer oaths and take and receive affidavits, declarations and affirmations within the province.

CERTIFIED COPY OF A REPORT OF THE COMMITTEE OF THE PRIVY COUNCIL, APPROVED BY HIS EXCELLENCY THE GOVERNOR GENERAL ON THE 17TH MARCH, 1908.

The Honourable the Minister of the Interior.

The Committee of the Privy Council have had under consideration a report, dated March 14, 1908, from the Minister of the Interior, stating that under clause 15 of the regulations, approved by order in council of the 6th February, 1908, respecting the purchase, sale, and distribution of grain to homestead settlers in the provinces of Alberta and Saskatchewan, it is provided that no seed grain shall be supplied to homestead settlers who had sown no crop in the season of 1907. According to the reports received from the officers of the Department of the Interior who have been at work in the west in connection with the distribution, it would appear that the number of applications that are being received for advances of seed grain under the provisions of the regulations is not as large as had been anticipated, and that in consequence the appropriation lately made by parliament to cover this expenditure is likely to be in excess of the requirements.

The minister recommends, inasmuch as numerous applications have been received from farmers in the provinces of Alberta and Saskatchewan who, although they had sown no crop in 1907, are urgently in need of seed grain during the coming season, and as the machinery for the purchase, distribution and taking of security for advances of seed grain now in operation is well fitted and sufficient to deal with such applications, and as the seed grain needed as above stated is not available in the provinces mentioned, and therefore cannot well be secured by the individual action of

those who require it, that clause 15 of the regulations approved by order in council of February 6, 1908, be amended so as to permit of advances to be made to settlers who had sown no crop in the season of 1907, under the same terms and conditions as set forth in such regulations.

The committee submit the same for approval.

(Sgd.) RODOLPHE BOUDREAU,
Clerk of the Privy Council.

MEMORANDUM OF CONFERENCE OF REPRESENTATIVES OF THE DOMINION, SASKATCHEWAN AND ALBERTA GOVERNMENTS.

Dominion government represented by—
W. W. Cory, Esq., Deputy Minister of the Interior.
C. C. Castle, Esq., Purchasing Agent.
R. E. A. Leech, Esq., Inspector Dominion Land Agencies.
Saskatchewan government—
W. R. Motherwell, Esq., Minister of Agriculture.
Alberta government—
George Harcourt, Esq., Deputy Minister of Agriculture.

Regarding the matter of net shortages in out-turn of cars at distributing points.

It is agreed, that actual shortages, which cannot be accounted for, shall be charged up to administration account. The distributing agent shall charge up all shortages to the purchasing agent, giving detailed statement as to out-turns, as verified by statutory declaration by the railway agents and homestead inspectors.

Re the disposal of surplus seed wheat at local points in Saskatchewan and Alberta.

The distributing agent is authorized to send out the following circular to mill owners, and others, asking for quotations, and is authorized to dispose of same. The grain above mentioned will be delivered f.o.b. cars at point of delivery. No quotations will be considered for prices quoted less than track prices at point of delivery; separate quotations must be given for sacks in addition to the price quoted for grain.

Circular 'A.'

'A quantity of seed wheat is left over on the line of railway after all applications are filled. We are now offering this for sale, which is made up approximately as follows:—

No. 1 H.
No. 1 Nr.
No. 2 Nr.
No. 3 Nr.
No. 4 Wheat.

This grain will be delivered to the purchaser's station on this line, freight free. If you desire to secure this, or any part of it, we would be pleased to have quotations separately for each grade, and also quoting price for sacks. The quantities, as given above, are approximate, and the actual amounts may be more or less. No quotations less than track price, your point, will be considered. Separate quotation must be given for sacks, in addition to the price quoted for grain.'

Re disposal of surplus seed wheat, in hands of the purchasing agent, purchased but not distributed for seed.

That the purchasing agent be authorized to dispose of surplus of wheat now in Winnipeg, Calgary, and Edmonton to the best market advantage, delivery of same to be made and sales to be completed not later than July delivery; the purchasing

agent in no case being authorized to sell all or any portion of such purchase at less than the current market price of the grain at date of sale.

In the case of the wheat now at Calgary and Edmonton, the purchasing agent is authorized to dispose of same to local mills, providing he can dispose of same for better price than by shipping the wheat to Fort William for sale there.

Re the disposal of surplus seed oats at local points in Saskatchewan and Alberta.

The distributing agent shall arrange to gather up all surplus seed oats at local railway stations; that in Saskatchewan to be gathered and loaded into car lots and shipped to the order of C. C. Castle, Fort William; that in Alberta to be gathered and loaded in the same way, but to be shipped to the order of C. C. Castle at Edmonton and Calgary, invoicing the same to Mr. Castle according to grades; English, Canadian and Prince Edward Island oats to be kept separate. Prince Edward Island oats to be billed to the order of C. C. Castle, Fort William, stop off at Winnipeg for orders.

That the purchasing agent be authorized to sell the surplus seed oats at Edmonton and Calgary locally in the province of Alberta, at not less than market price, or a premium over the market price; bags extra. If unable to do so, to ship same to Fort William for sale to best market advantage, at or above market prices at Fort William or Port Arthur. The purchasing agent to use his discretion in disposing of these oats at such times, and in such quantities, as it may be most advantageous, so as to realize the highest market price possible. In the event of the oats being shipped to Fort William or Port Arthur the grain to be unloaded into the grain elevators there and the sacks turned over to the inspector for the account of the seed grain purchasing agent. The sacks, subsequently, to be sold to the best market advantage.

Re the disposal of surplus seed barley at local points in Saskatchewan and Alberta.

In the event of there being any surplus barley left, after applications have been filled, the same will be gathered up and shipped to the order of C. C. Castle, Fort William, to stop over at Winnipeg for instructions.

Re the disposition of grain sacks on hand after deliveries are completed.

The purchasing agent is authorized to make sale of the same to the best advantage, using his own discretion as to time and place for making sales.

Re thirteen cars of oats and two cars of wheat, purchased by the Alberta Government from Mr. Castle, Purchasing Agent.

It is agreed that this grain shall be treated as having been handled under the ordinary distribution arrangements; that is, applications and mortgages shall be completed in proper form by the representative of the Alberta government, and transferred to R. E. A. Leech, distributing agent. The invoices which have been sent to Mr. Harcourt shall be transferred to Mr. Leech and Mr. Leech shall issue formal requisition upon Mr. Castle to cover the invoices. If, however, in connection with this transaction there have been extra freight charges, amounting to more than $1,000, the Alberta government shall pay such amount as is in excess of $1,000.

Re office furniture purchased for the Seed Grain Offices in Regina.

If the furniture has not already been paid for by Mr. C. H. Beddoe, from the seed grain appropriation, he shall arrange to make such payment. If the Dominion Department of Public Works has paid for the furniture Mr. Beddoe shall arrange

to reimburse the Department of Public Works, by paying for same out of the seed grain appropriation. When the offices are closed the distributing agent shall dispose of the same to the best advantage.

In connection with the furniture in the Winnipeg offices, Mr. Castle shall dispose of this to the best advantage.

Dated at Regina, May 18, 1908.

W. W. CORY,
GEO. HARCOURT,
W. R. MOTHERWELL.

PRELIMINARY REPORT OF THE PURCHASING AGENT.

WINNIPEG, MAN., June 26, 1908.

The Hon. FRANK OLIVER, M.P.,
Minister of the Interior,
Ottawa, Ont.

SIR,—Acting under the instructions of the Right Honourable the Minister of Trade and Commerce as contained in the following telegram:—

Ottawa, Ont., January 15, 1908, to C. C. Castle, Winnipeg, Man. 'Arrange to accompany Mr. Motherwell to Ottawa in connection with the seed grain relief problem,' signed F. C. T. O'Hara, Acting Deputy Minister.

I proceeded to Ottawa with the Honourable W. R. Motherwell and the Honourable J. A. Calder, Commissioner of Agriculture and Finance Minister, respectively, of the province of Saskatchewan. Upon arrival at Ottawa I reported to the minister, who instructed me to place my services at the disposal of the Minister of the Interior and the representatives of the provinces of Saskatchewan and Alberta, then assembled at Ottawa, in connection with the seed grain advance problem.

Daily conferences were held in regard to this matter between the federal and provincial authorities (at which I was present under instructions) resulting in an agreement being reached between the governments concerned, under which I was appointed as grain purchasing agent.

In pursuance of the duties assigned to me under the aforesaid agreement, I received instructions from the Right Honourable the Minister of Trade and Commerce to act under the instructions of the Honourable the Minister of the Interior in the matter of purchasing seed grain, as per attached copy, file No. 10347, Department of Trade and Commerce, Ottawa, Canada.

C. C. CASTLE, Esq.,
Warehouse Commissioner,
Winnipeg, Man.

Re Seed Grain Relief.

SIR,—I am directed by the Right Honourable the Minister of Trade and Commerce to instruct you to act under instructions of the Right Honourable the Minister of the Interior in the matter of purchasing seed grain. I have also to state that Mr. Horn is being communicated with to act with you in the matter of inspecting this seed grain.

I have the honour to be, sir, your obedient servant,
(Sgd.) F. C. T. O'HARA,
Acting Deputy Minister.

Official notification of my appointment as Seed Grain Purchasing Agent was conveyed to me by letter signed jointly by the Minister of the Interior and the representatives of the Saskatchewan and Alberta governments, as follows:—

SESSIONAL PAPER No. 25c

INTERIOR DEPARTMENT,
OTTAWA, CANADA, January 31, 1908.

CHARLES C. CASTLE, Esq.,
Warehouse Commissioner,
Winnipeg, Man.

SIR,—In consequence of an arrangement having been entered into between the Dominion government and the governments of the provinces of Saskatchewan and Alberta, whereby certain quantities of wheat, oats and barley shall be purchased by the government and supplied to certain farmers in these provinces who have no seed fit to sow this season and are without the necessary means to procure same, you have been appointed by the government to make purchases of grain for this purpose.

In the purchase of said grain the following conditions are to be observed:—

The wheat shall be bought through the ordinary channels of the grain trade at current prices from day to day, subject to official grade and weight by the proper officers of the grain inspection and weighing branches of the Department of Trade and Commerce; that grades 1 and 2 Northern only shall be purchased if sufficient of these grades can be procured, but if not, No. 3 Northern may be purchased from receiving elevators or in transit at Winnipeg, but not in terminal elevators; that grade No. 4 wheat may, if necessary, be purchased wherever it can be procured, having due regard to its suitability for seed purposes, its grading and cleanliness, but should be purchased only in the event of there not being sufficient of the other grades procurable.

That oats shall be purchased by you through the ordinary channels of the grain trade at western receiving elevators, at Winnipeg in transit to Fort William, or at Fort William; and shall be of grades Nos. 1, 2 and 3 White Oats as inspected and weighed by the Dominion grain inspection and weighing officials; provided, however, should such purchases be made subject to the test as to vitality a fixed advance on the market price from day to day may be arranged for by you at your discretion.

It is agreed that all purchases of grain in Canada shall be made by you, and that purchases outside of Canada shall be made by you as may be practicable under advice of G. H. Clark, Seed Commissioner, Department of Agriculture.

All points dealing with the matter of purchase and transportation of seed grain not herein provided for shall be at your discretion, assisted in all matters of inspection and cleaning by David Horn and G. H. Clark, and further assisted by way of consultation wherever practicable by the heads of the Department of Agriculture of the provinces of Saskatchewan and Alberta.

The barley required to be purchased may be bought in eastern Canada, Fort William or the West in your discretion and shall be of the grades Nos. 2, 3 extra and 3.

That where practicable grain may be purchased in car lots direct from farmers in Manitoba, Saskatchewan and Alberta at current prices from day to day, subject to official grade and weight.

You are hereby authorized to at once purchase 800,000 bushels of wheat in accordance with the above instructions, 1,500,000 bushels of oats and 300,000 bushels of barley.

That every precaution shall be taken to have all seed purchased free from smut, noxious weeds and other varieties of grains, and with this object in view all such grain shall, if found necessary, be recleaned as thoroughly as possible at such warehouse cleaning plants as can be secured for this purpose.

That cleaning and recleaning shall be done under the responsibility and supervision of David Horn, Chief Grain Inspector, Department of Trade and Commerce, and that officers shall be appointed by the Ministers of Agriculture for the provinces of Alberta and Saskatchewan to render all possible assistance to the chief inspector, and such officers shall consult with him upon all matters relating to the recleaning of grain.

That the seed testing branch of the Dominion Department of Agriculture shall make such provision for the testing of all seed grain purchased in the West or elsewhere as may be found necessary and practicable.

That all grain shall be sacked after recleaning according to its grade by inspection on receipt into store and that each sack shall be distinctly marked with the kind and grade of the grain contained therein, and that all sacks shall be sewn, not tied.

That all grain purchased by yourself shall be cleaned and stored according to its inspected grade in a cleaning elevator at such point or points as you may determine at such rate or rates for storage, insurance, &c., as you may agree to with the owner or owners of such cleaning elevator, and that such stored grain shall be held subject to your order for shipment in sacks after recleaning; provided, however, that the Minister of the Interior shall appoint an officer to receive delivery ex elevator of such sacked grain into cars, whose notification in writing to you shall be your authority to deliver such grain.

You are hereby authorized to purchase whatever number of sacks may be necessary for the sacking of all grain purchased by the government in connection with the scheme of seed grain relief; for settlement of freight, weighing, insurance, inspection and other charges and all other transactions in regard to grain until you shall have made delivery of same as above provided.

You shall before any seed is distributed furnish the person in charge of the Central Distributing Office with a statement of the estimated average cost of each class and grade of all grain to be advanced, and such average cost shall include the price paid for grain, cost of cleaning, storage, commission, premium, insurance, sacking, freight, and all other lawful charges; and in estimating such cost you shall take into account the shrinkage or loss arising from cleaning or otherwise and the proceeds of all screenings or cleanings which you are hereby authorized to dispose of to the best advantage. In the case of oats imported from Europe and barley from Eastern Canada the actual cost thereof, including price paid, cost of sacking, freight, &c., shall be charged, but exclusive of the cost of administration.

That matters relating to the purchase and transportation of seed grain not herein provided for shall be at your discretion, assisted in all matters of inspection and cleaning by David Horn, and in the matter of testing for vitality by G. H. Clark, and further assisted by way of consultation wherever practicable by the heads of the Department of Agriculture of the provinces of Saskatchewan and Alberta or officers appointed by them for the purpose.

On receipt of order from chief distributing officer to ship to point of distribution you will load and consign as therein directed and will forward to such officer a statement showing the number of bags, grade and kind of grain loaded into each car, with the initial letter, car number and date of loading ex elevator and destination. On such car being unloaded the chief distributing officer shall take a receipt from the person responsible for the unloading, showing the initial letter, car number, bags, grade, and kind of grain, also stating condition, and shall cause a copy to be forwarded to you.

Cancellation of insurance in grain to be made at your discretion as soon as the loaded cars are lifted by the railway company from the elevator siding.

All sacked grain to be shipped in car lots except under special instructions in writing from the officer above referred to.

As it has been arranged that all grain shall be recleaned if necessary before being sacked and distributed to farmers, the cleanings are to be sold by you to the best market advantage, and proper account of same entered in your records with the price received therefor, &c.

All money received from such sales shall be deposited at the bank to the special seed grain account.

There will, of course, be a shrinkage or loss in recleaning the grain which will be absolutely lost, such as weed seeds, straw chaff, dust, &c., and in the preparation of your balance sheets the actual waste which has been cleaned out and sold must be

shown and any shrinkage or loss in weight as above referred to actually ascertained must also be correctly shown.

In any event of its being deemed desirable to receive any grain at outside points such as Regina, Calgary, Moosejaw and elsewhere, you are authorized to make the necessary arrangements for the receiving, handling and recleaning of whatever grain may be necessary at a receiving elevator at any such point, and fix a price to be paid the owner of such building for the work of handling, receiving, cleaning, recleaning, storing, sacking, sewing, branding, weighing and delivering such grain into cars, which arrangement is also applicable at Winnipeg or St. Boniface.

The following trades already reported by you as having been made on the 29th of January are hereby approved:—

5,000	May option	$1 13½
15,000	"	1 13⅝
30,000	"	1 13
50,000	"	1 13
25,000	February option	1 09

You are no doubt aware I have made arrangements with Mr. Wm. Whyte, second vice-president of the Canadian Pacific Railway, and also with the other railway companies' head offices for special rate on this seed grain. Nothing, however, has yet been definitely fixed, but you will be able to complete arrangements on your return to Winnipeg.

Yours very truly,
(Sgd.) FRANK OLIVER,
Minister of the Interior.

Approved, J. A. Calder, Sask.
Geo. Harcourt, Alberta.

The further additional instructions were received from the Honourable the Minister of the Interior under dates the 1st and 4th February, as follows:—

OTTAWA, February 1, 1908.

Mr. C. C. CASTLE.

As payments to be made in connection with the purchase of grain will have to be made at the time of purchase, it will be necessary for you to consult the Department of Finance as to the best method of arranging the matter. All payments relating to the administration will be made by cheques issued at Ottawa, after estimates have been made and recommended for payment.

It is understood that you have authority to rent a suitable office temporarily and to secure the services of an expert grain accountant and also any clerical assistance which may be required to conduct the business connected with the purchase, cleaning, sacking, etc., of the grain, and you are authorized to rent for the time being furniture requisite for yourself and staff. If you should find it necessary to have a telephone you are at liberty to have one placed in your office, and in regard to the proposed purchase of a wide carriage tabulating typewriter, I think it would be better to rent one, especially in view of the fact that it will be required only for a few months.

If either Mr. Gelley of the Immigration Agency at Winnipeg, or Mr. Stephenson, of the Dominion Lands Office, have a stenographer and typewriter competent to do the work you require, it would be well to arrange with them if possible for the temporary assistance you will need.'

(Sgd.) FRANK OLIVER,
Minister of the Interior.

And under date February 10, 1908, the Honourable the Minister of the Interior wrote inclosing me a copy of an order of His Excellency the Governor General in

Council approving of the regulations respecting the purchase, sale and distribution of seed grain, the duties of the purchasing agent being prescribed in the first fourteen clauses thereof. I therefore attach hereto copy of said clauses:—

AT THE GOVERNMENT HOUSE AT OTTAWA.

THURSDAY, 6th day of February, 1908.

PRESENT:—His Excellency the Governor General in Council.

His Excellency the Governor General in Council is pleased to approve, and doth hereby approve, of the following regulations respecting the purchase, sale and distribution of seed grain to homestead settlers in the provinces of Alberta and Saskatchewan which have been made by the Minister of the Interior in pursuance of the order in council of January 30, 1908, respecting the distribution of seed grain to settlers.

Regulations respecting the purchase, sale and distribution of seed grain to homestead settlers in the provinces of Alberta and Saskatchewan:—

1. All purchases of grain in Canada shall be made by the warehouse commissioner of the Department of Trade and Commerce, C. C. Castle, hereinafter called 'the purchasing agent,' and all purchases outside of Canada shall be made by the purchasing agent under the advice, when it is practicable to obtain the same, of the seed commissioner of the Department of Agriculture, G. H. Clark.

2. Wheat shall be bought through the ordinary channels of the grain trade at current prices, from day to day at western receiving elevators, at Winnipeg, in transit to Fort William or elsewhere, subject to official grade and weight by proper officers of the grain inspection and weighing branch of the Department of Trade and Commerce. Grades 1 and 2 Northern only shall be purchased if sufficient of these grades can be procured, but, if not, No. 3 Northern may be purchased from receiving elevators or in transit at Winnipeg, but not in terminal elevators. Grade No. 4 wheat may, if necessary, be purchased wherever it can be purchased, having due regard to its suitability for seed purposes, its grading and cleanliness, but should only be purchased in the event of there not being sufficient of the other grades procurable.

3. Oats shall be purchased through the ordinary channels of the grain trade at western receiving elevators, at Winnipeg, in transit to Fort William, at Fort William or elsewhere including eastern Canada, and shall be of grades Nos. 1, 2 and 3 White oats, as inspected and weighed by the Dominion grain inspection and weighing officials, provided, however, should such purchases be made subject to a test as to vitality, a fixed advance on the market price from day to day be arranged for by the purchasing agent at his discretion.

4. Barley shall be purchased as in the case of oats and wheat, and may also be purchased in eastern Canada, and shall be of grades Nos. 2, extra and 3.

5. Where practicable grain may be purchased in car lots direct from farmers in Manitoba, Saskatchewan and Alberta at current prices from day to day, subject to official grade and weight.

6. All possible precaution shall be taken to have all seed purchased free from smut, noxious weed seeds and other varieties of grain, and with this object in view all such grain shall, if found necessary, be recleaned as thoroughly as possible at such warehouse cleaning plant as can be secured for this purpose.

7. Inspection, cleaning and recleaning shall be done under the direction of the purchasing agent by the grain inspector of the Department of Trade and Commerce, David Horn, assisted by such officers as may be appointed for the purpose by the governments of the provinces of Alberta and Saskatchewan respectively.

8. The seed testing branch of the Dominion Department of Agriculture, under the direction of the seed commissioner, assisted by such officers as may be appointed for the purpose by the governments of the provinces of Alberta and Saskatchewan respectively, shall make tests for the purpose of ascertaining the vitality of all seed

grain purchased in the west or elsewhere, whenever the same may in the judgment of the seed commissioner be necessary and practicable.

9. All grain shall be sacked after recleaning according to its grade by inspection on receipt into store, and each sack shall be distinctly marked with the kind and grade of the grain contained therein, and all such sacks shall be sewn.

10. All grain purchased by the purchasing agent shall, if necessary, be cleaned, and if stored shall be stored according to its inspected grade in a cleaning elevator at such point or points as he may determine, at such rate or rates for storage, insurance, &c., as the purchasing agent may agree with the owner or owners of such cleaning elevator; and all grain shall be shipped for delivery by the purchasing agent on the order of the officer in charge of the central distributing office at Regina hereinafter mentioned.

11. The purchasing agent shall purchase and provide the necessary sacks; arrange freight charges subject to any agreement as to freight rates made by the minister with the railway companies; certify to weighing and inspection charges, and make all other necessary arrangements for shipment and delivery of the grain as provided in the next preceding clause of these regulations.

12. A homestead settler or homesteader in these regulations shall mean a person occupying under a homestead entry, and who has not received a recommendation for a patent. The price charged for seed grain to homestead settlers shall be the estimated average cost thereof at the point of delivery, such cost to include storage, commission, premium, insurance, sacking, freight and all other proper charges, but not the cost of administration necessary in connection with the matters herein provided for, and in the case of oats imported and oats and barley brought from Eastern Canada said settlers shall be charged the actual cost thereof including price paid, cost of sacking, freight, cost of cleaning, storage, commission, insurance, and all other proper charges exclusive of the said cost of administration.

13. The purchasing agent shall, before any seed is distributed, furnish the officer in charge of the central distribution office at Regina with a statement of the estimated average cost or actual cost as provided in the next preceding clause of each class and grade of grain to be supplied, and such average cost shall include the price paid for grain, the cost of cleaning, storage, commission, premium, insurance, sacking, freight and all other proper charges, and in arriving at such average and actual cost, respectively, the purchasing agent shall take into account the shrinkage or loss arising from cleaning or otherwise, and the proceeds of all screenings or cleanings which he is hereby authorized to dispose of to the best advantage.

14. All matters relating to the purchase and transportation of seed grain not herein provided shall be in the discretion of the purchasing agent.

I arrived here from Ottawa on February 5, and at once secured an office adjacent to the Grain Exchange; and with the assistance of a grain expert formulated a system of books for the proper keeping of accounts, and later on engaged an office staff.

Advertisements were placed in all the leading newspapers in the Northwest stating I had been appointed purchasing agent, &c. Copies of these advertisements are hereto attached, marked exhibit 'A and B.'

While the forms of books, &c., were being printed I entered into negotiations with all elevator owners in Winnipeg and other points with a view to making arrangements with them to clean all seed grain purchased by the government.

Cleaning contracts were subsequently entered into with the following firms:—

1. C. P. R., Fort William.
2. Ogilvie Flour Mills Co., Winnipeg.
3. Anchor Elevator Co., Winnipeg.
4. Canada Malting Co., Winnipeg.
5. Crown Elevator Co., St. Boniface.
6. Western Canada Flour Mills Co., St. Boniface.
7. International Elevator Co., St. Boniface.

8. E. A. McKenzie & Co., Brandon.
9. Winnipeg Elevator Co., Regina.
10. D. McLean & Co. Moosejaw.
11. Calgary Malting Co., Calgary.
12. Brackman-Ker Milling Co., Calgary.
13. Western Milling Co., Calgary.
14. Brackman-Ker Milling Co., Strathcona.
15. Alberta Grain Co., Edmonton.

The rate for receiving, handling, cleaning, sacking and delivering cleaned sacked grain to cars was three cents per bushel; except in the case of the English oats, which were cleaned at Fort William by Canadian Pacific Railway, which they agreed to handle at 2¼ cents per bushel.

Under the letter of 31st of January above referred to I was instructed to purchase 800,000 bushels of wheat, 1,500,000 bushels oats and 300,000 bushels barley, and as all this quantity of grain had to be sacked before being distributed I therefore made contracts with two local and three eastern bag manufacturers for the necessary supply.

Particulars of sack contracts are given under exhibit 'C.'

Sack contracts were let on the 11th of February, and the first supplies were forwarded to cleaning elevators on the 17th of February.

Shortly after my return from Ottawa the press published a statement to the effect that the government intended purchasing for seed 1,300,000 bushels of wheat, 1,650,000 bushels of oats and 300,000 bushels of barley, on account of which, sellers materially stiffened their prices (farmers as well as dealers), and it very soon became apparent that I should have to pay May price at least in order to secure the amount of wheat required for seed in proper time. In the meantime I had been endeavouring to secure it at the current cash price, but without effect. I therefore entered into negotiations with the large elevator companies with a view to seeing if purchases of at least 400,000 bushels of contract wheat could not be supplied by them at current prices, but found that all their contract grades had been already sold for May delivery. They offered to purchase back stated quantities of their May sales, and sell such amounts to me, provided I paid the same price as they had to give on such repurchases. Eventually I agreed to this plan.

By this plan I did not require to personally go on the open market to purchase May wheat; the dealer had to do this under my instructions. For example, on the 13th of February I made contracts under above arrangement for 290,000 bushels of May wheat and started paying in the morning $1.11, every subsequent purchase being fractionally lower until $1.08¾ was reached, proving purchases were very judiciously made, as had it been known I was on the market, prices would have advanced probably several cents per bushel.

As it was deemed advisable to purchase all grain required for seed west of Winnipeg, if possible, arrangements were made with the railroad companies to stop off for twenty-four hours, all cars noted by inspectors as suitable for seed. Eventually all cars of the desired grade were stopped here, and the time of stop off increased from twenty-four to thirty-six hours.

Before taking delivery of any grain for seed purposes I arranged with Mr. E. D. Eddy, an officer of the Seed Commissioner's Department, and who was acting under instructions of Mr. G. H. Clark, Ottawa, to examine for purity official samples of all cars inspected at Winnipeg, and to mark his acceptance or rejection on same.

Up to the 17th of February Mr. Eddy had examined a large number of cars, but very few were accepted by him as suitable for seed, as at that time he refused to accept any grain that could not be cleaned to conform to the Seed Control Act, viz.: 1 noxious weed per lb.

On account of the large proportion of cars that were so refused the dealers above referred to who had sold their May wheat, stated they would be unable to fill their contracts (I had a clause in the contract giving me the privilege of rejecting any cars

rejected by the inspector as unsuitable for seed). One dealer during a few days had thirty-six cars of 1° and 2° rejected for seed purposes, and other dealers like proportions, which resulted in a deadlock. The dealers then refused to ship out any more grain under conditions that it would only be passed subject to the provisions of the Seed Control Act. About this time, however, the Honourable W. R. Motherwell, Commissioner of Agriculture, Regina, Saskatchewan, at my urgent request came to Winnipeg for a conference on this matter; as a result of which it was eventually agreed that the standard of inspection for wheat should allow not more than 10 wild oats or 10 purple cockle per pound; in addition samples that contained small weed seeds easily removable by cleaning were not to be rejected.

As regards the standard for oats: For a time the same impurities as in wheat were allowed—later this was raised to 15, and finally 25 wild oats per lb. had to be the maximum standard of impurities permitted, otherwise I question whether 75,000 bushels would have been obtained.

At my urgent request Mr. G. H. Clark came to Winnipeg, arriving here on Monday, February 24, and the day following the Hon. W. R. Motherwell arrived. A conference was held at which these two gentlemen and Mr. David Horn (Chief Grain Inspector) were present, which resulted in the following memorandum being drawn up for my guidance:—

WINNIPEG, February 25, 1908.

Memo. for CHAS. C. CASTLE,
Seed Grain Purchasing Agent,
Winnipeg.

It would appear from the character of the supplies of seed grain offered up to date that if quality and purity of the seed is to be given proper and due consideration, then the price paid therefor must be quite secondary, and further, if the seed grain that appears to be required is to be obtained in seasonable time the supplies from the interior must come forward more rapidly than at present; or it will be advisable to go to Fort William for a considerable portion of the wheat required.

In view of the foregoing, advice is given you as follows:—

Memo. of recommendation *re* procuring supplies of seed grain that may be acceptable to the farmers of the provinces of Saskatchewan and Alberta.

1. Make quality especially in respect to weed seeds the first consideration. The matter of price within reason for good clean seed grain should be of secondary consideration.

2. For seed grain, not the product of the western provinces and which has not now been accepted, adhere in the meantime to the provisions of the seed controller in respect to purity.

3. For wheat, the product of the western provinces allow not more than 10 noxious weed seeds per lb., then reclean. Pay sufficient extra premium for what will pass Seed Act.

4. For oats, the product of the western provinces, allow not more than 25 noxious weed seeds per pound, and then reclean. Pay small premium when they contain 10 wild oats or other noxious weed seeds per pound, and large and sufficient premium for oats that will pass Seed Act and is otherwise good seed.

5. Many portions of the province of Saskatchewan grow oats only for feed, and in view of the probable shortage of clean white oats, you are advised to purchase up to a quarter of a million of bushels of Prince Edward Island black oats for the province of Saskatchewan.

6. Procure, say, five cars of oats, out of several of the best bins at Fort William and have them sent to King's elevator to test result of his cleaning up to loss of 15 per cent.

7. Arrange, practicable and expedient, with the Canada Malting Company for the purchase of seed barley on commission, or otherwise, as may be in your best judgment, subject to the conditions in respect to wheat seeds as obtains for seed oats.

8. Snggest placing orders for Ontario and other eastern Canada oats and barley on commission basis with eastern Canada seedsmen, such as Steele-Briggs Seed Company. Allow sufficient commission to induce prompt and aggressive action and allow good premiums per bushel in advance over Toronto or other current market quotations for commercial grain—oats and barley cleaned for seed.

9. Restrict further British orders to named varieties and prevent as far as possible importations of potato oats. Pay good premium for right good seed for Britain.

10. It is recognized that by continuing to adhere to this relatively high standard of purity, all of the demands for seed grain may not be supplied, but it is thought expedient at this time, that especially in view of past charges on the part of farmers in general, against government importations of seed grain containing weed seeds to purchase only and all that it is possible to get for them of relatively clean seed wheat, oats and barley.

Acting in an advisory capacity, we hereby attach our signatures.

(Sgd.) GEO. H. CLARK.
(Sgd.) W. R. MOTHERWELL.
(Sgd.) DAVID HORN.

The provisions of second part of clause 4 were not acted upon, nor were those in clause 5, owing to it being evident that upwards of 500,000 bushels of excellent seed oats could be obtained in Great Britain without disturbing the market price there.

As regards clause 6, one car of 2 white oats was sent from Canadian Pacific Railway elevators at Fort William to King's for special treatment. This car contained 1 per cent of wild oats, but after repeated cleaning and a loss in weight of 20 per cent, it still contained a half of one per cent of wild oats, thus demonstrating that the Fort William oats with that percentage of wild oats were quite unfit for seed purposes, even after most severe recleaning.

As up to February 25 only 130 cars of wheat and 27 cars of oats had been accepted as suitable for seed, it was decided, after a further conference with the Hon. W. R. Motherwell, Messrs. Horn, Clark and myself that a system of premiums should be inaugurated with the object of securing the very purest qualities of grain possible and inducing prompter and heavier shipments being immediately made. This plan worked out as anticipated (upwards of 40 cars a day being inspected and accepted as suitable for seed, against twelve to fourteen before the plan was adopted), and on March 18 I practically discontinued buying, merely taking delivery of purchases previously contracted for.

Prior to this, fearing I might not be able to get sufficient supplies of seed west of Winnipeg, I had samples drawn by the inspectors at Fort William and Port Arthur from all bins in terminal elevators at these points of the grades 1° and 2° wheat, 1 and 2 white oats and No. 3 barley, which upon examination by Mr. E. D. Eddy here gave results averaging from 1 to 3 per cent of wild oats. With such results I determined not to buy a bushel of seed grain at the lake front if I could avoid it, and it was after bringing this matter to Mr. Motherwell's notice that the premium system as regards wheat bought west of Winnipeg was inaugurated. The oats and barley showed equally bad results, so that as west of Winnipeg the supplies were limited, it was obvious seed oats and barley would require to be imported.

Importations of seed oats were made from Prince Edward Island, also from Great Britain. About 100,000 from the former and some 400,000 from the latter. The Prince Edward Island oats upon inspection at Pictou were so soft that I refused acceptance until the shippers guaranteed them against heating in transit to Winnipeg. A satisfactory banker's guarantee was given before any of these oats were paid

for. However, they arrived here apparently in as good order as when inspected at Pictou—but were still quite damp—but upon being unloaded and run over the cleaners twice this defect was partly removed.

At the very beginning when it was estimated that 1,650,000 bushels of seed oats would have to be furnished by the government and at the same time it was estimated that only about 300,000 bushels of suitable seed was available west of Winnipeg it was agreed by the representatives of the federal and provincial governments that seed oats would have to be imported either from Great Britain or the States, or both. After most careful inquiries it was found that possibly 250,000 bushels could be secured from the States and possibly the same quantity from Great Britain. Valuable information concerning importations from the States was secured by Mr. G. H. Clark, seed commissioner of the Department of Agriculture, Ottawa, who at your request made a special trip for the purpose to Chicago, Duluth, Minneapolis and St. Paul. While as regards British importations valuable information was first secured through the Right Hon. Lord Strathcona, the Canadian High Commissioner at London, to whom you had communicated upon the matter by cable.

After the most careful consideration I concluded that the British oats were infinitely better than any that could be secured in the States and could be laid down at Winnipeg for less money.

I, therefore, in the first instance placed orders in the hands of Jas. Richardson & Sons, Kingston, Ont., for 131,000 bushels, under the following conditions: The conditions of purchase being 'No. 1 white milling oats, only named variety, weighing from 40 to 42 lbs. per imperial bushel, sound, suitable for seed, free from noxious weed seeds and wild oats at 66 cents per bushel of 34 lbs. sacked f.o.b. cars St. Johns, plus actual freight to Winnipeg. Any dispute as to quality and freedom from noxious weed seeds and wild oats to be decided by David Horn, Chief Grain Inspector, Winnipeg, whose decision shall be final and binding on both parties.'

Later the order under your instructions was increased to half a million bushels, and at your suggestion the Hon. the Minister of Agriculture instructed Mr. A. W. Grindley, chief cargo inspector of the Canadian Department of Agriculture at Liverpool, to make arrangements for the inspection of the grain before being loaded on vessels at London, Liverpool, Glasgow, or other British port. This arrangement was subsequently carried into effect and the following draft of cablegram was wired me on the 14th of February for amendment or approval:—

'Following draft of telegram prepared to be sent Strathcona. Please consider and amend or approve by wire to me. Dominion, London-Matter purchase seed oats from Britain responsibility of inspection and issue certificate on kinds and quality ordered vested in Department of Agriculture, Department Interior through Charles C. Castle, Winnipeg, purpose placing orders with commission dealers subject inspection British ports. Castle will instruct *re* kinds and quality standard. Minister wishes you place inspection in hands A. W. Grindley who should procure services one suitable referee grain man and one expert seedsman to inspect and pass upon all shipments from Great Britain. (Sgd.) Agricult.

'(Sgd.) F. OLIVER.'

Upon receipt of my approval by wire, the above cablegram was sent to Lord Strathcona, London, who subsequently sent for Mr. Grindley and arranged for him to issue certificates as to quality and freedom from noxious weed seeds and wild oats. Subsequently Mr. Grindley arranged with the London and Liverpool Corn Trade Associations to issue certificates showing the natural weight per bushel of the various shipments. Mr. James Charnock of the firm of Messrs. Jos. Pyke & Son, was appointed upon recommendation of the Liverpool Corn Association, Limited, to inspect shipments from Liverpool and Glasgow, and Mr. W. B. McMaster was appointed upon recommendation of the London Corn Trade Association to inspect the London shipments as to grade and purity.

Certificates as to quality, &c., and weight were attached to all cargo bills of lading from Great Britain. In some cases the certificates issued by the British inspectors were not definite, and while they showed that the oats did not strictly comply with the terms of contract, they did not state the number of foreign seeds per pound contained in sample—in some cases, however, it was stated on certificate that the impurities could easily be cleaned out. Shippers, however were notified by Mr. Grindley that these lots if shipped would have to go at their risk. The whole of the cargo containing these lots I had re-inspected on arrival here; most of them were 'line samples,' and complied so closely to the Seed Control Act that I passed them, as the impurities were easily removed upon running over the cleaners—a process all seed grain was submitted to. Some of the certificates clearly showed that parts of certain cargoes contained too many wild oats to comply with the terms of contract—even after being cleaned. These lots were also re-inspected upon arrival here, and I found I had to reject some 20,000 bushels, chiefly on account of the percentage of wild oats they contained.

The quality of the imported British oats is the finest I have ever seen, some samples weighing from 46 to 48 lbs. per bushel, and I desire to express my appreciation of the service to Canada performed by James Richardson & Sons, the people that purchased them, because it is surely a service to the country that the farmers of the Northwest should have had placed at their disposal seed of such excellence. The varieties imported were the Abundance, Banner and No. 1 White English; also about 3,000 bushels of Regenerated Abundance were purchased from Gartons, Limited, at the request of the Saskatchewan and Alberta governments; these weighed 51 pounds per imperial bushel, and were absolutely pure pedigree stock.

A small quantity of oats were also brought in from Ontario, Steele, Briggs & Co., Toronto, supplying the bulk of it—of very choice Ontario seed. All of this seed was inspected in Ontario by official grain inspectors and by Seed Commissioner Clark's expert as to purity.

Owing to Manitoba barley showing so much frost and also containing such proportions of wild oats, all barley purchased was brought in from Ontario and was of an excellent quality. I was, however, only able to secure about one half of what was required. The shortage was made up by shipping in lieu thereof imported English oats, which arrangement was made with Mr. R. E. A. Leech's concurrence.

All of the barley brought in from Ontario was officially inspected in Ontario as to grade, and as to purity by Seed Commissioner Clark's expert.

Wheat.—All wheat for seed purposes was purchased west of Winnipeg, basis May price, store Fort William, date the car was inspected. After the beginning of March a certain set of premiums (see Schedule B) was paid in addition thereto.

Oats.—In addition to those imported local oats were bought at the commencement at current market cost prices, basis store Fort William, which were later on raised to a flat rate of 65c. per bushel, store Fort William. I found in numbers of cases farmers were selling seed oats to neighbours at 70c. and upwards per bushel, consequently I had to raise the price or not get any.

Barley.—All barley for seed was purchased in Ontario, and was bought as high as $1.05 cleaned and sacked f.o.b. cars Winnipeg. Other lots were bought at 75 and 80 cents at Ontario points and cleaned and sacked at Winnipeg afterwards.

Cleaning operations were carried on at Fort William, Winnipeg, Brandon, Regina, Moosejaw, Calgary, Stratheona and Edmonton. A representative of either the Saskatchewan or Alberta governments was in charge practically in each cleaning elevator at above points. This official had power to order all grain to be run over the cleaners until he was thoroughly satisfied it was clean enough for seed. Every car received at such elevators was run two or more times over the cleaners, some cars being run through five times. Under my contract with the elevator owner the provincial government's representative had authority to order any or every car cleaned as often as he desired, before he allowed the grain to be sacked.

The method of handling the grain was as follows:—

While I was on the market to purchase seed grain the railroad companies issued instructions for all cars suitable for seed to be held out at Winnipeg for twenty-four hours; subsequently this period was extended to thirty-six hours. Public announcements were made both by the railroad company and by myself to that effect.

As soon as official samples of the inspected cars were received at the chief inspector's office they were turned over to Mr. E. D. Eddy (of the seed commissioner's office, Ottawa), who with his assistants made a most careful analysis of same. After this Mr. Eddy issued a certificate stating thereon the number of impurities per pound contained in sample. If it was suitable for seed the certificate, in addition to the foregoing, was marked 'O.K.'—or otherwise it was marked 'rejected.' All certificates were made out in duplicate and signed by Mr. Eddy or his deputy.

A list of all cars examined by Mr. Eddy was made out and forwarded to my office twice daily (see Exhibit 'Selection sheet'), on which those accepted were marked 'O.K.,' and those not accepted were marked 'Rejected,' and attached to this sheet was the original seed certificate of each car which appeared on the list. Immediately I received this list a 'spot notice' of 'accepted' cars was sent twice daily to the cleaning elevator and a 'disposition sheet' with same particulars to the railroad company. (See Exhibit, Spot Notice and Disposition Sheet.)

Upon its receipt into store in the cleaning elevator the car was officially weighed, and afterwards cleaned two or more times under the immediate supervision of the provincial government's representatives (oftener if necessary), before the grain was run to the bagging machine, who drew an average sample of the recleaned grain, same being carefully sent over daily to the chief inspector's office and filed away in a tin box, with full particulars, date, elevator cleaned at, car number, &c. These samples were then examined by Mr. Horn, and if not up to the mark he consulted me as to further treatment, and if necessary the car was ordered back to elevator again and recleaned. In some cases where it was impossible to fit the car for seed owing to cockle, &c., I forwarded it to Fort William and sold it at current market price. I desire, however, to emphasize the point that every car of seed grain that was distributed for seed was cleaned not less than twice, and frequently three or four times before being sacked, loaded into cars and shipped to the country. The provincial inspectors while the grain was running over the cleaners used the regulation No. 10 sieve from time to time to determine whether the grain was clean enough. The Crown Elevator Company, at St. Boniface, is the best equipped cleaning elevator in the west. For commercial purposes it can clean, receive and ship twenty cars in ten hours; but for seed purposes about six cars were all that they could clean in that time. One day (twenty-four hours) thirteen cars were run through. I merely state this to show the relative speed the grain could be run through this elevator for seed as compared for ordinary commercial purposes. On the whole the provincial government inspectors did their work faithfully and well. They all felt that the reputation of their province was at stake, and would suffer if they failed in their duty. In proof of this I may be permitted to point out that out of over 1,600,000 bushels of seed grain purchased, there were only six or seven cars that exception could be reasonably taken to.

As a matter of fact the elevators cleaned their grain better than I expected. The principle of construction for elevator cleaners is entirely different to the farm fanning mill. For really clean work the latter is best, and knowing this and also knowing it would be impossible to purchase the vast amount of seed perfectly pure that was required, I had deposited printed cards in each sack of recleaned grain, advising the recipient to clean it himself before sowing it.

Complaint has been made that some cars shipped were not thoroughly cleaned, but as I have already reported on this matter it will be unnecessary to again refer to it, except to add that on the whole a most exceptional lot of seed grain has been distributed. In fact both Mr. G. H. Clark and Mr. Eddy reported to me that it was better than 90 per cent of seed grain exhibited at our local shows. I have personally examined probably 75 per cent of the samples of cleaned, sacked grain shipped and

distributed, and from a close examination of them it is evident that most careful work has been done by the cleaning elevators, and equally careful supervision exercised by the government's representatives charged with looking after the cleaning.

When reports were received that grain was unsatisfactory, a deputy grain inspector was sent to the point to investigate the charges made, and when it was established there were reasonable grounds for the complaint, fresh seed was substituted in every possible case.

Under instructions from Mr. David Horn, Chief Grain Inspector, a deputy grain inspector was stationed at each cleaning elevator throughout the entire cleaning operations. The services of these officers were most valuable, especially when called upon to act in an advisory capacity with the provincial government's representatives.

Owing to the necessity of grain having to be purchased at Winnipeg, Brandon, Regina, Moosejaw, Calgary, Edmonton, Strathcona, &c., &c., it was impossible to keep in close touch with the daily purchases; it was also impossible to estimate the quantity of grain that could or would be bought at each of these points, or the total quantity that would be required for seed, and although I discontinued buying in Alberta on March 11, and Winnipeg on the 18th, it was found when deliveries were complete that there was a surplus over requirements. This also applied in the case of the British purchases, as until the grain was actually inspected on the quay, it was impossible to know how much would be accepted and how much rejected.

Acting under advice of the Alberta government, I appointed Mr. George Harcourt, Deputy Minister of Agriculture, as my purchasing agent for that province. Mr. Harcourt appointed Mr. C. Nairn as his representative at Edmonton and Mr. W. Carson at Calgary.

It appeared to me that was the only thing to do under the circumstances, especially as I felt all seed grain that could be purchased in that province should be bought there, to ensure prompt delivery besides saving extra freights.

From time to time I received reports from Mr. R. E. A. Leech, Regina, showing number of applications and amounts of various kinds of grain required for seed. The first of these reached me on March 8, at which time 9,470 applications had been received, the last of such reports I received on April 8, as follows:—

Number of applications, 15,275. Bushels of wheat, 514,772. Bushels of oats, 677,572. Bushels of barley, 89,649.

Upon requisition from Mr. Leech the first shipment of cleaned seed grain comprising twenty-three cars left Winnipeg on March 3.

I attach hereto a statement showing summary of seed grain on requisitions and petty cash sales shipped to Saskatchewan and Alberta:—

Saskatchewan—		
Total wheat on requisitions	466,698 15	
Total oats on requisitions	548,800 03	
Total barley on requisitions	23,336 00	
		1,038,834 18
Alberta—		
Total wheat on requisitions	30,820 00	
Total oats on requisitions	192,730 11	
Total barley on requisitions	23,640 00	
		247,190 11
Sold Saskatchewan government		1,286,024 29
Garton's oats		1,452 24
Sold Alberta government—		
Wheat	2,090 00	
Oats, (including Garton's) 8998.08	21,539 08	
		23,629 08
		25,081 32

Petty cash sales—		
Total wheat	1,082 15	
Total oats	13,686 07	
Total barley	40 00	
		14,808 22
Grand Total		1,325,915 15
Number of stations seed grain shipped to in Saskatchewan		155
Number of stations seed grain shipped to in Alberta		50

The number of stations in Saskatchewan and Alberta the grain was shipped to will show less than the number seed was actually distributed at, as the cars I shipped were billed to destination ordered by Mr. R. E. A. Leech. In many cases only part of car was unloaded at such destination. The balance being forwarded to flag stations or others of which I have no record.

When it became evident there was a surplus of seed wheat and oats on hand over the requirements the fact was reported to you, also to the Saskatchewan and Alberta governments, who after duly considering the matter authorized me to dispose of same for cash at the regular sale prices. The sale of the surplus seed was well advertised in the press and resulted in my disposing of, in small and large lots, 13,686·07 bushels English oats, 1,082·15 wheat and 40 bushels barley, in all 589 cash sales were made, and the price realized from such sales I deposited to a special trust account at Bank of British North America, Winnipeg, a statement of all such sales, as well as of sales of all cars of grain that were accepted for seed and subsequently rejected up to 1st of June was transmitted to your department early last June.

There was a profit on the option account amounting to $8,109.37, which sum was transmitted to your department on 1st June.

Cleaned grain was in accordance with the provisions contained in the order in council shipped upon receipt of Mr. Leech's requisition in writing, but as upwards of 240 cars were loaded with cleaned sacked grain before any requisitions came to hand, I frequently found I could not fill the requisitions exactly in accordance with Mr. Leech's order. Some shipments were under and some over the amount called for. I might explain that as soon as a car was loaded at an elevator it was sealed and then removed by the railroad company to the hold-out track in the railway yards, perhaps miles away—even had they remained adjacent to the elevator it would have been most unwise to have broken the seals in order to reload the cars exactly to the requisitions, as once car seals had been broken neither the railway companies nor the elevators would have recognized any claims for shortage. The whole plan would have worked out better had Mr. Leech been able to get in his applications for seed grain advances a month earlier than he did, then cars could have been loaded exactly to a bag as required. Unfortunately, however, he only commenced receiving applications about the time I started cleaning operations. I repeat it was unfortunate he had not the opportunity to start a month earlier. I must, however, express my appreciation of the promptitude with which his office handled the large number of applications, and forwarded to me the requisitions for shipment.

The care exercised in selecting cars for seed purposes can be more properly illustrated by explaining that during the time I was on the market there were inspected at Winnipeg the following number of cars of wheat of grades required for seed:—

	Cars.
1 Hard	3
1 Nor	380
2 Nor	590
3 Nor	872
No. 4	543

or a total of 2,355 cars, which were carefully inspected for seed, out of which only 555 cars were accepted, or, in other words, only 23¼ per cent of total cars inspected while I was on the market were accepted as satisfactory. This fact alone will, clearer than any words of mine, demonstrate the care and vigilance exercised in making the selections. While for the local oats 339 cars of 1 and 2 white were inspected and 260 of these accepted, or 33 per cent of these grades were rejected, notwithstanding 25 wild oats to the pound were allowed.

The work of compiling the prices farmers were to be charged for the different grades of seed wheat was taken in hand the evening of March 7, and at that time the following was the actual cost as shown by my office records:—

1 Northern cost per bushel, including 1½ per cent cleanings.	$1 02½
Freight	0 05½
Handling	0 03
Sacks	0 04¼
Loading	0 02¾
	$1 18
2 Northern cost per bushel, including 3 per cent cleanings.	$1 00¼
Freight	0 05½
Handling	0 03
Sacks	0 04¼
Loading	0 02
	$1 15
3 Northern cost per bushel, including 2½ per cent cleanings.	$0 91
Freight	0 05½
Handling	0 03
Sacks	0 04¼
Loading	0 03¼
	$1 07
No. 4 cost per bushel, including 3 per cent cleanings	$0 85
Freight	0 05½
Handling	0 03
Sacks	0 04¼
Loading	0 03¼
	$1 01

I deferred approximating the price to be charged to the farmers as late as possible, in order to make a close calculation of the actual cost. Over one hundred cars had been shipped and arrived at destination before I computed the price, and as farmers were clamouring for the seed, I could not delay the matter any later than I did. However, to guard against any subsequent raise in price, and to provide for the payment of premiums, which had been inaugurated about that time, after careful consultation with the accountant, I loaded or added to the actual cost of the grain as shown on my books, as follows:—

1 Northern	2¾c.
2 "	2c.
3 "	3¼c.
No. 4 wheat	3¼c.

The following were the prices charged the farmers for the various grades of wheat:—

1 Northern	$1 18
2 "	1 15
3 "	1 07
No. 4	1 01

Local oats, the prices to farmers were for 1 and 2 white 70 and 67 cents per bushel.

Imported oats.. .. .. 85c. per bushel.
Imported barley.. .. ..$1 13 per bushel.

In order to lessen the cost of seed grain to farmers, an arrangement was made with the railway companies whereby a flat rate of 9 cents per hundred pounds was charged from any point in Saskatchewan or Manitoba to Winnipeg and return to any point in Saskatchewan, that is to say, grain was shipped from any point on the Canadian Pacific Railway or Canadian Northern Railway in Saskatchewan or Manitoba to cleaning elevators at either Winnipeg, Brandon, Regina or Moosejaw and return, after being cleaned, to any point in Saskatchewan on same line of railway for 9 cents per one hundred pounds, while if shipments originated in Manitoba or Saskatchewan and after recleaning they were returned to Alberta the rate was 10 cents per one hundred pounds. The rate from any point in Alberta to cleaning elevators at Calgary or Edmonton, including the return of the cleaned grain to any point in that province on same line of railroad, was 9 cents per one hundred pounds.

Unfortunately, the full benefits accruing from these special seed rates were in a measure lost owing to the fact that much more wheat was purchased at points on the Canadian Northern Railway than was required to be distributed as seed on that company's lines, while more oats originated at the Canadian Pacific Railway points than was required for seed on their lines. The railway companies would not allow wheat tonnage originating on one line to be cancelled out with similar oat tonnage originating on another line or vice versa. This resulted in a greater expense for freight than was originally contemplated, as a special seed mileage freight rate had to be paid out in addition to the 9 cents per one hundred pounds already paid in.

In addition to the reduction of freight rates above referred to, the Canadian Pacific Railway lowered the ocean freight from Great Britain to St. John from 17 shillings to 11 shillings per ton on the imported British oats and the rate from St. John to Winnipeg was also lowered from 55 cents to 30 cents per one hundred pounds.

When the matter was first taken up with Sir Thomas Shaughnessy and Messrs. McKenzie & Mann, both agreed to co-operate to the fullest extent with the governments concerned and the lowering of the rates by the two companies has lessened the cost to the farmers to that extent and formed a handsome contribution towards the seed grain movement. In addition thereto both companies arranged with their country station agents to deliver free of cost the seed grain to settlers, added to this being the additional duty of seeing that the liens and mortgages were duly executed before the seed was distributed. Now, as seed was distributed at 205 stations in the two provinces at which there were agents, the saving to the government in this case is very material.

In concluding this interim report, I wish to say that the lateness of the date at which the purchasing operations were started has made the work most strenuous—for every officer engaged. I would be quite remiss in my duty if I neglected mentioning that no member of my staff has spared him or herself—and when I made requests for work to be done either at night or on Sundays (as I frequently had to do) it was always cheerfully responded to. Personally I greatly appreciate that Mr. C. H. Beddoe, chief accountant of your department, was authorized to attend to the payment of cheques issued under my authority for the purchase of seed grain. I have found him a most careful, exacting and efficient officer. Every voucher he carefully checked over before a settlement was made, and I found him a true friend, and one on whom I could always rely in time of trouble, and that was pretty frequent.

I am under obligation to my accountants, Messrs. C. B. Piper and R. J. Howden, for their assistance in organization of the office records and their subsequent faithful services. It might be said that because I took both of these gentlemen out of grain offices that in the ordinary nature of things they could not be as true to me—as to their former employers—but I distinctly must state—no officers could have rendered truer or more faithful services to the government than these two have.

I have the honour to attach the following schedules as part of this report:—

Exhibit 'A'—Advertisement published in the western press *re* the purchase of seed grain.

" 'B'—Further advertisement regarding the purchase of government seed grain.

" 'C'—Particulars showing number of sacks purchased and from whom.

" 'D'—Statement of option account with details attached.

" 'E'—Form of contract entered into when purchases were first made from elevator companies on a basis of May prices.

" 'E-2'—Cancellation of original contracts with elevator operators with whom I had made contracts similar to Exhibit 'E,' substitution contract was made in the form of Exhibit 'E-2.'

I have the honour to be, sir,

Your obedient servant,

CHARLES C. CASTLE,

Purchasing Agent.

SEED GRAIN ADVANCE—PURCHASING DEPARTMENT.

Re Government Seed Grain—Schedule 'A.'

The undersigned has been appointed by the Federal, Saskatchewan and Alberta governments to purchase grain in car lots only, suitable for seed, as follows: Wheat, Nos. 1 and 2 Northern, and if there is not sufficient of these grades then 3 Northern and No. 4, when purchased west of Winnipeg; white oats, Nos. 1, 2 and 3; barley, Nos. 1, 2, 3 extra and 3.

The above grades will be purchased basis in store Fort William, official weights and grades to govern in all cases, subject to my right of rejecting any cars rejected by the grain inspector as unsuitable for seed.

All grain must be free from wild oats, darnel and cockle.

If provision can be made to secure qualified grain inspectors, grain will be recleaned at Winnipeg, Saskatoon, Regina and Moosejaw.

Seed grain for the province of Alberta will, as far as practicable, be recleaned and distributed from Calgary.

All grain will be bought at current market prices, date of inspection, plus a reasonable premium, dependent upon its vitality and suitability for seed purposes, subject to the conditions as above set forth.

Re Billing.

Until further notice, owing to an arrangement with the railroad companies regarding freight rates, all grain for seed purposes fulfilling the above conditions, no matter where originating must be originally billed to Fort William or Port Arthur. Farmers and others shipping car lots of grain will bear this in mind.

As soon as arrangements are completed for receiving grain at interior recleaning points, an announcement will be made as to billing of same. Meantime, bill to Fort William or Port Arthur, as above advised.

CHARLES C. CASTLE,

Purchasing Agent.

P.O. Box 1327, Winnipeg.

Re GOVERNMENT SEED GRAIN.

Schedule 'B.'

Supplementing my previous announcement, I am in the market to purchase grain in car lots only, suitable for seed for government seed purposes, as follows:—

Wheat, Nos. 1 and 2 Northern; and if there is not sufficient of these grades, then 3 Northern and No. 4, when purchased west of Winnipeg.

White oats, Nos. 1, 2 and 3.

Barley, 1, 2, 3 Extra, and 3.

These grades will all be purchased basis in store Fort William, except as hereinafter noted. Official weights and grades to govern in all cases, subject to my right of rejection of any cars rejected by the Grain Inspector as unsuitable for seed. No bulkhead cars will be accepted.

It is inadvisable to send in samples of grain, as I cannot make selection except upon inspection of the entire car lot. All shippers must ship on their own judgment, and run the risk of the grain being rejected for seed purposes.

The prices paid for grain depend upon its suitability for seed, according to the conditions laid down by the Dominion Seed Commissioner. No grain whatever will be accepted if it contains any darnel, ragweed, sow thistle, or Canada thistle. The term 'noxious weed seeds,' as used below, means wild oats and purple cockle.

Standards and Prices for Wheat.

After this date, all wheat prices are 'in store' Fort William or Port Arthur, and are based on May price date of inspection—current spreads for different grades to govern.

A.—Containing no noxious weed seeds whatever. . . . . 20c. premium.
B.— " maximum of 1 noxious weed seed per lb. 15c. "
C.— " " 5 " " 10c. "
D.— " " 8 " " 5c. "

E.—If wheat does not classify in A, B, C or D, and contains maximum of 10 wild oats or 20 purple cockle per pound, it will be accepted, but no premium will be allowed, provided that if the wheat contains a maximum of 5 wild oats per pound, a maximum of 10 purple cockle only will be allowed for acceptance. Wheat containing more than any of these maximums will be rejected.

Standards and Prices for Oats.

All oats must be of the White variety, sound and of good vitality. After this date prices are based on an arbitrary basis of 65c. for 2 White 'in store' Fort William or Port Arthur, except for Alberta, where prices are determined by Deputy Minister of Agriculture, George Harcourt, Edmonton. A spread of 1c. premium shall determine price of 1 White, and a spread of 3c. discount shall determine the price of 3 White.

A.—Containing no noxious weed seeds whatever. . . . . 20c. premium.
B.— " maximum of 1 noxious weed seed per lb. 15c. "
C.— " " 10 " " 10c. "
D.— " " 20 " " 5c. "

E.—If oats do not classify in A, B, C or D, and contain a maximum of 25 wild oats or 25 purple cockle per pound, they will be accepted, but no premium will be allowed, provided that if both oats and purple cockle are present, the maximum number must not exceed 25 per pound. Oats containing more than these maximums will be rejected.

Barley.

At present I am not in the market for any barley whatever. An announcement as to barley will follow later.

Rebilling.

I have now completed arrangements to reclean grain at Edmonton, Cargary, Moosejaw and Regina.

Grain shipped for seed must never be billed west, as the railway companies refuse to handle grain west and then east again over the same line, except upon local rates plus through rates from extreme western station.

If the following directions as to billing are followed exactly, grain may be consigned to me at these interior cleaning points, and if rejected for seed purposes, will be forwarded to the lake terminal Fort William or Port Arthur, without any stop-over charge and upon the through rate as applying from point of origination. In every case grain must be billed to the order of C. C. Castle. Advise C. C. Castle, Winnipeg.

Destination is determined as follows:—

Everything in Alberta on the Canadian Pacific Railway lines (except the main line east of Calgary) must be billed to Calgary.

Everything north and west of Edmonton on the Canadian Northern Railway lines may be billed to Edmonton.

Wheat on the Soo line, Tuxford line, and on the main line west of Moosejaw, may be billed to Moosejaw. Oats on these lines must be billed to Regina.

All grain on the Arcola line, Prince Albert line from Saskatoon south, and the main line east of Moosejaw, may be billed to Regina.

All grain from all other points must be billed to Fort William or Port Arthur. As far as possible this grain will be cleaned at Winnipeg. The bill of lading, in all cases, even when billed to interior points, must be sent to me at Winnipeg. Always advise me to whom you wish me to turn over your bill of lading, in case the car is rejected for seed purposes, as I cannot handle grain which has been rejected.

If the shipper chooses he may consign his Fort William or Port Arthur shipments to any regular dealer in Winnipeg, billed to his advice. In any event the advice must be Winnipeg, and the bills of lading must be in Winnipeg when the car arrives.

In consigning cars to C. C. Castle, do not draw any advances, as the government will not honour the drafts. Send in your bill, and settlement will be made as soon as the cars are unloaded.

CHARLES C. CASTLE,
Purchasing Agent,
Box 1327, Winnipeg.

Box 1327, Winnipeg.

EXHIBIT C.

Name.	Wheat.	Oats.	Barley.
Nicholson & Bain	65,000		
R. J. Whitla & Co	65,000		
Merrick, Anderson & Co	65,013	51,000	
Smart Bag	165,000	113,954	5,000
Bemis Bros	175,000	56,000	
	535,013	220,954	5,000

Total wheat	535,013
Total oats	220,954
Total barley	5,000
	760,967

Checked and found correct.

R. J. HOWDEN.

WINNIPEG, May 30, 1908.

SCHEDULE D.

STATEMENT of funds deposited to the credit of C. C. Castle's Trust Account (Seed Grain Department) being moneys received for credit option account as per summary herewith.

No. 1	acct. P. and S. by	Saskatchewan Elevator Co.	$ 135 00
No. 2	"	International Elevator Co.	1,150 00
No. 3	"	Imperial Elevator Co.	62 50
No. 4	"	Western Elevator Co.	1,456 25
No. 5	"	Northern Elevator Co.	750 00
No. 6	"	Winnipeg Elevator Co.	25 00
No. 7	"	Northern Elevator Co.	1,518 75
No. 8	"	Parrish & Lindsay	388 12
No. 9	"	Parrish & Lindsay	even
No. 10	"	North Star	743 75
No. 11	"	Imperial Elevator Co.	506 25
No. 12	"	Canadian Elevator Co.	181 25
No. 13	"	Canadian Elevator Co.	287 50
No. 14	"	Canadian Elevator Co.	925 00
		Total credit C. C. Castle	8,129 37
No. 15	"	Winnipeg Elevator Co. debit	20 00
		Total amount at credit option account	8,109 37

Checked and found correct.

R. J. HOWDEN.

WINNIPEG, March 11, 1908.

Account purchase and sale by Saskatchewan Elevator Co.

March 13,	Sold 10 M. bushels at $1.09⅝		$10,962 50
	Delivered about 5,500 bushels	$6,029 38	
March 7,	Bought 5 M. May, H. McBean & Co., at $1.12¾	5,073 75	
	Commission ⅛		5 63
	Balance		135 00
		$11,103 13	$11,103 13

At credit C. C. Castle $135.

WINNIPEG, March 6, 1908.

Account purchase and sale by International Elevator Co.

February 14.	Bought 20 M. May, M. McBean & Co., $1.07¾.	$21,550 00	
March 4.	Sold 10 M. May, H. McBean & Co., at $1.14		$11,400 00
March 5.	Sold 10 M. May, W. C. Leistikow, at $1.13		11,300 00
			$22,700 00
	At credit C. C. Castle		1,150 00

WINNIPEG, March 21, 1908.

Account purchase and sale by Imperial Elevator & Lumber Co.

March 11.	Sold 5 M. bushels Winnipeg, May, $1.12½		$5,612 50
	Bought 5 M. bushels, Winnipeg, May, $1.10⅝	$5,543 75	
	Commission ⅛	6 25	
	At credit C. C. Castle	62 50	
		$5,612 50	$5,612 50

March 5, 1908.

Account purchase and sale by Western Elevator Co.

February 13.	Bought 10 M. bush., $1.11	$11,100 00	
	15 M. bush., $1.10⅝	16,631 25	
	5 M. bush., $1.10½	5,525 00	
	10 M. bush., $1.10⅝	11,037 50	
			$44,293 75
February 28.	Sold 40 M. bush. at $1.14½		45,800 00
	Gain		$ 1,506 25
	Commission ⅛		50 00
	At credit C. C. Castle		$ 1,456 25

WINNIPEG, March 5, 1908.

Account purchase and sale by Northern Elevator Co.

February 29.	Sold 25,000 bush. 1 Northern, $1.10	$27,500 00	
March 5.	Cancelled 25,000, $1.13½		$28,281 25
	Commission	31 25	
	At credit C. C. Castle	750 00	
		$28,281 25	$28,281 25

WINNIPEG, March 2, 1908.

Account purchase and sale by Winnipeg Elevator Company.

March 2, bought 10 M. bush. May wheat at $1.13		
Sold 10 M. bush May wheat at $1.13⅜		
Gain		$37 50
Less commission ⅛		12 50
		$25 00
At credit C. C. Castle		$25 00

WINNIPEG, February 29, 1908.

Account purchase and sale by Northern Elevator Company.

February 29. Sale 40 M. cash wheat at $1.10	$44,000 00	
May option sold as follows:—		
5 M. bus., $1 13¾		$5,687 50
5 M. bus., 1 14		5,700 00
5 M. bus., 1 13⅝		5,693 75
5 M. bus., 1 13⅝		5,693 75
5 M. bus., 1 14		5,700 00
5 M. bus., 1 14		5,700 00
5 M. bus., 1 14		5,700 00
5 M. bus., 1 13⅝		5,693 75
Commission	50 00	
At credit C. C. Castle	1,518 75	
	$45,568 75	$45,568 75

WINNIPEG, February 29, 1908.

On account purchase and sale by Parrish & Lindsay.

Bought	5,000 at $1 13½	$ 5,675 00	
	15,000 at 1 13⅝	17,043 75	
	30,000 at 1 13	33,900 00	
	25,000 at 1 13	28,250 00	
			$84,868 75
Sold	10,000 at 1 13½-⅝	11,356 25	
	25,000 at 1 13	28,250 00	
	10,000 at 1 13⅝	11,362 50	
	10,000 at 1 14⅜	11,437 50	
	10,000 at 1 14½	11,450 00	
	10,000 at 1 14⅝	11,462 50	
			85,318 75
			$450 00
	Commission, 1/16		46 88
	To credit C. C. Castle		$403 12
	Less interest on margins		15 00
			$388 12

WINNIPEG, February 28, 1908.

On account purchase and sale by Parrish & Lindsay.

January 29, Bought 25,000 at $1.09	$27,250 00	
February 28, Sold 25,000 at $1.09⅛		$27,281 25
Commission ⅛ cent	31 25	
	$27,281 25	$27,281 25

WINNIPEG, March 7, 1908.

On account purchase and sale by North Star Grain Company.

February 29, Sold 15,000 May, $1.12¾		$16,912 50
March 6, Sold 14,000 May, 1.13½		15,890 00
February 14, Bought 4,000 1 Nor., $1.10⅞	$ 4,435 00	
20,000 1 Nor., 1.10¼	22,050 00	
5,000 1 Nor., 1.10¾	5,537 50	
Commission ⅛	36 25	
At credit C. C. Castle	743 75	
	$32,802 50	$32,802 50

WINNIPEG, March 2, 1908.

On account purchase and sale by Imperial Elevator and Lumber Co.

February 29, Sold 15,000 Wpg. May, $1.12½		$16,875 00
5,000 Wpg. May, 1.12½		5,625 00
5,000 Wpg. May, 1.12⅜		5,618 75
10,000 Wpg. May, 1.12⅜		11,237 50
Bought 35,000 Wpg. May, $1.10⅞	$38,806 25	
Commission ⅛	43 75	
At credit C. C. Castle	506 25	
	$39,356 25	$39,356 25

WINNIPEG, March 6, 1908.

On account purchase and sale by Canadian Elevator Co.

Bought May option wheat 5,000, $1.10	$5,500 00	
Sold May option wheat 5,000, $1.13¾	.....	$5,687 50
Less commission ⅛	6 25	
At credit C. C. Castle	181 25	
	$5,687 50	$5,687 50

WINNIPEG, March 6, 1908.

On account purchase and sale by Canadian Elevator Co.

Feb. 11,	Bought May option wheat, 10,000, $1.10	$11,006 00	
Mar. 5,	Sold May option wheat, 10,000, $1.13	.....	$11,300 00
	Less commission ⅛	12 50	
		$11,021 50	$11,300 00
	At credit C. C. Castle	287 50	
		$11,300 00	$11,300 00

WINNIPEG, March 2, 1908.

On account purchase and sale by the Canadian Elevator Co.

Feb. 11,	Bought May option, 25,000 bushels, $1.09⅞	$27,468 75	
Feb. 28,	Sold May option, 20,000 bushels, $1.13¾	.....	$22,750 00
	Sold May option, 5,000 bushels, $1.13½	.....	5,675 00
	Less commission ⅛	31 25	
		$27,500 00	$28,425 00
	At credit C. C. Castle	925 00	
		$28,425 00	$28,425 00

WINNIPEG, March 9, 1908. ..

Account, purchase and sale by Winnipeg Elevator Company.

	Bought 12,000, May, $1.13	
	Sold 10,000, May, $1.13	
	Sold 2,000, May, $1.12¾ De	$ 5 00
	Commission ⅛	15 00
	At debit C. C. Castle	$20 00

SCHEDULE 'E.'

CONFIRMATION OF SALES.

WINNIPEG, February 11, 1908.

The Canadian Elevator Company, Limited.

C .C. CASTLE, Esq.,
Warehouse Commissioner.

We confirm the following sales to you to-day:—
Thirty thousand bushels (30 M.) at $1.10.
Twenty-five thousand bushels (25 M.) at $1.09⅞, basis, one northern—two northern to be applied at two (2) cents discount—three northern at eight (8) cents discount. No. four wheat at fifteen (15) cents discount. Delivery, Winnipeg basis, Fort William freight.

To be shipped from country points as fast as cars are obtained.

Purchaser has privilege of rejecting wheat not suitable for seed purposes on account of wild oats and noxious weeds.

THE CANADIAN ELEVATOR CO., LIMITED.
(Sgd.) 'GODFREY.'

Checked and found correct,
R. J. HOWDEN.

SCHEEDULE 'E—2.'

WINNIPEG, MAN., March 5, 1908.

C. C. CASTLE,
Purchasing Agent,
Winnipeg, Man.

DEAR SIR,—We hereby agree to cancel and do cancel all our sales to you of wheat for future delivery, according to the terms of our contracts dated February 11, 1908, and February 29, 1908, upon the conditions that you account to us for losses occasioned in our selling the May options at the market to cover the final unfilled portion of the above mentioned contracts, and that we account to you for gains so occasioned.

We agree to ship out our 1 Northern, 2 Northern, 3 Northern and No. 4 Wheat as rapidly as cars are obtainable, from the following points:—

Vonda, Howell, Borden, Saskatoon, Hanley, Hague, Rosthern.

In consideration you agree to accept and pay for all wheat desirable for seed of the said grades shipped from the said stations, subject to the conditions and premiums hereinafter set forth.

All wheat shall be rejected if it contains any darnel, ragweed, sow thistle or Canada thistle. The term 'noxious weed seeds' as used herein shall include wild oats and purple cockle in addition to the aforementioned weed seeds. All wheat containing more than the maximum of seeds allowed hereinafter shall be rejected. All bulkhead cars shall be rejected.

Premiums on accepted cars will apply as follows:—

A. Containing no noxious weed seeds whatever, 20 cents.

B. Containing maximum one noxious weed seed per pound, 15 cents.

C. Containing maximum five noxious weed seeds per pound, 10 cents.

D. Containing maximum eight noxious weed seeds per pound, 5 cents.

E. If wheat does not classify in groups A, B, C or D, and contains maximum of ten wild oats or twenty purple cockle per pound, it will be accepted, but no premium will be allowed: Provided that if the wheat contains a maximum of five wild oats per pound, a maximum of ten purple cockle only shall be allowed for acceptance.

Price and premium shall be based upon closing May price in store at Fort William or Port Arthur at date of inspection, and the spreads for 1 Northern, 2 Northern, 3 Northern and No. 4 shall be three, eight and fifteen cents respectively.

You agree to pay storage in lake terminals up to and including May 1, 1908, on all cars of the above mentioned grades shipped from the above mentioned stations, if said cars are rejected as being undesirable for seed purposes, and actually go into store in said terminals as determined by surrender of terminals out-turns.

No provisions of this contract shall be retroactive. All deliveries on previous contracts shall be settled upon prices of such contracts and without premiums. This contract shall become operative upon execution by both parties. It shall cease and become inoperative upon forty-eight hours' notice in writing from you to that effect. You agree to apply upon this contract all cars otherwise applicable to this contract received and inspected at Winnipeg up to and including the last day of the expiration

of said forty-eight hours' notice, but it is provided that no cars received and inspected at Winnipeg after the expiration of said notice shall be applied upon this contract.

The provisions of this contract as to prices and premiums but not as to indemnity of terminal storage charges shall apply to all of our wheat coming forward from any station west of Winnipeg.

Dominion weights and grades shall govern in all cases. The seed commissioner's inspection, upon official sample, shall be final as to the desirability for seed and consequent determination of premiums. Bills of lading shall be surrendered without advances upon notice from you, and cars shall be invoiced when complete.

Approved: CANADIAN ELEV. CO. L.
(Sgd.) A. K. GODFREY.

Approved: (Sgd.) CHARLES C. CASTLE,
Purchasing Agent.

REPORT OF THE DISTRIBUTING AGENT.

REGINA, SASK., June 22, 1908.

W. W. CORY, Esq.,
Deputy Minister of the Interior,
Ottawa, Ont.

DEAR SIR,—In connection with seed grain distribution work, I beg to make an interim report, as follows:—

At the request of the Minister of the Interior, I took charge of the distribution of seed grain in the provinces of Saskatchewan and Alberta, as per the agreements entered into between the Minister of the Interior and the representatives of the Saskatchewan and Alberta governments. In Ottawa, in the latter part of January and first of February, I arranged for the printing and distribution of notices and circulars regarding the terms and conditions of the proposed seed grain distribution, forms of application, liens, mortgages, &c.

On February 11, I arrived in Regina to open offices and organize a staff for handling the work. By the terms of the regulations governing the seed grain distribution, applications were to be made in duplicate before the secretary-treasurers of local improvement districts, Dominion land agents, sub-land agents, homestead inspectors, immigration agents or Northwest Mounted Police; the original application form to be immediately forwarded to my office, afterwards to be forwarded to the various land offices, or provincial authorities, for verification as to the interest of applicants in the lands described; the duplicate to be approved, or otherwise, by the council of the local improvement district and subsequently forwarded to me.

In order to meet the requirements of Section 13, of the agreements made in Ottawa, February 3, between the Minister of the Interior and the representatives of the Saskatchewan and Alberta governments, respectively, I was notified that Mr. D. S. McCannel was appointed to represent the Saskatchewan government, and Mr. George Stevenson was appointed to represent the Alberta government. Those representatives opened offices, convenient to my own, and their approval was had to all applications made by non-homesteaders, for the respective provinces, before seed was delivered.

In order to facilitate keeping an accurate and readily available record of applications, I prepared registers and divided the work by land districts. In those registers the following notations are made:—

'Application number,' 'name,' 'post office address,' 'description of land,' 'original application received,' 'amount applied for,' 'date original application sent land office,' 'date original application sent provincial government,' 'date original applica-

tion received back,' 'amount finally recommended,' 'papers sent railway agent, giving date and station,' 'date lien received from railway agent,' 'amount of seed supplied, wheat, oats and barley,' 'amount charged to governments, Dominion, Saskatchewan, Alberta, and cash sales.'

On February 13, the first applications were received. February 22 was the first date fixed for closing applications. The time for receiving applications, however, was extended from time to time and was, eventually, left open. The last application received was June 16, and seed was delivered on this application. Altogether 16,615 applications were received and dealt with by this office.

As applications were finally approved they were listed for shipment under the stations at which the applicants desired their seed delivered. Each day, as the approved applications for any railway station made up a car lot of any given grain, a requisition was issued upon Mr. Charles C. Castle, purchasing agent, Winnipeg, for the shipment of the same. The first of such requisitions was made February 28, for 26 cars, and daily requisitions, as required, were made subsequently during the shipping season. The last requisition was made May 13. The total requisitions are as follows:—

	Cars.
Wheat	500
Oats	482
Barley	39

In addition to this, however, grain was shipped on the requisition of Hon. W. T. Finlay, for the province of Alberta, as follows:—

	Cars.
Wheat	2
Oats	14

which will also be accounted for through this office. In all, 1,037 cars of seed were shipped out for distribution.

When seed was shipped by Mr. Castle, the shipping bills were sent to this office, invoices accompanying the same, which were noted in our records. To the shipping bill for each car we attached a delivery list with liens and mortgages for execution by the applicants before the railway agents at time of delivery, it being necessary to take a separate mortgage, or lien, for each kind of grain owing to the deliveries being made at different times. For each car of seed the number of deliveries to be made to applicants varied from 20 to, in one instance, 121, requiring the execution of as many securities. The first shipping bills were received at this office March 11th and were for 67 cars, and on the same day were sent forward to the various railway agents (or in the case of flag stations, to homestead inspectors) with the necessary delivery lists, liens and mortgages attached; also, each applicant was notified of the seed being shipped. As it was important that applicants should be able to receive the seed as soon as it reached its destination, we made it the rule of the office that all the shipping bills should be sent forward, with lists, liens, mortgages, &c., on the day that they were received, and I am pleased to be able to report, that while we received as high as 81 shipping bills in one day, none ever remained over night in our office.

Seed was delivered at 175 stations in Saskatchewan, and 75 stations in Alberta, making 250 stations in all; and the quantities ranged from a very few bushels up to, in one instance, 32 cars at one station.

In accordance with the arrangements made with the Canadian Pacific and Canadian Northern railways their agents made delivery of the grain at the railway stations, and had the necessary documents executed. This was a very important part of the work, and, on the whole, has been done in a satisfactory manner. Deliveries at flag stations were attended to by homestead inspectors.

Owing to the enormous amount of work in connection with deliveries, I arranged for homestead inspectors to supervise the work on all railway lines, allotting to each

a certain territory, which they attended to in addition to flag stations. By this means railway agents having heavy deliveries were given assistance. As the deliveries for each car were completed the railway agent was requested to give a 'return statement' showing the deliveries as they had been made, on a form provided, and attach thereto the securities taken. Up to the present time these 'returns' and securities have not all been received at this office, but they will probably reach a total exceeding 30,000 in number. A separate file was made for each applicant to which was attached his application in duplicate, all correspondence in connection therewith, and the liens, mortgages or cash sale invoices taken in settlement for seed delivered.

As liens, mortgages or cash sale invoices are received they are entered into our 'out-turn' grain books and our 'application' register, and attached to the proper application files. When all liens, mortgages or cash sale invoices relating to an application file are received, the file with the securities is immediately transferred to Ottawa in the case of homesteaders, and to the provincial authorities respectively in the case of non-homesteaders.

Duplicates of non-homesteader's files are made, and the same forwarded to Ottawa.

At the present time, about 50 per cent of the files have been disposed of in the above manner.

RE UNSATISFACTORY SEED.

In every case where complaint was made about the seed supplied not being satisfactory, I immediately had an investigation made, in most instances by a deputy grain inspector, and where the seed, upon examination, was not thoroughly satisfactory I immediately stopped delivery of the same and requested applicants who had received such seed to return it, when satisfactory seed would be substituted. Many complaints, however, proved to be not well founded, and more particularly in connection with oats.

The earlier deliveries of oats were western grown. Later, when English oats were being delivered, being of much superior quality, many became dissatisfied with the western oats they had received. Up to the present time, however, I have not had a complaint that the oats supplied have failed to grow satisfactorily.

I have had a few complaints of seed wheat not giving satisfactory germination, and am having each case thoroughly investigated. So far as these cases have been reported upon, it is clearly evident that the seed was seriously injured by formalin treatment by the farmer previous to sowing.

ALLOTMENTS NOT CALLED FOR.

Considerable quantities of seed delivered to various points were not called for by applicants. These refer particularly to applications for barley. In the application form each applicant was asked to state, whether, in the event of the kind of grain applied for not being available, he would be satisfied to have some other kind of grain substituted. Almost invariably applicants consented to this suggestion.

In connection with barley it was found that only about one-third of the quantity required could be secured, and oats were therefore substituted on applications for barley. When those substituted oats arrived at destination points the farmers appeared to be disappointed in not receiving barley; and the season then being somewhat late, they, in a great many instances, preferred not to take oats. There were also many cases where people living long distances from the railway stations did not receive the notice of their grain being shipped, in reasonable time. Also, there were a number of cases where settlers had rivers and streams to cross to reach the railway station, and having to depend upon ferry crossings, which owing to high water, were unable to operate, they were disappointed in not being able to take the seed they required.

QUALITY OF SEED.

Out of 1,037 cars sent out for distribution the entire complaints received will only refer to about 15 cars, and of this number there does not appear to have been reasonable ground for complaint against more than 8 cars, which is quite a small percentage of the entire shipments.

The seed, generally, appears to have been carefully inspected and well cleaned. I have scores of letters expressing appreciation and satisfaction, both as to quality of seed, prices for the same, and the manner in which the business was handled in connection with seed distribution.

Owing to the very short time between the commencement of seed grain distribution operations and seeding time it required a large office staff to handle the business. For three months my staff of about 35 in number worked every day from 7 a.m. until nearly midnight, and sometimes even later. I am pleased, however, to be able to report that each day's business was cleared up on the day it was received, and that no oversight or miscarriage appears to have occurred in connection with a single application.

SEED GRAIN DISTRIBUTION A NECESSITY.

While the distribution did not reach the proportions anticipated, there is no question as to the necessity for making the distribution. In many districts seed was not available, and settlers had not the means to purchase the same. Owing to the general financial stringency settlers were unable to borrow, even upon good securities. I believe I am well within the mark in saying that 500,000 acres have been seeded which would not have been were it not for the present seed grain distribution. A considerable additional acreage would probably have been sown with inferior seed, which would have given poor results. This upon an average crop return will yield an extra eight or ten million dollars to the crop returns for this year in the provinces of Saskatchewan and Alberta.

Attached hereto please find schedules as follows:—

1. The number of applicants by land districts to whom seed grain was advanced, and whether upon homesteader's liens, seed grain mortgages or cash sales.

2. The number of applications rejected or cancelled, by land districts.

3. Statement of grain distributed at railway stations in Saskatchewan, showing the kind, quantities and grades of grain delivered.

4. Statement of grain distributed at railway stations in Alberta, showing the kind, quantities and grades of grain delivered.

5. A statement showing the total seed grain delivered.

I have the honour to be,

Your obedient servant,

R. E. A. LEECH,

Inspector, D. L. Agencies.

N.B.—Railway agents in some cases not having sent in final returns of deliveries made, the figures in the schedules hereto in some cases are approximated, and will be subject to correction when completed returns are available.

SCHEDULE No. 1.

No. OF APPLICANTS RECEIVING SEED GRAIN AND TERMS OF SETTLEMENT.

Land District.	Settlement by				
	Liens.	Mortgages.	Cash Sales.	Total.	—
Saskatchewan—					
Humboldt	1,472	302	21	1,795	
Battleford	728	131		859	
Prince Albert	215	154		369	
Regina	875	1,361	56	2,292	
Yorkton	1,501	2,100	84	3,685	
Moosejaw	796	92	11	899	
Estevan	259	1,025	17	1,301	
Brandon	90	490	12	592	
	5,936	5,655	201	11,792	11,792
Alberta—					
Edmonton	1,125	1,047	144	2,316	
Lethbridge	90	27	13	130	
Red Deer	216	314	24	554	
Calgary	119	219	66	484	
	1,630	1,607	247	3,484	3,484
Total					15,276

SCHEDULE No. 2.

STATEMENT SHOWING THE NUMBER OF APPLICATIONS REJECTED AND CANCELLED.

	Cancelled Application.	
Saskatchewan land district—		
Humboldt	115	
Battleford	157	
Prince Albert	37	
Regina	127	
Yorkton	193	
Moosejaw	78	
Estevan	80	
Brandon	29	
	816	816
Alberta land district—		
Edmonton	265	
Lethbridge	23	
Red Deer	119	
Calgary	116	
	523	523
Total		1,339

SCHEDULE No. 3.

STATEMENT of Grain distributed at Railway Stations in Saskatchewan.

Station.	Wheat.				Oats.			Imported.	Barley.
	1 Nr.	2 Nr.	3 Nr.	No. 4.	1 Wh.	2 Wh.	3 Wh.		
Aberdeen	628							13	
Abernethy	1,250		1,750			777		355	
Alameda			6,207	1,050				1,785	
Antler	700		2,883	3,075		5,111		663	
Arcola	2,750	1,050	4,805	4,858	336	2,960		682	
Asquith	1,050			1,309				1,170	
Balcarres	1,034	1,684	3,692			1,200		3,505	
Balgonie		2,232	3,436			1,800		2,013	348
Battleford		2,234	3,924	1,000		5,508		3,650	
Belle Plain			220					380	
Benito			1,050					2,035	
Bethune	1,000			1,419				1,214	
Buenfait		113	4,146					2,746	
Birch Hills		113						1,046	
Bladworth			1,530					970	
Blutcher	700			467				1,536	
Borden			905					490	
Bredenbury		205						297	159
Bresaylar		30						180	
Broadview	676		454	1,016				1,565	300
Brumo		260	1,090					1,102	
Buchanan			1,016					6,896	
Canora	830	2,324	2,966	1,008		1,722		29,022	1,187
Carievale		1,000	615					500	
Carlyle			3,196	9		1,710		235	
Caron			1,000					1,620	
Carnduff			1,181					640	
Chamberlain			1,727		89		1,056	861	
Churchbridge		650	902	710		1,800		2,095	429
Condie		1,050	200					55	
Craik			2,425	350		1,236		810	
Creelman	1,922	968	3,357	134		1,800		1,235	
Cupar	1,050	397	3,071	2,200		6,625		635	
Dana			2,448					2,247	
Davidson	1,050	1,050	2,628	3,041		1,836		3,620	1,250
Disley			1,040	609				379	
Drinkwater	253		640					2,678	
Dubuc	180	650	3,147	1,100		1,170		3,216	
Dundurn				1,785				1,084	
Duck Lake		115						157	
Earl Grey			3,617					1,018	
Ebor			455					72	
Elstow			1,553					1,352	
Englefeldt			653					1,490	175
Esterhazy	1,000			2,984		1,200		669	
Estevan	1,080	1,309		1,050				1,715	
Fairlight	1,218	128	745					1,425	
Fielding				262				225	
Fillmore			2,635	668		1,791		1,866	
Fleming	370							460	40
Foam Lake			443			2,228			174
Forget	2,008	3,736	8,199	5,087		8,038		200	1,250
Francis		2,072	3,864	1,050		200		1,939	
Frobisher	3,470	2,432	2,050	807		1,800		714	
Gainsboro	334		1,000	666		1,788		250	
Girvin			1,480					318	
Glen Ewen			2,930	682		173		1,382	
Govan		3,000	2,826	1,404		1,166		2,243	
Grayson	380	2,440	3,000	2,693		4,986		3,900	1,150
Grenfell			2,064	1,048		1,215		1,251	385
Quill Lake	972							2,160	

SCHEDULE No. 3.

STATEMENT of Grain distributed at Railway Stations in Saskatchewan—*Continued.*

Station	Wheat.				Oats.			Imported.	Barley.
	1 Nr.	2 Nr.	3 Nr.	No. 4.	1 Wh.	2 Wh.	3 Wh.		
Hague			106						
Halbrite	1,000		1,670	1,400				1,325	
Hanley	637		1,082	261				775	
Harrowby			610					604	
Herbert	506	244	1,292			1,190		301	364
Heward			489	1,110		1,200		1,052	
Hirsch	2,050	3,780	3,449			2,157		641	
Hitchcock			605					245	
Humboldt			2,800					4,791	10
Indian Head		648	2,368					1,973	164
Insinger			575					1 200	13
Invermay		325						5,445	
Kaiser			1,632			1,239		1,103	
Kamsack	1,050			67				9,390	
Kenaston	792			1,038				1,083	
Kennedy				850				483	
Killaly		516	1,112					1,798	
Kinistino		310						610	
Kisbey			1,314	3,010				1,952	
Kronau			100			1,320		548	
Kuroki		24	92					1,775	155
Lang			229					899	
Langenburg	1,597	996	692	1,573		7,986		1,205	682
Langham			202	129				170	
Lanigan	2,234		1,609			3,600		2,490	900
Lashburn	846	954	796			2,364		2,348	588
Lemberg	1,116		1,060	758		128		2,646	
Lipton	3,503	1,040	5,126	2,086		1,839		8,312	
Lockwood	1,050		127					674	
Lloydminster	1,070		2,280	1,000		3,621		9,712	2,705
Lumsden			1,624	978				610	
Macoun	2,086	1,314	4,029	4,998		3,555		192	594
Maidstone			1,239					1,767	147
Manor		975	3,379	1,105		1,800		1,329	
Maple Creek								202	
Marshall			566	999				1,885	524
Marchwell			1,394			1,800		654	
Margo		34						1,209	101
Maymont			968	75				514	
Melfort			1,050					2,965	
Midale	148	852	1,502					1,547	
Milstone			1,475			2,949			
Moosejaw			1,050			1,701		320	
Moosomin			1,970					897	210
Morse			1,032			1,800		618	110
Mortlach	1,038		1,020	1,732		3,597		2,984	402
Muenster			2,160			2,607		1,512	440
McDowell								236	
McLean		1,050	366					1,540	140
McTaggart			490					180	
Neudorf		214	786	1,050		800		177	
Nokomis	2,138	2,596	1,058			3,270			
N. Battleford				977				1,194	
North Portal			120					200	
Orcadia			260			3,379		1,500	70
Osage		3,100	912					1,897	
Osler		55						104	
Oxbow	1,306		1,298	440				1,078	
Parkbeg			240					120	10
Pasqua			462					630	
Paynton		956						1,413	119
Pense								80	
Pilot Butte			95					320	50

SCHEDULE No. 3.

STATEMENT of Grain distributed at Railway Stations in Saskatchewan—*Concluded.*

Station.	Wheat.				Oats.			Imported.	Barley.
	1 Nr.	2 Nr.	3 Nr.	No. 4.	1 Wh.	2 Wh.	3 Wh.		
Prince Albert		55						405	
Qu'Appelle		932	1,816			1,158		757	390
Quill Lake			747			1,993		3,032	692
Radisson	1,100		1,051	520				756	
Redvers	2,340	1,970	3,003	1,000		3,651		1,800	1,050
Regina		970	4,436	1,100				4,351	
Rocanville			528					462	
Roche Percee			25					78	50
Rokeby				324		5,895		3,620	211
Rouleau	947	1,050						1,419	
Rush Lake			100					300	
Saltcoats		1,878	2,996	1,026		13,153		9,639	716
Saskatoon	1,986		1,025	958				3,782	
Sedley			2,860					2,521	
Sheho	1,438		13			3,600		4,352	598
Sintaluta			1,052					330	100
Southey		687	532	768		2,297		44	
Springside			372			1,800		3,168	235
Star City	653		644					4,003	
St. Gregor			475					775	38
Stockholm		996	159					1,565	2
Stoughton	1,050	1,024	4,866	1,556		3,750		1,926	
Strassburg			1,319			130		289	
Swift Current		3,124	2,230			3,410		4,186	
Summerbery								78	180
Tantallon			535					562	
Theodore		979	138			2,578		5,365	103
Tiny		72						2,280	
Tisdale	177		1,050	110		1,800		3,069	
Togo		1,760				1,911		6,395	
Tuxford	302		974	1,778				1,842	155
Tyvan			1,976	2,028				875	
Verigin				1,428				8,321	
Vonda		932	1,131					1,583	
Wadena	674		2,093	1,764				14,982	1,240
Walpole			655					805	
Wapella		4	1,576	1,209				1,212	241
Warman				145				696	
Watson	972	1,448	2,110	368		517		7,213	
Wauchope	1,048	1,030	2,010	1,000		1,909		2,383	
Wawota			300					325	
Welwyn			470					330	
Weyburn	1,002		4,215					2,843	
Whitewood		1,090	1,137	222		1,530		155	170
Windthorst	1,658		5,880	3,698		3,693		3,014	1,271
Wolseley			2,000	1,100		2,400		255	465
Yellow Grass	196	2,140	1,668			3,026		470	
Yorkton	398	1,362	2,212			30,711		9,520	902
Total	60,013	74,668	229,506	87,282	425	204,873	1,056	333,492	24,154

SCHEDULE No. 1.

STATEMENT of Grain distributed at Railway Stations in Alberta.

Station.	Wheat.				Oats.			Imported.	Barley.
	1 Nr.	2 Nr.	3 Nr.	No. 4.	1 Wh.	2 Wh.	3 Wh.		
Airdrie			85					572	50
Alix			9			558		120	306
Bawlf		344	394			675	1,866	1,392	
Bassana						60			
Blackfalds			8			270			62
Bowden			289			1,920		1,645	351
Bow Island	60					110			
Bruderheim								115	
Calgary			44					2,709	378
Camrose		522				1,634		1,858	740
Canmore								251	
Cardston		55			116				
Carstairs			64					2,001	120
Cayley								1,822	
Chipman			8					120	14
Claresholm	470					265		25	
Cochrane			75			1,200		1,781	401
Coleridge	46					125			
Cowley		95				736			
Crossfield	100		65					700	160
Daysland	1,060	776				810		2,526	512
Didsbury			202			1,800		1,200	854
Edmonton			500					3,590	353
Fort Saskatchewan	524							4,832	748
Gleichen			30			85		100	
Grannum		120				1,690		12	
Grassy Lake	15					10			
Hardisty			522					3,201	200
High River		680				8,639		774	
Innisfail			680			8,466		149	1,789
Innisfree			1,122			1,800		267	258
Islay			1,122					4,000	461
Irvine	442					717		10	
Killam		306	710			582	1,200		180
Kitscoty			986					1,605	242
Lacombe			165			2,766		175	648
Lamont			304					2,702	404
Lavoy			154					1,507	145
Langdon						770		698	30
Leduc	178							11,591	1,188
Lloydminster								64	
Lougheed								28	
Lethbridge		72				208			
Manville			537	894				5,089	613
Medicine Hat		712						1,467	
Millet	180					1,399		1,330	
Midnapore								78	
Morinville			5,372					1,699	569
Morley								199	
Moringside			35			915		20	216
Mundare			280					1,132	111
McLeod		430				160			
Nanton	256	100				2,858		475	
Ohaton		360				1,249		1,219	365
Okotoks		10				403		502	
Olds			199			1,842		4,388	660
Penhold			14					568	139
Ponoka		332				1,716	1,893	5,761	1,250
Pincher						380		10	
Ranfurley			105					455	20
Red Deer		700				1,906		3,354	668

SCHEDULE No. 4.

STATEMENT of Grain distributed at Railway Stations in Alberta—*Concluded.*

Station.	Wheat.				Oats.			Imported.	Barley.
	1 Nr.	2 Nr.	3 Nr.	No. 4	1 Wb.	2 Wb.	3 Wh.		
Sedgewick		301				764		40	112
St. Albert			55					3,928	24
Sheppard						855			
Stavely	446					302			
Stettler		214	786					3,989	749
Stony Plain			313					1,240	156
Strathcona			128			677		3,865	1,086
Taber	129					174			
Strathmore			98			385			
Tees			28			1,768			185
Vegreville			936					4,746	517
Vermillion	1,000		1,626		345	1,458		8,922	1,742
Walsh	160					185			
Wetaskiwin	686				1,932	5,031	2,889	1,904	1,110
Total	5,746	6,099	17,984	894	2,393	60,323	7,848	110,522	20,886

SCHEDULE No. 5.

STATEMENT showing Total Grain distributed in Saskatchewan and Alberta.

Saskatchewan	66,013	74,668	229,506	87,282	425	204,873	1,056	333,492	24,154
Alberta	5,746	6,099	17,984	894	2,393	60,323	7,848	110,522	20,886
Total	71,759	80,767	247,490	88,176	2,818	265,196	8,904	444,014	45,040

Total wheat	488,192
Total oats	720,932
Total barley	45,040
	1,254,164

SESSIONAL PAPER No. 25c

REPORT OF THE SEED COMMISSIONER.

REPORT ON WORK OF SEED BRANCH IN CONNECTION WITH THE PURCHASE AND DISTRIBUTION OF GOVERNMENT SEED GRAIN.

Directly after the early frosts, which occurred in western Canada in the fall of 1907, steps were taken by the Seed Branch to ascertain the extent of the damage to the crop, and to collect all possible information as to which districts were so seriously affected as to require seed from outside points, and also the districts from which the necessary seed could be procured. The district officers located at Calgary, Regina and Winnipeg covered the three provinces as thoroughly as possible and collected samples of wheat, oats and barley, which were sent to our seed laboratories at Ottawa and Calgary, for germination test. A large number of samples were also secured direct from the farmers, and from the results of the germination tests of these samples, numbering about 2,500, much valuable information as to the actual condition of the crop was obtained. Results of the germination tests conducted up to January 10, together with information as to how the tests should be conducted and how the results should be interpreted, were published in bulletin form and 60,000 copies distributed throughout the west.

When the question arose as to the amount of seed that it would be necessary to purchase in order to supply the needy areas, the information compiled by the officers of the Seed Branch, together with that obtained from the results of our germination tests, was placed at the disposal of the governments interested. A calculation was made of the areas in the three provinces where seed wheat, oats and barley would have to be secured from outside sources. This estimate did not take into consideration the ability of the farmers to help themselves by procuring their own seed from distant districts.

WORK OF THE SEED BRANCH AS FIRST DEFINED.

The work of the Seed Branch, as defined by the order in council, covering the regulations respecting the purchase, sale and distribution of seed grain to homestead settlers in the provinces of Alberta and Saskatchewan, was confined to giving advice, when asked, as to the purchases outside Canada, and to making vitality tests of grain purchased in the west, or elsewhere, when such tests were considered necessary. The first eight sections of the order in council read as follows:—

1. All purchases of grain in Canada shall be made by the warehouse commissioner of the Department of Trade and Commerce, C. C. Castle, hereinafter called 'the purchasing agent,' and all purchases outside of Canada, shall be made by the purchasing agent under the advice, when it is practicable to obtain the same, of the seed commissioner of the Department of Agriculture, G. H. Clark.

2. Wheat shall be bought through the ordinary channels of the grain trade at current prices, from day to day at western receiving elevators, at Winnipeg, in transit to Fort William, at Fort William or elsewhere, subject to official grade and weight by proper officers of the grain inspection and weighing branch of the Department of Trade and Commerce; grades 1 and 2 Northern only shall be purchased if sufficient of these grades can be procured, but if not, No. 3 Northern may be purchased from receiving elevators or in transit at Winnipeg, but not in terminal elevators; grade No. 4 wheat may, if necessary, be purchased wherever it can be purchased, having due regard to its suitability for seed purposes, its grading and cleanliness, but should only be purchased in the event of there not being sufficient of the other grades procurable.

3. Oats shall be purchased through the ordinary channels of the grain trade at western receiving elevators, at Winnipeg, in transit to Fort William, at Fort William,

or elsewhere, including eastern Canada, and shall be of grades Nos. 1, 2 and 3 white oats, as inspected and weighed by the Dominion Grain Inspection and Weighing officials, provided, however, should such purchases be made subject to a test as to vitality, a fixed advance on the market price from day to day may be arranged for by the purchasing agent at his discretion.

4. Barley shall be purchased as in the case of oats and wheat and may also be purchased in eastern Canada, and shall be of grades Nos. 2, 3 extra and 3.

5. Where practicable grain may be purchased in car lots direct from farmers in Manitoba, Saskatchewan and Alberta at current prices from day to day, subject to official weight and grade.

6. All possible precaution shall be taken to have all seed purchased free from smut, noxious weed seeds and other varieties of grain, and with this object in view all such grain shall, if found necessary, be recleaned as thoroughly as possible at such warehouse cleaning plant as can be secured for this purpose.

7. Inspection, cleaning and recleaning shall be done under the direction of the purchasing agent by the grain inspector of the Department of Trade and Commerce, David Horn, assisted by such officers as may be appointed for the purpose by the governments of the provinces of Alberta and Saskatchewan, respectively.

8. The seed testing branch of the Dominion Department of Agriculture, under the direction of the seed commissioner, assisted by such officers as may be appointed for the purpose by the governments of the provinces of Alberta and Saskatchewan respectively, shall make tests for the purpose of ascertaining the vitality of all seed grain purchased in the west or elsewhere, whenever the same may be in the judgment of the seed commissioner necessary and practicable.

From the above it was clear that the work of the seed branch was defined in sections 1 and 8, and the responsibility of inspecting the grain offered for sale was to rest with the officers of the grain inspection and weighing branch of the Department of Trade and Commerce. With this division of work in mind, I wrote to Mr. C. C. Castle, purchasing agent, and Mr. E. D. Eddy, my district officer in Manitoba, on February 10, as follows:—

Mr. CHARLES C. CASTLE,
Warehouse Commissioner,
Winnipeg, Man.

DEAR MR. CASTLE,—I am to-day writing to my district officer at Winnipeg, Mr. E. D. Eddy, to call upon you and place himself at your disposal in the matter of conducting vitality tests of seed oats, barley or wheat. Mr. Eddy will make arrangements to have germination tests made in some greenhouse at Winnipeg, and you may expect to receive from him a report on the percentage germination at the end of five days, at least within a week, from the time you hand him the sample. Of course you would not be able to defer purchases for such germination report, but the records of such report may be useful before the seed be forwarded for distribution.

Seed oats that will germinate 50 per cent during the first five days should be counted as of satisfactory quality, considering the condition of the 1907 crop in the western provinces. Oats of the 1906 crop will germinate more than 90 per cent in five days. Those that will not germinate in five days under greenhouse conditions will scarcely be of much use when sown under field conditions, unless the soil is moist and the weather be exceptionally favourable.

Very truly yours,

(Signed) G. H. CLARK,
Seed Commissioner.

SESSIONAL PAPER No. 25c

Mr. E. D. EDDY,
Edwards Block, Winnipeg, Man.

DEAR MR. EDDY,—I enclose herewith copy of letter sent to-day to Mr. Castle, Warehouse Commissioner, Winnipeg. Mr. Castle has been nominated chief officer in connection with the purchase of seed grain for the provinces of Saskatchewan and Alberta, and it is necessary that we give him all possible assistance that we can. I have no doubt that you have plenty of work on hand, but this work of Mr. Castle's must be attended to, and attended to very promptly. You will therefore at once place yourself at his disposal, as indicated in my letter, and receive samples from him twice daily, by calling at his office.

Without troubling Mr. Castle about the matter, you will, at our expense, make arrangements for having the oats tested in the soil for vitality. It would be most satisfactory if you could procure from some greenhouse convenient to your office enough space for conducting these germination tests. If you cannot get space in any greenhouse, you had better get a room, until April 1st, with windows having a south exposure, and heated so that the temperature will not fall below 55 degrees at any time, and be kept at an average temperature of not less than 65 degrees.

You will obtain definite agreement as to the cost of space in greenhouse or rent of room, in advance. If need be, you will have boxes for germination tests and trestles made on rush order for the work.

It is first of importance that there shall be no delay, and you will act throughout according to the instructions of Mr. Charles C. Castle.

I append herewith description of the boxes used in our Ottawa laboratory for soil tests, and the method of planting and counting, which I think you should follow throughout.

Faithfully yours,
(Signed) G. H. CLARK,
Seed Commissioner.

WORK OF INSPECTION ASSUMED.

On February 10th I received the following telegram from Mr. Eddy:—

'Warehouse Commissioner Castle starts buying seed grain here Wednesday and wants me to get authority to pass on it for purity and vitality. Wire instructions.'

On the morning of February 11th I received the following letter from Mr. David Horn, Chief Grain Inspector at Winnipeg:—

Mr. G. H. CLARK,
Seed Commissioner.
Department of Agriculture, Ottawa.

DEAR SIR,—Mr. Castle, Warehouse Commissioner, has been commissioned by the Department of the Interior to purchase seed grain for the needy farmers in Saskatchewan, Alberta, and, I presume, also Manitoba.

Mr. Castle seems to think that I will have to take the responsibility of passing upon and inspecting the seed he purchases. This it seems to me is practically the duty of your department, and, if not you, then the staffs of the experimental farms, or the two of you together. This morning I asked your Mr. Eddy to come in and see me and he informs me that he has no instructions of any kind. Mr. Castle is going on with his arrangements and will be purchasing largely immediately. My opinion is that you should at once see the Department of the Interior and arrange for your staff to be responsible for the accepting of what is deemed acceptable seed.

I am willing to co-operate as far as lies in my power and as far as is practicable in stating what the grade of such purchases is in the market, but it seems to me it is up to you to decide when it is good seed and in a fit state for sowing.

I hope you will see this in the same light as I do and that you will take action at once.

Yours truly,

(Signed) DAVID HORN,
Chief Inspector.

This made it clear that the Grain Inspection Branch at Winnipeg was not prepared to accept the responsibility of passing on the grain for seed purposes.

In conference with the Honourable the Minister of the Interior on the morning of February 11th, I was requested to provide a staff to do the inspection work; and I agreed to this, with the understanding that the provincial governments, who were the real purchasers, should set the standard of purity to which my inspectors should work. This was agreed to, and the following telegram was sent to Mr. Eddy:—

'You will provide Castle with written statement, showing probable vitality oats or barley. Also certificate purity all kinds. If samples will pass Seed Act without label, mark certificates accordingly. Retain all samples and copies of certificates. Wire if you need additional help.'

The following letters explain my position and the instructions given on this question:—

February 13, 1908.

To the Honourable the Minister of the Interior,
Ottawa.

RE INSPECTION OF SEED GRAIN PURCHASED BY C. C. CASTLE.

My understanding in conference in your office together with provincial representatives from Alberta and Saskatchewan *et al* was that all present agreed as to the inadvisability of purchasing and distributing seed grain contaminated with wild oats and other noxious impurities. Further, that the provincial representatives approved of Mr. Castle's suggestion to rely on the ruling of the Chief Grain Inspector at Winnipeg in the matter of grade, purity and vitality of seed wheat, oats and barley that might be inspected at that point.

On the night of February 10, I received a telegram from my district officer at Winnipeg, Mr. E. D. Eddy, and on the morning of the 11th a letter from Mr. David Horn, dated February 8th, which made clear to me that the Chief Grain Inspector respectfully declined to assume the responsibility in the matter of purity and vitality of the seed grain to be purchased by Mr. Castle. My previous instructions to Mr. Eddy have been to report to Mr. Castle twice daily and arrange to make actual vitality tests promptly, as required by Mr. Castle. My further instructions to Mr. Eddy, on the morning of February 11, were to at once assume responsibility in the matter of purity and vitality of seed, as per samples submitted by Mr. Castle, by furnishing Mr. Castle with a statement showing estimate of the percentage vitality of the grain, and the kinds, if any, and total number of noxious weed seeds per pound. On the morning of February 11, I also instructed my district officer for Saskatchewan to proceed at once to Winnipeg to Mr. Eddy's assistance, and on February 12 Mr. William Bond, expert seed analyst, was despatched from our Ottawa staff to Winnipeg. To augment our staff at Winnipeg, I have asked for and received consent from Mr. David Horn, Chief Inspector of Grain, for the loan of one or more of his trained men should Mr. Castle need the additional assistance.

I take it that under the understanding and agreement, the provincial governments of Alberta and Saskatchewan have the right to dictate as to the quality of the seed grain that will be acceptable to them, and that it is not the privilege of the seed branch to do more than advise, inspect and certify as to such quality; also that Mr. Castle will keep himself informed, as the chief purchaser, as to what standard of purity will be satisfactory to the provincial authorities.

In the matter of any seed grain purchased by Mr. Castle east of Port Arthur, I shall, at his request, endeavour promptly to have lots inspected at points of shipment or elsewhere, as per his direction.

Yours truly,
(Signed) G. H. CLARK,
Seed Commissioner.

Mr. E. D. EDDY,
Winnipeg, Man.

DEAR MR. EDDY,—I have taken the stand, and am supported by the honourable the Ministers of Agriculture and Interior, that it is the privilege and duty of the seed branch to advise as to the quality of the grain that may be purchased, but the acceptance of such grain is vested with the governments of Saskatchewan and Alberta. When they dictate as to the quality they want, Mr. Castle may name the quantity he may be able to supply, as per their requirements. They may be expected to amend their standard of quality from time to time. Mr. Castle will keep himself informed as to that.

Your certificates are intended for Mr. Castle's information only, and they should show your estimate of the percentage vitality, and the kinds and total number, or percentage by weight, of the various kinds of noxious weed seeds, including darnel in addition to those named in the Seed Control Act. Mr. Castle will make his own estimate as to what can be done by cleaning, and the provincial men will inspect and reject or accept at time of sacking.

From this letter I think you will understand the position in respect to responsibility that is to be assumed by the seed branch, and, in the meantime, you will have full authority over the operations of the seed branch at Winnipeg.

Faithfully yours,
(Signed) G. H. CLARK,
Seed Commissioner.

Mr. Castle evidently was under the impression that the seed branch had assumed the full responsibility of setting the standard for purity and passing on the grain submitted. This led to some confusion, as Mr. Eddy, the seed branch representative in Winnipeg, refused to O.K. samples that could not be cleaned to comply with the Seed Control Act. We adhered to the position that until the provincial governments expressed their willingness to accept a lower standard, we would have to stand by the standard of the Seed Control Act, which limits the impurities to one noxious weed seed per pound. The following letter from Mr. Castle indicates the difficulties of securing the required amount of grain in the limited time when the inspection was done under the Seed Control Act standard:—

WINNIPEG, MAN., February 18, 1908.

GEO. H. CLARK,
Seed Commissioner,
Ottawa, Ont.

DEAR SIR,—In reply to yours of the 15th inst., I think if you can arrange to leave Ottawa in about a week's time for Winnipeg it would be advisable for you to do so, as by that time everything here should be in full swing. I fear, however, that in the time available we shall be unable to secure either sufficient oats, wheat or barley to meet the requirements, as nothing but practically pure seed of any of these kinds of grain is being accepted. Of course my instructions by order in council are to purchase 1 and 2 Northern, and, if sufficient of these grades cannot be obtained, No. 3 west of Winnipeg and No. 4 wheat; and as regards oats, grades of 1, 2 and 3 white; and barley 2 and 3, but so far as selection of these grades is concerned I am acting entirely under Mr. Motherwell's recommendations, so that any car ruled out by your depart-

ment will not be purchased. The wisdom of this rule can not be questioned, but there can be no doubt that with the limited time at our disposal the required quantities of seed will not be secured.

I am, sir, yours truly,

(Signed) CHARLES C. CASTLE,
Purchasing Agent.

In a report on the progress of inspection up to February 18, Mr. Eddy points out that of the number of cars of wheat and oats inspected by him, exceedingly few were accepted and O.K.'d as being sufficiently free from noxious weed seeds to be cleaned so as to conform with the provisions of the Seed Control Act.

Acting under the instructions quoted above, Mr. Eddy took the ground that, as the seed branch was responsible for passing on the grain, we had no right to accept seed badly contaminated with noxious weed seeds; and up to February 17, no approved certificates were issued on grain that could not be cleaned so as to conform to the Seed Control Act, as no intimation had been received from the provincial governments that they would accept a lower standard.

On the morning of February 17, Honourable W. R. Motherwell, Commissioner of Agriculture for Saskatchewan, arrived in Winnipeg, and the question of selecting a standard of purity was gone into. At that time it was apparent that sufficient grain could not be secured in time if the standard of inspection so far enforced were maintained, and Mr. Motherwell agreed to accept grain of a lower standard.

It was finally agreed that the standard of inspection for wheat should be no more than ten wild oats or ten purple cockle per pound, and for oats not more than twenty-five wild oats or twenty-five purple cockle per pound. Samples containing small weed seeds which could be removed by cleaning were not to be rejected, as the provincial representatives in charge of the cleaning plants had authority to have the grain cleaned as often as necessary in order to remove all small seeds. All samples containing even a trace of sow thistle, Canada thistle, ragweed or darnel were to be rejected. In all cases, the inspection for purity was made on official samples drawn under the direction of the chief inspector of grain, for the purpose of commercial grading.

While the seed branch representatives in Winnipeg were consulted in this matter and were, to some extent, responsible for fixing the standard of purity, they were merely acting in an advisory capacity.

Until February 17, arrangements were not completed with the railway companies for holding grain that was accepted, so that actual purchases from the trade did not start until that date. Duplicate certificates of all grain inspected on and after February 17 are now held in the seed branch offices.

PREMIUM PRICES RECOMMENDED FOR PURE SEED.

On Monday, February 24, I arrived in Winnipeg and spent the day examining the methods of inspection for purity and vitality. I was also accorded an interview with Mr. Charles C. Castle at which the difficulties that were being experienced by him, in procuring supplies of seed wheat and oats that would comply with the standard of purity then adhered to, were discussed. The Honourable W. R. Motherwell arrived in Winnipeg on the morning of February 25, at which time the matter of inspection in relation to the standard of purity was fully discussed. With Mr. Motherwell's approval, I telephoned from the hotel to Mr. David Horn, chief inspector of grain, and asked him to meet us in conference, in order that we might get the benefit of his experience and advice. As a result of this conference the following memorandum was drafted and presented to Mr. Castle for use as a basis for further discussion in conference with him:—

SESSIONAL PAPER No. 25c

WINNIPEG, MAN., February 25, 1908.

Memo. for CHAS. C. CASTLE,
Seed Grain Purchasing Agent,
Winnipeg, Man.

It would appear from the character of the supplies of seed grain offered up to date that if quality and purity of the seed is to be given proper and due consideration, then the price paid therefor must be quite secondary, and further, if the seed grain that appears to be required is to be obtained in seasonable time the supplies from the interior must come forward more rapidly than at present; or it will be advisable to go to Fort William for a considerable portion of the wheat required.

In view of the foregoing, advice is given you as follows:—

Memo. of recommendations *re* procuring supplies of seed grain that may be acceptable to the farmers of the provinces of Saskatchewan and Alberta.

1. Make quality, especially in respect to weed seeds, the first consideration. The matter of price within reason for good clean seed grain should be of secondary consideration.

2. For seed grain, not the product of the western provinces and which has not now been accepted, adhere in the meantime to the provisions of the Seed Control Act in respect to purity.

3. For wheat, the product of the western provinces, allow not more than ten noxious weed seeds per pound, then reclean. Pay sufficient extra premium for what will pass Seed Act.

4. For oats, the product of the western provinces, allow not more than twenty-five noxious weed seeds per pound and then reclean. Pay small premium when they contain only ten wild oats or other noxious weed seeds per pound, and large and sufficient premium for oats that will pass Seed Act and is otherwise good seed.

5. Many portions of the province of Saskatchewan grow oats only for feed, and in view of the probable shortage of clean white oats, you are advised to purchase up to a quarter of a million bushels of Prince Edward Island black oats for the province of Saskatchewan.

6. Procure, say, five cars of oats out of several of the best bins at Fort William and have them sent to King's elevator to test result of his cleaning up to loss of fifteen per cent.

7. Arrange, if practicable and expedient, with the Canada Malting Company for the purchase of seed barley on commission, or otherwise as may be in your best judgment, subject to the conditions in respect to weed seeds as obtains for seed oats.

8. Suggest placing orders for Ontario and other eastern Canada oats and barley on commission basis with eastern Canada seedsmen, such as the Steele, Briggs Seed Company. Allow sufficient commission to induce prompt and aggressive action and allow good premium per bushel in advance over Toronto or other current market quotations for commercial grain—oats and barley clean for seed.

9. Restrict further British orders to named varieties and prevent as far as possible importations of potato oats; pay good premium for right good seed from Britain.

10. It is recognized that by continuing to adhere to this relatively high standard of purity, all of the demand for seed grain may not be supplied, but it is thought expedient at this time, and especially in view of past charges on the part of farmers in general against government importations of seed grain containing weed seeds, to purchase only and all that it is possible to get for them of relatively clean seed wheat, oats or barley.

Because of a large decrease in the estimated amount of oats required and the securing of more than at one time was thought available in the Old Country, the recommendations given in the latter part of paragraph 4 and paragraphs 5 and 6 in the above memorandum were not acted upon.

THE FINAL STANDARD OF PURITY.

Under instructions from the Hon. Mr. Motherwell and in accordance with announcement *re* premiums on purchase of wheat, the standard purity of wheat recommended in paragraph 3 was later altered, so that twenty purple cockle seeds per pound, instead of ten, were allowed. The standard of purity which the inspectors were instructed to follow on February 28th, and which was adhered to until the work was completed, was as follows:—

No sample of wheat to be accepted that contains any darnel, ragweed, Canada thistle, or perennial sow thistle, more than ten wild oats per pound, or more than twenty purple cockle per pound. Other noxious weed seeds not mentioned above may be allowed if cleaning plant is capable of removing them.

In addition to the above standard of cleanliness, the plumpness and fitness of the sample for seed must also be considered. Samples containing a large proportion of thin, lean or shrivelled kernels shall be rejected, as shall also be those which give evidence of containing different varieties.

Classification may be made as follows:—

Certificate to be marked A for samples entirely free from noxious weed seeds.

Certificates to be marked B for samples containing not more than one noxious weed seed per pound.

Certificate to be marked C for samples containing not more than eight wild oats or purple cockle to the pound.

Certificate to be marked C for samples containing not more than five wild oats or purple cockle to the pound.

Certificate to be marked E for samples containing not more than ten wild oats or twenty purple cockle to the pound. Sample containing more than five wild oats must contain not more than ten cockle.

As aforementioned, the premium for oats, suggested in paragraph 4 of the memorandum submitted to Mr. Castle on February 25, was not offered, and our inspectors were instructed to adhere to the standard of 25 wild oats or 25 purple cockle per pound, or a combined count of 25, without classifying the accepted samples, as in the case of wheat.

RE PURCHASE OF BRITISH SEED OATS.

When the purchase of seed oats in Great Britain was decided upon, with the approval of the Honourable the Minister of Agriculture, I suggested to the Honourable the Minister of the Interior that if purchases were to be made based on inspection at British ports, Mr. A. W. Grindley, Chief Cargo Inspector of the Dominion Department of Agriculture, who is permanently located at Liverpool, might be appointed to make arrangements for that work of inspection. The suggestion was approved, and the following telegram was sent to Mr. Castle on February 14th:—

'Following draft of telegram prepared to be sent Strathcona. Please consider and amend or approve by wire to me: "Dominion, London—Matter purchase seed oats from Britain responsibility of inspection and issue certificate on kinds and quality ordered vested in Department Agriculture Department Interior through Charles C. Castle, Winnipeg, purpose placing orders with commission dealers subject inspection British ports. Castle will instruct *re* kinds and quality standard. Minister wishes you place inspection in hands A. W. Grindley who should procure services one suitable referee grain man and one expert seedsman to inspect and pass upon all shipments from Great Britain. (Sgd.) Agricult."

(Sgd.) F. OLIVER.'

Upon receipt of Mr. Castle's approval by wire, a cablegram, as drafted above, was sent to Lord Strathcona, Canadian High Commissioner, London. The arrangements made with Mr. Grindley are explained in the following extracts from a letter

to the Honourable the Minister of Agriculture from Lord Strathcona, dated February 28th:—

'Immediately upon receipt of this message (the cablegram quoted above) I communicated with Mr. A. W. Grindley, by telegram, asking him to come to London to see me, which he accordingly did on the 21st inst., and I then went thoroughly into the matter with him. It was then arranged to appoint an expert to inspect the oats and for him to issue certificates covering quality as regards freedom from noxious weed seeds and wild oats; and also for the Corn Trade Associations of London and Liverpool to issue official certificates as to the natural weight of the various consignments of oats. Mr. W. B. McMaster, of Messrs. McMaster & Frankish, 15 Seething Lane, E.C., was appointed to issue certificates as to quality, such appointment being recommended by the London Corn Trade Association, who state Mr. McMaster to be well qualified to give certificates of the nature required. Similar arrangements have also been made in regard to Liverpool, where, in addition to the co-operation of the Liverpool Corn Trade Association, Mr. Grindley has appointed Mr. James Charnock, of the firm of Messrs. Joseph Pyke & Son, to inspect and issue certificates as to quality.

'These general arrangements having been made, Mr. Grindley can now carry out the necessary details in direct communication with your department, and I have notified him accordingly, informing him at the same time that I will gladly extend any further assistance possible, on hearing from him.'

Full instructions as to conditions of contract, &c., were forwarded to Lord Strathcona, and, later, direct to Mr. Grindley. The arrangements as to inspection outlined by Lord Strathcona were followed throughout the British shipments. Some of the certificates issued by the British inspectors might be said to be indefinite, insomuch that although the certificates made clear that the oats did not comply strictly with the terms of the contract, they did not state the proportion, nor, in some cases, the kinds of foreign seeds that were present.

It was made clear to the shippers by Mr. Grindley that if these lots were forwarded to Canada, they would have to be sent at the owner's risk, as they were not accepted by the inspectors. Under the direction of Mr. Castle, the cargoes containing these lots were reinspected in Canada. Most of them proved to be what is known in the trade as 'line grain;' that is to say, the amount of impurities were approximately equal to the margin of tolerance allowed under the Seed Control Act, which impurities were largely removed by the process of recleaning, to which all, or nearly all, the imported oats were submitted.

A few of the certificates indicated very clearly that parts of the shipments not only did not comply with the conditions of contract, but that they contained too many wild oats to be cleaned by practical process, to comply with the standard fixed for seed grain, except that purchased in western Canada. The reinspection of these lots at Winnipeg resulted in twelve car lots of the British oats being refused acceptance on account of the content of wild oats and other noxious weed seeds.

OFFICIALS EMPLOYED IN THE WORK OF INSPECTION.

The following permanent officials of the seed branch were authorized to inspect and issue certificates respecting the purity of the seed grain purchased in Canada, viz.:—

Messrs. Samuel J. Moore, official seed inspector for maritime provinces; T. G. Raynor, B.S.A., official seed inspector for the province of Ontario; E. D. Eddy, B.S.A., official seed inspector for the province of Manitoba; William Bond, assistant seed analyst of five years' experience; Harris McFayden, B.S.A., official seed inspector for the province of Saskatchewan; W. C. McKillican, B.S.A., official seed inspector for the province of Alberta; and James A. Hayes, assistant seed analyst in the Calgary laboratory. In addition, we had for a time the services of Mr. James Murray, superintendent, experimental farm, Brandon, Man., and at my request, the chief

inspector of grain allowed his deputy inspectors to issue certificates, on my responsibility, relative to the purity of seed grain purchased at Kingston and Toronto, in the province of Ontario, Regina and Moosejaw in Saskatchewan, Edmonton in Alberta.

ANALYSIS OF SAMPLE OF CARS SENT OUT.

As was previously mentioned, the cleaning operations were superintended by representatives for the provincial governments, who had authority to have the grain recleaned as often as necessary, in order to remove the small weed seeds and bring the grain to the highest possible standard of cleanliness before being sacked. It was also the duty of the provincial representatives to take representative samples of each car that was sent out. These samples were collected daily from the Winnipeg cleaning elevators and stored in the office of the chief grain inspector. When the work of cleaning was completed at Brandon, Moosejaw and Regina, samples of the cars sent out from these points were also sent to the office of the grain inspector at Winnipeg. An analysis was made of each of these samples by Seed Inspector E. D. Eddy, results of which are given below. It is assumed that the samples taken from the recleaned car lots by the persons in direct charge of the cleaning operations for the provincial governments were representative of the bulk of grain contained by the car.

SUMMARY ANALYSIS.

From the detailed report given below, it will be seen that of the 545 samples of wheat analyzed, nearly all representing full car lots, 149, or 27 per cent, were entirely free from noxious weeds mentioned in section 6 of the Seed Control Act; 167 lots, or 31 per cent, while not entirely free from noxious weeds, contained not more than one per pound, thus conforming to the provisions of the Seed Control Act; 165 lots, or 30 per cent, contained more than one noxious weed seed per pound, but not more than five or about one twenty-fifth of one per cent; while 64 lots, or 12 per cent, contained more than five noxious weed seeds per pound. All of the seed wheat sent out had to be selected from commercial grain, but after cleaning 58 per cent of it was of such quality that it could have been sold as seedsmen's stock under the Seed Control Act.

Of the oats, those purchased in western Canada were by far the most badly contaminated with noxious weed seeds. Of the 201 lots analyzed, 16, or eight per cent, were free from the weed seeds mentioned in section 6 of the Seed Control Act; 16, or eight per cent, not entirely free from noxious weeds, contained not more than one per pound; 63 lots, or 32 per cent, contained over one noxious weed seed per pound, but not more than five; while 106 cars, or 52 per cent, contained over five noxious weed seeds per pound. With the exception of four cars, all of the oats supplied from Ontario conformed to the provisions of the Seed Control Act. Four wild oats per pound was the highest proportion of impurities shown in any of the Ontario oats cleaned at Winnipeg.

Of the 61 lots of Prince Edward Island oats examined, 47, or 77 per cent were entirely free from noxious weed seeds, while all the rest conformed to the Seed Control Act, with the exception of two cars, which contained a fraction over one wild oat per pound. The wild oats in the Prince Edward Island oats were of the smooth white variety.

Of the 200 samples of recleaned British oats examined, 56, or 28 per cent were entirely free from noxious weed seeds; 85, or 42½ per cent, contained not more than one wild oat per pound, while 59, or 29½ per cent, contained more than one wild oat per pound, but not more than five, the latter number being shown in only a few instances.

Of the 40 lots of barley analyzed, one was entirely free from noxious weed seeds, 13 contained not more than one per pound, 22 contained more than one but not over

five per pound, while four contained more than five per pound, eight wild oats being the highest proportion of impurities shown.

During the process of recleaning, a few cars of seed grain were accidently mixed with oats badly contaminated with wild oats. This was made possible by the fact that some of the cleaning elevators could not be entirely given over to the cleaning of the government seed, and in handling their private business some badly contaminated oats were received into the elevators. The small quantity of these oats that was retained in the elevator bins and boots was sufficient to considerably affect the purity of the car of seed taken in immediately after the commercial oats were handled. As a result of this, two or three cars of wheat show a slightly higher number of wild oats per pound, after being cleaned, than was allowed by the standard of inspection. A few cars of oats cleaned at Winnipeg and Fort William were also affected in this way. In most of these cases, the mixed cars were detected and were not distributed for seed. The cars rejected in this way are starred in the list given below.

GERMINATION QUALITIES.

Actual germination tests of wheat and barley supplied were not considered necessary as the vitality of these grains can be pretty accurately estimated by appearance. Samples containing any considerable proportion of thin or shrunken grains were rejected, even though they might grade high enough to be accepted.

The oats distributed direct from Ontario were not submitted to the germination test, as their vitality was considered unquestionable. In the case of the oats purchased at Edmonton, also, the germination test was not considered necessary, as the grain was all of the 1906 crop and quite free from injury. With the exception of the cases mentioned, the oats were put in for germination test as soon as purchased, and any that came below 70 per cent were reported to Mr. Castle as soon as the results were out. Mr. Castle found it impracticable to hold all the grain until the report of the germination test was available, and in some instances the cars were cleaned and sent out before the test was completed.

Further germination tests were made, as explained above, of the car samples as billed out after cleaning, and these results show that of a total of nearly 200 cars, purchased in western Canada, only twelve showed less than 70 per cent germination, while the average was between 85 per cent and 90 per cent.

The average percentage germination of the 127 cars of western oats, cleaned at the Winnipeg elevators, was 88 per cent. Four cars germinated 100 per cent, 66 cars 90 per cent and under 100 per cent, 38 cars 80 per cent and under 90 per cent, 12 cars 70 per cent and under 80 per cent, and 7 cars below 70 per cent.

The 29 cars cleaned at Brandon averaged 85 per cent germination. Eleven cars were over 90 per cent, eleven cars were over 80 per cent and under 90 per cent, three cars were over 70 pr cent and under 80 per cent, and four cars were under 70 per cent.

The six cars cleaned at Regina averaged 85 per cent, the highest being 94 per cent and the lowest 81 per cent.

The 24 cars distributed from Calgary averaged 86 per cent. One car gave a germination of 100 per cent, nine cars were 90 per cent and under 100 per cent, eight cars were 80 per cent and under 90 per cent, five cars 70 per cent and under 80 per cent, and one car 66 per cent.

The seven cars of Ontario oats cleaned at Winnipeg averaged 95 per cent germination, the highest being 97 per cent and the lowest 91 per cent.

The 61 cars of Prince Edward Island oats cleaned at Winnipeg averaged 88 per cent, the highest being 100 per cent and the lowest 78 per cent. One car germinated 100 per cent, 25 cars 90 per cent and under 100 per cent, 33 cars 80 per cent and under 90 per cent, and two cars under 80 per cent.

The 133 cars of British oats cleaned at Winnipeg gave an average germination of 89 per cent, the highest being 99 per cent and the lowest 78 per cent. Fifty-nine cars

were over 90 per cent, 73 cars were 80 per cent and under 90 per cent, and one car below 80 per cent.

The 31 cars of British oats from the *Empress of Ireland* shipment, cleaned at Fort William, averaged 92 per cent germination, the highest being 99 per cent and the lowest 84 per cent. Twenty-four cars germinated 90 per cent and over and seven cars 84 per cent and under 90 per cent.

The 32 cars of British oats from the *Empress of Britain* shipment, cleaned at Fort William, averaged 88 per cent germination, the highest being 100 per cent and the lowest 76 per cent.

In the following detailed report all cars that were sampled after cleaning at Winnipeg, Brandon, Regina, Moosejaw and Fort William, and the samples retained in the chief inspector's office at Winnipeg, are included. The cars that were rejected after being cleaned and those that were recalled after being sent out, according to the list provided by Mr. Castle, are starred. The list therefore includes any cars that may have been cleaned and sampled but were not required for seed. In the case of the Calgary grain, only those cars that were distributed are included. All grain that was accepted by the inspector at Edmonton is included.

GEO. H. CLARK,
Seed Inspector.

RECLEANED Wheat Sampled at Winnipeg Cleaning Elevators.

Car Number.	Number of two bushel sacks in car.	Grade.	Kinds and number per lb. of Weed Seeds mentioned in Section 6 of Seed Control Act.	Impurities not Mentioned in Section 6 of Seed Control Act.
42,000	500	2 Nor	1 wild oat	Odd wild buckwheat.
73,000	441	1 "	1 wild oat in 2 lbs	" "
73,000	59	2 "	5 purple cockle, 2 cow cockle	" "
11,200	350		1 wild oat, 5 purple cockle, 1 cow cockle	A few tame oats.
44,200	111	No. 4	1 wild oat	Odd wild buckwheat.
44,200	378	3 Nor	2 wild oats	" "
15,300	350	No. 4	"	" "
54,500	525	1 Nor	1 p.c. in 2 lbs	Free.
41,400	500	1 "	15 purple cockle, 1 cow cockle	"
31,706	550	3 "	1 purple cockle in 2 lbs	Odd wild buckwheat.
32,800	510	1 "	1 wild oat, 1 cow cockle	" "
35,900	525	3 "	1 ball mustard in 2 lbs	" "
41,010	525	3 "	1 wild oat in 2 lbs	" "
43,110	500	No. 4	1 wild oat	" "
43,210	500	3 Nor	1 purple cockle	" "
49,210	327	3 "	1 w.o. in 2 lbs., 2 purple cockle	" "
49,210	173	1 "	2 w.o. 1 p.c., 1 c.c., 1 ball mustard in 2 lb	" "
37,410	525	3 "	Free	Free.
510		2 "	1 p.c., 1 c.c. in 2 lbs	Odd wild buckwheat.
32,510	500	1 "	1 p.c., 1 c.c.	" "
36,610	480	No. 4	1 w.o., 1 p.c. in 2 lbs	" " and tame oat.
28,810	350	1 Nor	1 w.o., 1 ball mustard	Free.
40,910	558	3 "	Free	Odd wild buckwheat.
93,910	500	3 "	1 w.o., 1 p.c. in 2 lbs	" "
52,020	94	2 "	3 w.o., 2 cow cockle	" "
52,020	406	1 "	Free	" "
40,220	525	1 "	1 purple cockle, 1 cow cockle	Free.
71,220	525	2 "	1 p.c. in 2 lbs.	Odd wild buckwheat.
40,420	550	1 "	1 w.o., 1 p.c	" "
38,520	525	3 "	1 w.o	" "
98,620	525	3 "	3 p.c. in 2 lbs	Occasional oat.
40,720	525	3 "	Free	Little wild buckwheat.
41,820	566	3 "	1 p.c. in 2 lbs.	Odd wild buckwheat.
43,820	525	3 "	Free	" " and tame oat.
71,920	550	3 "	2 p.c	Free.
37,130	525	3 "	1 w.o. in 2 lbs.	Odd wild buckwheat and tame oat.
38,430	550	3 "	Free	Free.
36,630	488	3 "	"	Odd wild buckwheat.
6,630	12	No. 4	1 w.o. in 2 lbs	" " and bl'ck oat.

RECLEANED Wheat Sampled at Winnipeg Cleaning Elevators.—*Continued.*

Car Number.	Number of two bushel sacks in car.	Grade.	Kinds and number per lb. of Weed Seeds mentioned in Section 6 of Seed Control Act.	Impurities not Mentioned in Section 6 of Seed Control Act.
37,630	525	3 Nor.	1 w.o.	Odd w. b. and w. sunflower.
41,730	148	1 "	1 w.o. in 2 lbs.	Occasional w. b. and vetch.
41,730	352	3 "	2 w.o.	A little wild buckwheat.
75,730	415	3 "	3 p.c., 1 c.c. in 2 lbs.	Odd tame oat.
830	425	1 "	1 w.o., 1 p.c., 5 c.c.	Free.
3,830	545	3 "	Free	Odd wild buckwheat.
147,930	500	2 "	1 w.o. in 2 lbs.	" "
57,930	.....	No. 4	Free	Odd wild buckwheat and tame oat.
37,040	525	3 Nor.	"	" " sunflower.
22,240	325	2 "	2 p.c., 2 c.c.	" "
72,240	550	No. 4	1 w.o., 1 p.c	" " and tame oat.
31,340	525	3 Nor.	1 ball mustard	" "
41,440	542	3 "	Free	" " and tame oat.
34,440	508	No. 4	"	" " and bl'ck oat.
52,740	500	"	6 w.o., 1 p.c	Considerable w.b.
47,740	500	3 Nor.	1 p.c. in 2 lbs	Odd tame oat.
147,740	498	3 "	Free	"
32,940	506	3 "	3 w.o	Odd w.b. and tame oat.
33,050	500	2 "	8 p.c., 2 c.c	" "
41,250*	424	No. 4	1 p.c. in 2 lbs.	" and black oat.
77,450	500	"	1 c.c., 1 ball mustard	Considerable w.b.
40,550	500	.....	3 w.o., 2 p.c., 1 c.c.	Odd w.b. and tame oat.
43,650	525	3 Nor.	1 p.c	" " "
36,750	500	3 "	Free	" " "
43,460	525	1 "	1 w.o., 1 c.c., 2 p.c. in 2 lbs.	A few tame oats.
19,460	350	No. 4	1 w.o. in 2 lbs.	Odd wild buckwheat.
78,660	500	3 Nor.	1 p.c., 1 c.c	" tame oat.
43,760	525	3 "	1 w.o	" "
45,760	107	2 "	1 p.c. in 2 lbs	" wild buckwheat.
45,760	393	3 "	1 w.o., 1 p.c., 1 c.c. in 2 lbs.	" " "
76,960	436	3 "	Free	" w.b. and tame oat.
76,960	64	2 "	1 w.o., 1 p.c	Free.
30,270	350	No. 4	1 c.c. in 2 lbs	Little wild buckwheat.
40,370	500	3 Nor.	1 w.o., 1 p.c. in 2 lbs	Odd wild buckwheat.
42,470	525	No. 4	Free	" w.b. and tame oat.
38,570	525	3 Nor.	1 p.c., 1 c.c	" black oat.
39,570	525	3 "	Free	A little wild buckwheat.
77,770*	315	3 "	1 p.c., 1 w.o. in 2 lbs	Odd w.b. and tame oat.
39,770	550	3 "	Free	" wild buckwheat.
35,970	510	2 "	"	" w.b. and 1 darnel in 2 lbs.
33,080	492	2 "	1 c.c	" wild buckwheat.
94,180	525	3 "	2 w.o., 1 p.c., 1 c.c., 1 ball mustard	" " "
25,480	350	1 "	2 w.o., 1 p.c.	Free.
42,580	525	.....	1 w.o. in 2 lbs	Odd wild buckwheat.
91,680	525	2 Nor.	2 w.o., 2 p.c., 1 ball mustard.	" " "
34,880	550	3 "	1 w.o., 2 p.c	" " "
57,390	400	2 "	1 w.o., 4 p.c.	" " "
48,490	525	.....	1 p.c., 1 c.c.	" " "
74,690	525	1 Nor.	4 p.c., 3 c.c	" w.b. and tame oat.
45,690	700	No. 4	1 w.o	Free.
2,790	314	1 Nor.	1 w.o., 1 p.c., 5 c.c	Odd wild buckwheat.
2,790	186	3 "	Free	" tame oat.
35,890	500	.....	3 w.o., 3 p.c., 1 c.c. in 2 lbs.	" wild buckwheat.
45,890	427	2 Nor.	2 p.c., 1 c.c.	" w.b. and tame oat.
45,890	89	1 "	2 w.c	" wild buckwheat.
2,990	522	3 "	Free	" w.b. and tame oat.
20,002	250	1 "	6 p.c., 1 c.c., 1 w.o. in 2 lbs.	A few tame oats.
42,002	525	2 "	1 w.o., 1 ball mustard.	Free.
44,002	525	3 "	Free	A little wild buckwheat.
38,202	500	3 "	2 c.c	Free.
39,402	525	3 "	Free	Odd w.b., tame oat.
302,502	500	2 "	2 p.c.	" wild buckwheat.
91,602	100	No. 4	1 p.c. in 2 lbs.	" " "
91,602	450	3 Nor.	2 w.o., 15 p.c., a little cow cockle.	" w.b. and tame oat.
13,602	343	3 "	Free	" wild buckwheat.

*41,250 This car also contains 101 sacks 3 Nor.
*77,770 This car also contains 67 sacks No. 4 and 3 sacks 2 Nor.

RECLEANED Wheat Sampled at Winnipeg Cleaning Elevators.—*Continued.*

Car Number.	Number of two bushel sacks in car.	Grade.	Kinds and number per lb. of Weed Seeds mentioned in Section 6 of Seed Control Act.	Impurities not Mentioned in Section 6 of Seed Control Act.
40,702	525	2 Nor	Free	Odd w.b. and black oat.
31,702	233	No. 4	"	" " "
31,702	69	3 Nor	1 w.o. in 2 lbs	" wild buckwheat.
31,702	198	2 "	1 w.o., 7 p.c., 4 c.c. in 2 lbs	" " "
39,802	525	3 "	1 w.o., 1 c.c. in 2 lbs	" " "
43,902		No. 4	7 p.c., 1 w.o. in 2 lbs	" " "
54,902	550	3 Nor	Free	" " "
6,512	500	3 "	1 w.o. in 2 lbs	" " "
37,512	525	No. 4	"	" " "
38,612	545	3 Nor	Free	" w.b. and tame oat.
32,712	550	No. 4	2 p.c	Free.
34,712	500		1 c.c. in 2 lbs	Odd w.b., lambsquarters and tame oats.
74,812	500	1 Nor	2 c.c., 2 ball mustard	Odd wild buckwheat.
92,022	537	2 "	1 w.o	" w.b. and tame oat.
43,112	525	3 "	Free	" wild buckwheat.
42,222	516	3 Nor	"	" w.b. and tame oat.
14,222	350	No. 4	"	" " "
43,322	525	" 4.	1 p.c. in 2 lbs	" wild buckwheat.
37,422	525	" 4.	1 w.o	" "
42,522	500	" 4.	1 w.o., 1 p.c., 1 c.c. in 2 lbs	" w.b. and tame oat.
30,622	525	" 4.	1 w.o. in 2 lbs	" w.b. and tame oat and a little smut.
29,722	525	3 Nor	1 p.c	Odd black oat.
57,822	550	3 "	1 w.c., 7 p.c. in 2 lbs	" tame oat.
145,922	600	3 "	1 w.o. in 2 lbs	" wild buckwheat.
30,922			Free	Considerable w.b., odd wild sunflower and tame oat.
74,032*	334	2 Nor	11 w.o	Odd w.b. and vetch.
40,232	525	3 "	2 w.o., 2 p.c	" and tame oat.
31,232	500	No. 4	4 w.o., 2 p.c	" "
43,432	500	3 Nor	1 w.o. in 2 lbs	Odd wild buckwheat.
42,532	525	No. 4	Free	Free.
73,832		3 Nor	1 w.o. in 2 lbs	Odd wild buckwheat.
91,932	525	2 "	1 w.o., 6 p.c., 4 c.c. in 2 lbs	" "
38,042	500	3 "	1 c.c. in 2 lbs	" "
52,142	502		Free	Odd w.b. and tame oat.
43,242	200	Sa	2 p.c., 3 c.c., 1 ball mustard	A little w.b. and considerable mixture of oats.
43,242	300		5 p.c., 5 c.c	A little wild buckwheat.
48,342	500	1 Nor	1 w.o. in 2 lbs	Odd wild buckwheat.
58,342	233	1 "	1 w.o., 1 c.c. in 2 lbs	" "
58,342	267	2 "	2 w.o., 5 p.c., 5 c.c	Free.
4,442		2 "	1 w.o., 7 p.c., 1 c.c	Odd vetch and barley grain.
52,642	500	2 "	Free	" wild buckwheat.
38,742	500	3 "	"	" "
40,842	525	3 "	1 w.o	Considerable w.b.
39,842	525	No. 4	1 c.c., 1 p.c. in 2 lbs	Odd wild buckwheat.
91,942	517		1 w.o., 2 p.c., 1 c.c	A little wild buckwheat.
38,052		3 Nor	Free	Odd wild buckwheat.
49,152	350	No. 4	"	" "
51,552	528	3 Nor	"	" w.b. and wild sunflower.
45,552	496	2 "	2 p.c., 1 c.c	A few tame oats.
142,852	618	3 "	4 p.c., 1 c.c	Odd w.b. and tame oat.
94,852	396	No. 4	1 p.c., 4 c.c	" " "
47,852	356	1 Nor	5 p.c., 1 c.c	Free.
47,852	144	3 "	1 w.o., 10 p.c. in 2 lbs. also some cow cockle	Odd wild buckwheat.
15,952	350	1 "	1 w.o. in 2 lbs	" "
32,952	538	2 "	1 w.o., a little hare's-ear mustard.	" "
37,952	525	No. 4	2 w.o	" "
31,062	547	3 Nor	2 w.o	" "
146,062	700	3 "	Free	" "
57,162	525	No. 4	1 w.o	" "
4,162	499	3 Nor	Free	" "

*74,032. This car was not distributed.

RECLEANED Wheat Sampled at Winnipeg Cleaning Elevators.—*Continued.*

Car Number.	Number of two bushel sacks in car.	Grade.	Kinds and number per lb. of Weed Seeds Mentioned in Section 6 of Seed Control Act.	Impurities not Mentioned in Section 6 of Seed Control Act.
35,162	500	No. 4	2 w.o., 9 p.c	Odd w.b. and tame oat.
36,362	541	3 Nor	1 p.c. in 2 lbs	" wild buckwheat.
18,362	344	3 "	6 p.c., 2 c.c.	Free.
*1,462	514		2 p.c	"
94,462	550	3 Nor	1 w.o., 4 p.c.	A few tame oats.
3,862	500	2 "	1 w.o.	Odd wild buckwheat.
57,862	350	3 "	1 w.o., 1 p.c. in 2 lbs	" tame oat.
90,962	550	3 "	3 w.o., a little w.b.	A little wild buckwheat.
39,172	492	1 "	2 p.c., 3 c.c.	Odd wild buckwheat.
58,272	550	No. 4	1 w.o., 1 p.c., 2 c.c. in 2 lbs	" "
3,372	500	3 Nor	1 w.o., 2 p.c. in 2 lbs	" "
55,372	525	No. 4	1 p.c. in 2 lbs	" "
26,372	350	3 Nor	1 p.c., 1 c.c. in 2 lbs	" "
36,372	500	1 "	6 p.c., 2 c.c.	" w.b. and tame oat.
38,872	550	No. 4	1 w.o., 4 p.c.	Free.
15,972	350	3 Nor	1 p.c in 2 lbs	1 black oat in 2 lbs.
59,972	525	2 "	Free	1 w.b. per lb.
48,082	500	No. 4	3 w.o., 2 p.c., 1 c.c.	Considerable w.b.
59,182	520	2 Nor	1 w.o., 7 p.c., 3 c c	Odd w.b. and tame oat.
27,282		No. 4	1 w.o	Odd lambsquarter and tame oats.
71,382	500	2 Nor	1 w.o., 2 p.c., 2 c.c.	Odd wild buckwheat.
41,482	500	3 "	1 c.c. in 2 lbs	Some wild buckwheat.
91,582	500	3 "	1 ball mustard in 2 lbs	Odd wild buckwheat.
41,782	525	3 "	1 w.o., 1 c.c. in 2 lbs	Odd w.b. and tame oats.
38,882	500	1 "	1 w.o. in 2 lbs	Odd wild buckwheat.
38,882	525	3 "	1 w.o., 2 p.c., 1 c.c.	" "
71,092	500	3 "	Free	Odd w.b. and tame oat.
*33,492	197	3 "	1 w.o. in 2 lbs	Odd wild buckwheat.
40,692	525	1 "	1 w.o., 3 c.c. in 2 lbs	" "
41,692	333	No. 4	1 w.o., 1 ball m. in 2 lbs	Occasional wild buck.
41,692	167	1 Nor	2 w.o., 1 p.c.	Odd wild buckwheat
27,792		2 "	1 w.o. in 2 lbs	" "
37,792 C.P.R	525	No. 4	1 p.c. in 2 lbs	" "
37,792 C.N.R.	525	3 Nor	1 w.o., 3 p.c, in 2 lbs	" "
892	515	3 "	1 w.o. in 2 lbs	" "
57,992	352	1 "	1 p.c.	" "
57,992	148	3 "	Free	" "
3,263	520	2 "	3 p.c., 3 c.c.	" "
44,104	534	3 "	Free	Odd w.b. and tame oat.
4,404	477	3 "	Free	Odd wild buckwheat.
26,404	350	2 "	2 w.o., 4 p.c., a little c.c	" "
41,504		No. 4	Free	Odd w.b., oats and flax.
42,604	500	3 Nor	3 w.o., 2 p.c., 1 c.c	Free.
91,704	550	No. 4	1 w.o	Odd wild buckwheat.
71,804	500	2 Nor	2 w.o., 3 p.c	" "
39,904	525	1 "	1 c.c. in 2 lbs	Odd w.b. and vetch.
48,014	525	3 "	2 w.o., 1 p.c., 1 c c. in 2 lbs.	Odd w.b. and tame oat.
17,114	250	No. 4	1 w.o., 1 p.c. in 2 lbs	Odd wild buckwheat.
51,514	500	3 Nor	1 w.o., 2 p.c., 6 c c. in 2 lbs	Free.
41,614	525	3 "	2 w.o., 1 p c	Odd wild buckwheat.
350,614	350	1 "	1 w.o. in 2 lbs	" "
1,714	500	3 "	1 p.c., 1 c.c. in 2 lbs.	" "
43,814	500	3 "	Free	" "
24,914	350	1 "	3 w.o., 1 p.c., in 2 lbs	" "
39,021			1 w.o., 1 p.c	Odd w.b. and tame oat.
43,224	500	3 "	1 w.o., 7 p c	Odd tame oat.
36,224	500	2 "	3 w.o., 3 p.c	Odd wild buckwheat.
26,324	163	2 "	2 p c., 1 c.c	Free.
26,324	162	3 "	1 w.o., 1 p.c., 4 c.c	"
78,324	525	3 "	1 w.o., 2 p.c. in 2 lbs	Odd wild buckwheat.
93,424		3 "	1 c c. in 2 lbs	Free.
25,424	350	3 "	Free	Odd wild buckwheat and tame oat.
73,624	525	1 "	1 w.o., 2 p.c.	Odd vetch and tame oat

*1,462. This car was not distributed.
*33,492. Balance of this car loaded with 2 Nor. wheat.

RECLEANED Wheat Sampled at Winnipeg Cleaning Elevators.—*Continued.*

Car. Number.	Number of two bushel sacks in car.	Grade.	Kinds and number per lb. of Weed Seeds Mentioned in Section 6 of Seed Control Act.	Impurities not Mentioned in Section 6 of Seed Control Act.
144,824	702	No. 4	Free	Odd w.b. and black oat.
147,924	500	2 Nor	1 w.o., 1 p.c	Odd wild buckwheat.
56 034	500	No. 4	1 w.o., 10 p.c., 3 c.c	" "
72,234	529	3 Nor	1 c.c. in 2 lbs	Odd w.b. and tame oats.
43,234	500	1 "	1 w.o. in 2 lbs	Odd wild buckwheat.
*43,834	381	No. 4	2 p.c., 1 c.c	" "
25,044	350	1 "	1 w.o., 3 c.c	" "
43,244	525	3 "	1 w.o., 1 p.c	" "
55,244	544	3 "	Free	" "
48,344	500	2 "	1 w.o	" "
39,344	525	3 "	1 p.c. in 2 lbs	Odd tame oats.
36,744	528	3 "	1 w.o. in 2 lbs	Free.
38,844	525	3 "	1 w.o. in 2 lbs	"
35,944	525	3 "	Free	Odd w.b. and tame oats.
554		3 "	"	Odd wild buckwheat.
42,654	478	2 "	1 w.o., 2 p.c., 1 c.c., 1 ball m	Free.
43,754		3 Nor	1 w.o. in 2 lbs	Odd wild buckwheat.
38,754	473	1 "	1 w.o	" tame oat.
43,854	525	3 "	3 p.c., 1 p.c	" wild buckwheat.
42,954	320	3 "	Free	" " "
42,954	180	1 "	1 w.o., 1 c.c., 5 p.c. in 2 lbs	" " "
40,164	525	3 "	Free	" w.b. and tame oats.
144,164	600	3 "	1 p.c	" " " "
36,264	543	3 "	2 p.c., 1 c.c	" "
75,364	439	1 "	Free	" "
40,464	550	No. 4	"	" "
302,464	500	2 Nor	1 w.o., 7 p.c., 1 c.c	" "
19,464	350	3 "	2 p.c. and considerable c.c	" "
29,564	325	2 "	2 w.o., 5 p.c., 5 c.c	" "
58,864	440	3 "	Free	" "
58,864	60	1 "	"	" "
42,674		3 "	"	" "
39,674	525	3 "	"	" " and black oats.
46,774	534	3 "	"	" "
92,874	525	1 "	1 w.o., 5 ball mustard in 2 lbs	" tame oats.
94,874	539	3 "	1 c.c. in 2 lbs	" w.b. and tame oats.
2,974	509	3 "	Free	" " " "
40,080		No. 4	"	" "
44,284	500		"	" "
9,284		3 Nor	1 wild mustard	Free.
44,384	530	2 "	Free	Odd w.b.
52,684	550	No. 4	1 w.o., 3 p.c	" " and tame oats.
54,684		No. 4	Free	" "
38,784	500	No. 4	"	" " and tame oats.
39,984	523	3 Nor	1 c.c. in 2 lbs	" " and black oats.
71,094	550	No. 4	1 w.o., 1 c.c. in 2 lbs	" "
33,044	351	3 Nor	1 p.c. in 2 lbs	" "
33,094	149	No. 4	Free	" "
44,094	525	1 Nor	"	" " and vetch.
43,394	525	2 "	1 w.o. in 2 lbs	" grain of barley.
76,694	525	3 "	1 c.c. in 2 lbs	" w.b. and tame oats.
38,894	525	1 "	2 w.o., 2 p.c., 1 ball mustard	" "
78,894		3 "	7 w.o., 12 p.c., 1 c.c., 1 hare's-ear mustard	" " and tame oats.
78,894			2 w.o., 1 p.c., 3 c.c	" " " "
42,994	525	3 "	Free	" " " "
92,106	525	No. 4	"	" " black oats.
40,206	525	3 Nor	"	" "
72,206	550	3 "	5 p.c	" tame oat.
43,206	536	3 "	Free	" w.b. and tame oats.
40,306	214	3 "	"	" "
40,306	286	2 "	1 w.o., 1 p.c. in 2 lbs	" "
44,306	525	3 "	1 p.c. in 2 lbs.	" vetch and tame oats.
72,406	525	3 "	1 w.o	" w.b.
98,606	525	2 "	2 p.c., 1 c.c.	" tame oat.
2,706	525	No. 4	1 w.o	" " "

*43,834. The balance of this is loaded with 2 Northern wheat.

RECLEANED Wheat Sampled at Winnipeg Cleaning Elevators.—*Continued.*

Car Number.	Number of two bushel sacks in car.	Grade.	Kinds and number per lb. of Weed Seeds mentioned in Section 6 of Seed Control. Act.	Impurities not Mentioned in Section 6 of Seed Control Act.
74,706	517	3 Nor.	Free	Odd w.b. and tame oat.
26,806	350	3 "	3 w.o., 6 p.c. in 2 lbs	" " " "
74,016	151	1 "	Free	" " 1 darnel in 2 lbs.
74,016	374	No. 4	1 w.o. in 2 lbs	Free.
24,216	250	1 Nor.	1 w.o	Odd w.b.
24,216	100	3 "	3 w.o. in 2 lbs	" tame oat.
37,216	55	No. 4	Free	" w.b. and tame oats.
37,216	415	1 Nor.	1 w.o	" "
146,416	434	1 "	Free	" "
43,516	553	3 "	"	" " and tame oats.
142,916	111	3 "	"	" "
142,916	489	2 "	3 w.o., 1 p.c	" "
41,916	506	1 "	Free	" "
38,026	526	3 "	"	" " and black oats.
410,126	540	3 "	"	" "
40,226	525	3 "	1 c.c. in 2 lbs	" "
24,226	350	1 "	1 w.o., 1 p.c	" "
25,226	350		2 p.c., 1 c	" " and tame oats.
72,426	525	3 "	1 p.c., 1 w.o., 1 c.c. in 2 lbs	" " " "
147,426	700	No. 4	1 w.o. in 2 lbs	Free.
78,526	544	1 Nor.	1 " "	Odd w.b.
43,626	535	1 "	Free	" "
4,136	525	3 "	"	Odd tame oats.
58,336	525	1 "	1 w.o. in 2 lbs	Odd w.b.
36,736	525	3 "	1 w.o.	" "
37,736	525	1 "	1 "	" "
58,936	204	3 "	2 p.c., 2 c.c	" "
58,936	296	2 "	1 w.o., 2 p.c., 4 c.c	" "
36,046	500	3 "	6 p.c., 7 c.c	" " and tame oat.
40,146	500	3 "	1 p.c., 5 c.c	" "
94,146	550	3 "	1 w.o., 3 p.c., 1 c.c	" " " "
42,246	525	3 "	Free	" "
24,246	350	3 "	1 w.o. in 2 lbs	" " and black oat.
37,446	525	No. 4	Free	" "
75,646	558	1 Nor.	"	" "
38,646	500	1 "	9 p.c., 8 c.c., 1 w.o	" "
37,746	525	3 "	1 w.o. in 2 lbs	" "
140,846	500	3 "	Free	Odd tame oat.
46,846	513	3 "	4 p.c., 6 c.c	" w.b.
41,056		2 "	3 p.c	" tame oat.
147,256	700	2 "	2 w.o	" w.b.
2,356	525	1 "	1 p.c., 1 c.c	" "
40,456	500	3 "	Free	" "
90,456		2 "	3 p.c	" " and tame oat.
43,456	525	3 "	3 p.c., 1 c.c	" "
36,456	500	1 "	1 c.c. in 2 lbs	" "
46,456	525	2 "	1 w.o., 3 p.c., 1 c.c. in 2 lbs	Free.
41,556	525	3 "	1 w.o., 3 p.c., 4 c.c., ball mustard.	"
46,556	525	3 "	1 w.o., 4 c.c., 2 ball mustard	Odd w.b.
37,556	538	No. 4	1 p.c	" "
57,556	500	2 Nor.	1 w.o., 5 p.c., 6 c.c. in 2 lbs	" "
43,756	500	No. 4	1 w.o	" "
13,856	350	3 Nor.	1 ball mustard in 2 lbs	" "
144,856	600	3 "	3 w.o., 1 p.c., 2 c.c. in 2 lbs	" "
77,856	525	3 "	Free	" " tame oat.
147,266	550	3 "	1 w.o., 5 c.c. in 2 lbs	Free.
41,466	429	2 "	1 w.o., 4 p.c., 5 c.c. in 2 lbs	Odd w.b.
41,466	71	No. 4	Free	" " and tame oat.
44,466	540	3 Nor	"	" "
92,766	466	3 "	7 p.c., 5 c.c	" "
141,866	600	1 "	1 p.c	" black oat.
36,866	500	3 "	Free	" w.b. and tame oat.
37,966	505	3 "	"	" "
41,176	479	2 "	1 w.o. in 2 lbs	" " and black oats.
41,176	46	3 "	4 w.o., 1 p.c., 1 c.c., 1 ball mustard	" "
42,276	525	3 "	1 w.o., 1 p.c. in 2 lbs	" "
94,276	525	3 "	Free	" "

RECLEANED Wheat Sampled at Winnipeg Cleaning Elevators.—*Continued.*

Car Number.	Number of two bushel sacks in car.	Grade.	Kinds and number per lb. of Weed Seeds mentioned in Section 6 of Seed Control Act.	Impurities not Mentioned in Section 6 of Seed Control Act.
72,376	517	3 Nor	1 w.o., 1 c.c. in 2 lbs	Odd b.w.
144,576	329	1 "	1 w.o., 3 p.c., 1 c.c	" "
144,576	171	3 "	3 w.o	" "
4,876	350	3 "	1 w.o., 10 p.c. in 2 lbs	Free.
12,976		3 "	3 w.o., 2 p.c	"
76,976	500	2 "	Free	Odd w.b. and tame oats.
20,086	220	No. 4	1 w.o. in 2 lbs	" "
20,086	153	1 Nor	1 p.c., 1 c.c	" "
41,186	500	No. 4	Free	" " and tame oat.
4,386	525	3 Nor	"	" "
37,486	525	No. 4	1 w.o	" "
2,586	372	1 Nor	1 p.c., 3 c.c. in 2 lbs	" tame oat.
2,586	128	2 "	1 w.o., 4 p.c., 3 c.c. in 2 lbs	" w.b.
41,786	542	2 "	1 w.o	" tame oat and barley.
47,786	550	No. 4	Free	" lambs quarters.
34,886	521	3 Nor	"	" w.b.
92,096	500	No. 4	"	" "
71,196	525	3 Nor	1 c.c. in 2 lbs	" " and tame oats.
41,196	415	1 Nor	Free	Free.
93,196	544	2 "	4 p.c., 1 c.c	Odd w.b. and tame oats.
55,296	512	2 "	9 p.c	" "
37,596	526	2 "	1 w.o., 1 c.c. in 2 lbs	" vetch.
57,596	501	1 "	1 w.o. in 2 lbs	" "
38,596*		2 "	4 p.c., 1 c.c	Considerable mixture white oat.
39,596	440	3 "	1 w.o., 5 p.c. in 2 lbs	Odd w b.
39,596	60	No. 4	1 w.o. in 2 lbs	"
347,696		3 Nor	Free	" and black oat.
42,796	340	3 "	"	" "
53,796		3 "	1 p.c. in 2 lbs	" "
42,896	500	3 "	1 w.o. in 2 lbs	" tame oat.
38,896	500	No. 4	Free	" w.b.
25,996		2 Nor	4 w.o	" "
90,008	500	2 "	Free	" "
40,508	525	No. 4	"	" " and tame oat.
39,608	550	1 Nor	1 w.o. in 2 lbs	" " tame oat and barley.
40,708	500	3 "	2 p.c., 1 c.c	" w.b.
76,808	525	1 "	1 w.o. in 2 lbs	" "
144,908	426	2 "	1 w.o., 1 p.c., 1 c.c	" "
144,908	74	1 "	1 w.o., 1 p.c., 2 c.c. in 2 lbs	" "
38,908	447	No. 4	1 w.o. in 2 lbs	" " and black oat.
38,908	53	3 Nor	Free	" " "
147,218	393	3 "	"	" "
147,218	107	2 "	3 w.o. in 2 lbs	" "
34,518	555	3 "	1 w.o., 1 p.c	" "
44,518	525	1 "	1 w.o., 2 p.c., 3 c.c. in 2 lbs	" tame oat.
39,518	500		1 p.c., 1 c.c	" w.b.
43,618	525	1 Nor	2 w.o., 1 p.c., 3 c.c. in 2 lbs	Free.
36,818	525	3 "	1 w.o., 1 p.c. in 2 lbs	Odd w.b., sunflower and tame oat.
145,028	600	3 "	2 p.c	Odd w.b.
36,028	525	2 "	3 p.c., 4 c.c.	" "
38,328	525	3 "	1 w.o., 3 p.c., 1 c.c. in 2 lbs	" "
3,428	500	1 "	1 p.c., 1 c.c	" "
36,728	500	3 "	1 c.c., 1 p.c. in 2 lbs	" tame oat.
44,828	500	3 "	2 p.c., 2 c.c	" w.b.
54,828	506	1 Hard	Free	Free.
93,928	370	2 Nor	5 w.o	Odd w.b. and vetch.
93,928	180	3 "	Free	Free.
43,038	525	3 "	"	Odd w.b.
59,138	550	No. 4	1 w.o. in 2 lbs	" tame oat.
13,238	325	2 Nor	2 w.o., 5 p.c	" "
56,338	500	1 "	1 w.o., 1 p.c., 1 ball mustard 2 lbs.	" w.b.
44,538	525	1 "	1 w.o., 1 c.c	" "
37,638	525	No. 4	1 w.o. in 2 lbs	" "
38,638	530		1 ball mustard	" " and tame oat.
39,638	350	3 Nor	Free	" "

* 38,596. This car was mixed with oats in the process of cleaning and was not distributed for seed.

SESSIONAL PAPER No. 25c

RECLEANED Wheat Sampled at Winnipeg Cleaning Elevators.—*Continued.*

Car Number.	Number of two bushel sacks in car.	Grade.	Kinds and Number per lb. of Weed Seeds mentioned in Section 6 of Seed Control Act.	Impurities not Mentioned in Section 6 of Seed Control Act.
36,738	500	1 Nor	1 w.o., 4 c.c. in 2 lbs	Odd w.b.
59,938	228	No. 4	Free	"
59,938	297	3 Nor	"	"
2,048	500	3 "	1 w.o	"
55,048	550		Free	" and tame oat.
22,148	303	No. 4	1 p.c., 1 c.c	"
55,248	500	1 Nor	1 p.c., 1 ball mustard	"
37,348		3 "	1 p.c	"
50,448	539	2 "	3 w.o	"
58,448	500	3 "	15 p.c., 1 c.c	" and tame oat.
76,548	525	3 "	1 c.c	" "
1,648	525	No. 4	Free	" and black oat.
47,648	525	1 Nor	"	Free.
57,648*	504	No. 4	16 w.o., 2 p.c., 2 c.c., 2 hare's-ear mustard	Badly mixed with oats.
18,648	350	No. 4	Free	Odd w.b. and black oats.
42,748	500	No. 4	1 w.o. in 2 lbs	" and tame oats.
144,748	700	3 Nor	2 w.o., 3 p.c	"
40,848	500	2 "	2 w.o., 9 p.c. in 2 lbs	"
48,948	500	3 "	4 p.c., 2 c.c	"
36,058	500	3 "	3 w.o	"
146,058	360	No. 4	4 p.c	" "
146,058	340	3 Nor	4 p.c	"
38,158	525	3 "	1 hare's ear mustard, considerable c.c	Free.
57,258		2 "	6 p.c., 6 c.c., 2 hare's-ear mustard	Considerable w.b.
41,358	521	2 "	1 p.c	Odd w.b. and tame oat.
32,358	547	3 "	Free	" "
4,358	512	2 "	1 w.o., 7 p.c. in 2 lbs	Odd tame oats.
39,358	495	3 "	Free	Odd w.b.
71,458	425	3 "	1 p.c	" tame oat and barley.
658	525	3 "	2 p.c., 1 c.c	"
40,068	525	3 "	1 w.o., 3 c.c	"
41,068	500	3 "	1 w.o. in 2 lbs	"
59,068*	300	3 "	Free	" and tame oat.
37,168	525	2 "	4 p.c., 1 c.c	Free.
39,268	500	3 "	Free	Odd w.b.
1,368	370	3 "	"	" and tame oat.
1,368	130	1 "	"	"
75,368	525	1 "	10 p.c., 3 c.c	" "
147,558	681	2 "	3 p.c., 5 c.c	"
42,868	205	No. 4	Free	" "
42,868	295	3 Nor	2 p.c	" "
72,868		3 "	Free	"
37,868	525	3 "	1 p.c., 1 w.o. in 2 lbs	Odd tame oat.
147,868	301	3 "	1 c.c. in 2 lbs	Odd w.b. and black oats.
147,868	199	1 "	1 w.o., 1 p.c., 4 c.c. in 2 lbs	"
42,078	500	No. 4	1 w.o. 1 c.c. in 2 lbs	" and tame oats.
58,078	500	3 Nor	10 p.c., 1 c.c	Odd tame oats.
39,078	491	3 "	1 w.o., 1 p.c., 4 c.c	Odd w.b.
54,178	525	1 "	1 w.o., 4 p.c., 1 ball mustard in 2 lbs	" and tame oats.
31,278			5 w.o., 1 ball mustard	" lambsquarters and tame oats.
42,278	500	No. 4	Free	" tame oats and barley.
15,278	350	3 Nor	1 w.o., 1 c.c., 2 ball mustard	"
36,378	550	No. 4	3 w.o., 2 p.c	"
45,478	532	3 Nor	Free	" and tame oats.
43,578	550	3 "	5 p.c., 1 c.c., 1 w.o in 2 lbs	Odd tame oats.
43,678	500	No. 4	3 w.o	Odd w.b.
37,678	525	3 Nor	Free	"
44,778		3 "	1 w.o. in 2 lbs	"
39,778	525	3 "	1 w.o., 1 p.c. in 2 lbs	"
39,878	198	No. 4	Free	" and tame oat.

* 57,648. This car was mixed with oats in the cleaning elevator, which accounts for the large amount of impurities.

* 59,068. Balance of this car loaded with oats.

RECLEANED Wheat Sampled at Winnipeg Cleaning Elevators.—*Continued.*

Car Number.	Number of two bushel sacks in car.	Grade.	Kinds and Number per lb. of Weed Seeds mentioned in Section 6 of Seed Control Act.	Impurities not Mentioned in Section 6 of Seed Control Act.
39,878	97	3 Nor	Free	Free.
39,878	205	1 "	1 w.o. in 2 lbs	"
38,188	506	2 Nor	1 w.o. in 2 lbs	Odd tame oats and vetch.
38,288	526	No. 4.	2 p.c	Odd w.b. and tame oats.
58,488	500	3 Nor.	1 w.o., 1 p.c., 1 c.c	" 1 darnel in 2 lbs.
40,788	525	1 "	5 p.c., 1 c.c	Free.
38,888	510	3 "	Free	Odd w.b. and black oats.
37,988	500	3 "	1 w.o	"
73,198	434	2 "	1 w.o., 5 p.c., 3 c.c	"
146,398	650	No. 4.	3 p.c., 1 c.c	"
77,398	525	1 Nor.	1 w.o. in 2 lbs	"
42,498	550	3 "	1 w.o. in 2 lbs	Odd tame oats.
16,498	325	2 "	3 p.c., 1 c.c	"
36,598	534	3 "	1 w.o.	"
25,698	177	3 "	2 c.c.	"
25,698	173	1 "	3 p.c., 1 c.c	"
22,798	350	No. 4.	1 c.c	Odd w.b.
78,798	481	2 Nor.	1 w.o., 3 p.c., 3 c.c.	" tame oat.
39,788	515	3 "	Free	" w.b.
42,998	499	1 "	1 w.o., 1 p.c., 2 ball mustard in 2 lbs	" "

WHEAT CLEANED AND SHIPPED FROM REGINA.

55,920	556	No. 4.	3 p.c. in 2 lbs	Odd tame oat.
47,550	508	3 Nor.	Free	" w.b.
90,732	558	3 "	Free	" " and tame oat.
38,142	537	No. 4	1 wild mustard	" lambsquarters.
43,752	536	3 Nor.	Free	" w.b. and tame oat
47,752	528	3 "	"	" "
55,852	480	3 "	"	" " and tame oat.
54,184	499	3 "	"	" "
10,925	494	3 "	"	" "
52,026	500	No. 4	1 w.o. in 2 lbs	" "
39,926	511	No. 4.	Free	" " and tame oat.
55,996	517	3 Nor.	1 c.c. in 2 lbs	" "
77,796	490	3 "	Free	" " and tame oat.
75,818	525	3 "	1 c.c. in 2 lbs	Free.

WHEAT CLEANED AND SHIPPED FROM MOOSEJAW.

59,320	510	No. 4.	3 p.c	Odd w.b.
42,802	504	No. 4.	1 p.c	" "
15,732	327	2 Nor.	4 c.c., 1 p.c.	" "
144,542	510	3 "	1 p.c., 4 c.c. in 2 lbs	" and tame oat.
71,672	449	3 "	1 w.o., 1 c.c. in 2 lbs	Free.
91,482	500	3 "	3 p.c., 1 c.c. in 2 lbs	"
32,792	500	3 "	1 w.o., 1 p.c., 2 c.c. in 2 lbs	Odd tame oat.
56,414	542		17 p.c., 3 c.c., 1 hare's-ear mustard	" w.b.
39,134	510	3 Nor.	1 p.c. in 2 lbs	Free.
56,354	518	1 "	4 p.c., 2 c.c	"
90,928	522	3 "	1 p.c.	Odd w.b.
146,348	510	3 "	1 p.c., 1 c.c., 1 h.e.m., 2 lbs	" lambsquarters.
145,378	523	2 "	1 stinkweed	" w.b.

WHEAT CLEANED AND SHIPPED FROM CALGARY.

The information given in the following summary report on the wheat cleaned and shipped from Calgary was compiled in the Calgary seed laboratory. In all cases the analysis takes into account only the weed seeds prohibited by the Seed Control Act, and is based on the official samples drawn by the grain inspector's staff for commercial grading. Each car was recleaned thoroughly after this analysis was made, so that the grain sent out would be of a considerably higher standard of purity than the report given herewith would indicate. In addition to the following list of cars which were distributed from Calgary, about fourteen car lots were inspected and accepted by the seed inspectors but were not required for seed purposes.

Car Number.	Grade.	Kinds and number, per pound, of Weed Seeds mentioned in Section 6 of Seed Control Act.
46,360	3 Northern	2 wild oats.
94,240	1 "	Free.
36,762	2 "	9 wild oats.
77,314	2 "	2 wild oats, considerable hare's-ear mustard.
17,174	2 "	1 wild oat.
73,116	1 "	1 wild oat.
32,926	2 "	6 wild oats.
77,236	2 "	4 wild oats, 1 ball mustard.
37,466	1 "	1 wild oat.
28,696	1 Hard	1 wild oat.
72,318	2 "	Free.
43,458		Free.
44,368	2 "	1 wild oat in 2 lbs.
92,488	3 "	1 wild oat in 2 lbs.

WHEAT PURCHASED AT EDMONTON.

The analysis of the wheat purchased at Edmonton as given below is based on the original inspection certificate. As at the other points, the grain was thoroughly cleaned after inspection. The car numbers are for the grain as it was purchased and these may or may not correspond with the car number as the grain was sent out.

Car Number.	Grade.	Kinds and number, per pound, of Weed Seeds mentioned in Section 6 of Seed Control Act.
39,212	2 Northern	Free.
2,174	2 "	2 wild oats, odd wild mustard.
38,046	1 "	Free.

SEED OATS BOUGHT IN WESTERN CANADA, CLEANED AND DISTRIBUTED IN WINNIPEG.

The following car lots of oats bought in western Canada were cleaned and distributed from Winnipeg. In nearly all cases these oats graded No. 2 white. Unless otherwise mentioned, each car was made up of one lot of oats and the one certificate covers the whole car.

Car Number.	Percentage of Seeds Germinable in Soil.	Kinds and number, per pound, of Weed Seeds mentioned in Section 6 of Seed Control Act.	Impurities not mentioned in Section 6 of Seed Control Act.
38,200*	100	4 wild oats	Odd wild buckwheat and black oat.
41,100	66	2 " " , 2 ball mustard	Free.
35,400	89	10 " " , 1 purple cockle	A few black oats.
75,210	82	20 " "	Odd wild buckwheat and black oats.
50,510	89	4 " "	Odd black oats.
144,710	100	6 " "	" "
98,910	72	16 " "	" "
141,420	88	20 " "	" "
58,620	91	4 " "	" "
59,920	91	Free	" " & w.b.
39,030	96	1 wild oat, 1 wild mustard, 1 ball mustard	Free.
42,630	100	2 wild oats	Odd black oat.
42,240	78	24 wild oats, 1 purple cockle	" "
73,240	97	1 wild oat	Odd wild buckwheat.
78,150	93	8 " "	Odd black oat
73,060	84	14 " "	" "
99,060	97	2 " "	Odd grain of wheat.
93,260	99	4 " "	Odd black oat.
39,460	94	8 " "	" "
41,170	93	6 " "	" " and wheat.
34,580	86	50 wild oats, 1 purple cockle, 1 ball mustard	Odd grain of wheat.
17,580	96	6 wild oats	" "
20,780	95	Free	Considerable black oats.
15,880	91	1 wild oat	Odd wild buckwheat.
56,090	96	1 " "	Odd black oat.
59,690	78	9 " "	Odd black oat and wild buckwheat.
144,402	87	4 " "	Free.
43,902	61	6 " "	Odd wild buckwheat.
49,112	92	16 " "	Odd black oat and wheat.
141,512	76	1 " "	Odd black oat.
15,912	91	2 cow cockle	Odd wild buckwheat.
44,222	95	2 wild oats	Odd black oat.
40,622	77	1 " "	" "
38,722	85	2 " "	A little wheat.
91,332	95	2 " "	Odd wild buckwheat and black oats.
35,632	93	6 " " , 4 ball mustard	Odd black oat.
53,242	48	15 " "	Free.
17,442	95	6 " "	Odd wild buckwheat.
38,642	95	6 " "	Odd black oat.
39,742	91	6 " " , a little ball mustard	" "
57,942	86	Free	Considerable flax.
30,052	93	6 wild oats	Odd black oat.
94,052	81	10 " "	" " and wild buckwheat.
31,752	80	10 " "	" "
41,062	98	20 " " , a little cow cockle	Free.
2,862	76	6 " "	Odd black oat.
44,272	84	4 " "	" "
76,472	81	1 " "	Odd wild buckwheat.
41,772*	98	12 " "	Odd black oat and wild buckwheat.
48,972	91	40 " "	" "
42,092	92	3 " "	Odd wild buckwheat and barley.
145,392	96	3 " "	Odd black oats and wild buckwheat.
44,592	89	24 " " , 1 cow cockle	" " and wheat.
39,204	99	5 " "	Odd wild buckwheat.
57,214	75	4 " "	Free.
71,414	95	10 " " , 2 ball mustard	Odd black oat.
52,914	93	6 " "	" "
147,914	95	4 " "	" "

*38,200 This car contains 384 sacks, 1 white, germinating 97%.
*41,772 This car, after being send out, was recalled and replaced.

SEED OATS BOUGHT IN WESTERN CANADA.—*Continued.*

Car Number	Percentage of Seeds Germinable in Soil.	Kinds and number per pound of Weed Seeds mentioned in Section 6 of Seed Control Act.	Impurities not mentioned in Section 6 of Seed Control Act.
87,024	97	10 wild oats, 2 cow cockle	Odd black oat and wild buckwheat.
40,724	98	2 " "	" " "
21,924	94	10 " " some ball mustard	Free.
91,134*	84	10 " "	Odd black oat and wild buckwheat.
21,334	99	2 " "	Odd wild buckwheat.
77,334	83	12 " "	Odd black oats.
4,434	97	12 " "	Odd wild buckwheat and black oat.
37,584	87	18 " "	Odd black oat.
35,834	86	4 " "	Odd wild buckwheat and black oat.
54,144	85	10 " "	" "
23,054	89	12 " "	" "
17,054	97	4 " "	" "
140,354*	97	15 " "	Considerable lambsquarters.
11,454	97	10 " " 4 ball mustard	Odd wild buckwheat.
93,454	93	4 " "	" " and black oat.
36,454	85	8 " "	Odd black oat and wheat.
141,754	91	10 " "	"
12,954	100	6 " "	Odd wild buckwheat and black oats.
19,074	82	18 " "	Odd wild buckwheat.
29,574	94	2 " "	Odd black oats.
140,774	94	8 " "	" and wheat.
93,384	51	2 " "	Odd wild buckwheat.
45,384	94	15 " " 4 purple cockle	" "
145,584	92	14 " " 4 ball mustard	Odd block oat.
38,584	92	6 " "	"
71,394*	86	6 " "	Odd wild buckwheat.
46,006	94	6 " "	Odd black oat.
53,106	93	4 " " 6 cow cockle, 4 ball mustard	Free.
146,406	69	4 " "	Odd wild buckwheat.
41,906	77	14 " "	Free.
50,416	72	8 " "	Odd black oat.
71,616	82	2 " "	Odd wild buckwheat.
49,026	81	20 " "	" " and black oat.
34,036	28	25 " " 2 purple cockle	" "
144,836	80	10 " "	Odd black oat.
42,936	88	16 " "	"
147,646	64	2 " "	Free.
71,656	96	8 " "	Odd wild buckwheat and black oat.
38,656	72	12 " "	Odd black oat.
51,076	93	4 " "	"
24,376	96	9 " "	Odd wild buckwheat and wheat.
22,886	89	16 " "	" "
98,896	78	53 " "	" "
52,996	87	Free	Odd black oat.
57,168	91	6 wild oats, 2 ball mustard	"
21,208	91	2 " "	"
74,308	92	4 " " 2 cow cockle, 2 purple cockle	Considerable wheat.
42,508*	89	Free	Odd wild buckwheat.
34,608	89	12 wild oats, 4 cow cockle, 6 ball mustard	Odd black oat.
140,218	88	4 " "	"
32,128	83	12 " "	"
45,228	98	2 " " 2 purple cockle	Odd wild buckwheat.
71,428	95	Free	" " and black oat.
43,638	80	25 " " 2 purple cockle	Odd black oat.
32,248	88	18 " " 2 "	" and wheat.
55,348	95	1 " "	"
76,158	84	4 " "	"
32,068	95	8 " "	"
42,068	73	4 " "	"
73,368	87	1 " "	Odd wild buckwheat.
54,368	96	8 " " 2 ball mustard	" " and black oat.
41,668	95	2 " "	" "
53,778	47	6 " "	Odd black oat.
40,878	83	10 " "	Odd wild buckwheat.

* 91,134 Above analysis is for 464 sacks, 2 white oats. Balance of car Prince Edward Island oats.
*140,354 Above analysis for 2 white oats. This car also contains 144 sacks No. 1 white oats.
* 71,394 This car, after being sent out, was recalled and replaced.
* 42,508 " " " " "

SEED OATS BOUGHT IN WESTERN CANADA.—*Continued.*

Car Number	Percentage of Seeds Germinable in soil.	Kinds and Number per pound of Weed Seeds mentioned in Section of Seed Control Act.	Impurities not mentioned in Section 6 of Seed Control Act.
21,488	98	10 wild oats	Odd black oats.
59,888	94	Free	"
56,298	98	2 wild oats	" and flax.
41,398	94	14 " 5 ball mustard	" and wild buckwheat.
35,398	96	3 "	"

OATS BOUGHT IN WESTERN CANADA, CLEANED AND DISTRIBUTED FROM BRANDON.

51,920	59	1 wild oat, 1 ball mustard	Odd black oat.
25,230	79	1 ball mustard	"
26,330	89	4 wild oats	Odd wild buckwheat and flax.
145,650	82	Free	Odd black oat and wheat.
21,960	92	6 wild oats	Odd wild buckwheat and wheat.
98,880	90	Free	Some black oats and wheat.
22,722	88	9 wild oats, 8 purple cockle	Considerable wheat.
29,142	94	12 wild oats	Odd wild buckwheat.
17,342	83	1 ball mustard	Odd black oat and wheat.
55,962	86	1 wild oat	" "
92,072	75	Free	" "
33,304	97	2 wild oats	Odd wild buckwheat and wheat.
33,304	90	22 "	Odd black oats.
71,124	91	3 " , 2 purple cockle	Some wild buckwheat and wheat.
75,534	68	25 "	Odd black oat.
72,444	69	1 wild oat	Odd wild buckwheat.
42,306	97	8 wild oats	"
28,716	88	3 "	Odd black oat and buckwheat.
40,326	89	1 wild oat	Some black oats and wheat.
98,596	85	1 "	Odd wild buckwheat.
53,008	87	1 "	Odd black oat and wild buckwheat.
20,408	93	2 wild oats	" wheat.
13,328	98	Free	Odd wild buckwheat and wheat.
47,448	53	6 wild oats	Odd black oat and wild buckwheat.
43,548	84	3 "	" wheat and barley.
46,548	91	7 "	Odd wild buckwheat and flax.
147,648	88	4 "	Odd black oat and wheat.
33,988	73	1 wild oat	"
34,568	96	1 "	" and wheat.

OATS BOUGHT IN WESTERN CANADA, CLEANED AND DISTRIBUTED FROM REGINA.

25,320	83	2 wild oats	Odd black oat.
40,670	84	5 "	Odd wild buckwheat and wheat.
54,912	82	1 " 1 ball mustard	" "
18,704	88	4 "	Odd black oat and wheat.
72,744	94	1 "	Odd wild buckwheat.
45,078	81	4 "	Odd black oat and wheat.

OATS BOUGHT IN WESTERN CANADA, CLEANED AND DISTRIBUTED FROM CALGARY.

As in the case of wheat, the analysis of the oats shipped from Calgary, given below, is based on the official samples drawn by the grain inspector's staff before the grain was cleaned. In all, 77 cars of oats were accepted by the seed inspectors in Calgary, but of this number only the following were distributed for seed:—

Car Number.	Percentage of Seeds Germinable in Soil.	Grade.	Kinds and Number, Per Pound, of Weed Seeds mentioned in Section 6 of Seed Control Act.
90,110	95	No. 2	Free.
46,210	72	No. 2	6 wild oats, 4 ball mustard.
44,130	99	No. 2	4 wild oats.
40,630	92	No. 3	4 wild oats, some ball mustard.
52,580	99	No. 2	Free.
53,502	73	No. 2	2 wild oats.
55,782	71	No. 2	14 wild oats, some ball mustard.
58,492	82	No. 3	10 wild oats, some ball mustard.
55,592	82	No. 3	10 wild oats, some ball mustard.
55,592	74	No. 3	4 wild oats, some ball mustard.
78,592	82	No. 2	12 wild oats, 12 ball mustard.
*49,404	74	No. 3	4 wild oats, some ball mustard.
92,214	82	No. 2	10 wild oats, some ball mustard.
41,954	95	No. 1	14 wild oats.
72,684	99	No. 2	Free.
57,094	75	No. 2	20 ball mustard.
*71,016	60	No. 3	8 wild oats, some ball mustard.
73,636	82	No. 3	4 wild oats.
77,296	82	No. 2	Some ball mustard.
57,308	92	No. 3	4 wild oats, some ball mustard.
53,228	96	No. 2	10 ball mustard.
74,738	97	No. 2	Free.
90,158	66	No. 2	2 wild oats.
72,758	83	No. 2	6 wild oats, 4 ball mustard.
48,688	87	No. 2	16 wild oats, some ball mustard.
73,208	100	No. 1	Free.

*These cars after being sent out, were recalled and replaced.

OATS PURCHASED AT EDMONTON.

The analysis of the oats purchased at Edmonton, as given below, is based on the original inspection certificate. As at the other points, the grain was thoroughly cleaned after inspection. The car numbers are for the grain as it was purchased, and these may or may not correspond with the car numbers as the grain was sent out. As was previously stated, these oats were of the 1906 crop, and germination tests were considered unnecessary.

Car Number.	Grade.	Kinds and Number, Per Pound, of Weed Seeds mentioned in Section 6 of Seed Control Act.
72,200	No. 1	20 wild oats, odd wild mustard.
38,242	No. 1	Free.
71,552	No. 1	18 wild oats, odd wild mustard.
58,852	No. 2	8 wild oats, odd wild mustard.
76,404	No. 2	18 wild oats.
78,154	No. 1	20 wild oats, odd ball mustard.
73,214	No. 1	18 wild oats, odd ball mustard.
37,394	No. 2	2 wild oats, odd ball mustard.
25,566	No. 1	22 wild oats, odd ball mustard.
90,386	No. 1	22 wild oats, odd ball mustard.
77,724	No. 3	20 wild oats, odd ball mustard.
91,004	No. 1	14 wild oats.
78,156	No. 1	12 wild oats.
92,546	No. 1	20 wild oats.
72,576	No. 1	14 wild oats.

ONTARIO OATS.

The following cars of oats were purchased in Ontario through the Steele, Briggs Company, and were cleaned and sacked before shipping to the western provinces. In all cases these oats were inspected under Seed Control Act standard, which limits the impurities to one noxious weed seed per pound.

Car Number	Grade.	Contents of Car.
24,320	No. 1.....	253 sacks Sensation, 58 sacks 20th Century, variety.
90,884	" 1.....	308 sacks (1,100 bush.) Ligowa variety.
33,416	" 1.....	1,200 bush. Sensation variety.
16,018	" 1.....	367 sacks Sensation variety.
41,754	" 1.....	1,200 bush. Dewdrop, 300 bush. Sensation.
14,582	" 1.....	250 sacks Sensation, 100 sacks Ligowa, 33 sacks 20th Century.
29,735	" 1.....	1,200 bush. 20th Century.
15,496	" 1.....	570 bush. Banner, 243 bush. Sensation, 759 bush. Prospect, 144 bush. 20th Century.
21,332	" 1.....	208 sacks Scottish Chief, 129 Ligowa, 95 Banner, 68 Tartar King.
15,681	" 1.....	220 sacks Scottish Chief, 110 sacks Banner, 70 sacks Ligowa, 100 Tartar King.
76,120	" 1.....	145 sacks Banner, 100 sacks Sensation.
78,132	" 1.....	1,500 bush. white oats (variety not named).

ONTARIO OATS CLEANED AND DISTRIBUTED FROM WINNIPEG.

Car Number.	Percentage of Seeds Germinable in Soil.	Grade.	Kinds and Number Per lb. of Weed Seeds mentioned in Section 6 of Seed Control Act.	Impurities not mentioned in Section 6 of Seed Control Act.
38,200*	97	No. 1.....	Free.....	Some buckwheat and wheat.
36,626	91	" 2.....	4 wild oats.....	Free.
48,476	94	" 1.....	1 wild oat.....	Odd grain of wheat.
98,404	94	" 1.....	4 wild oats.....	Odd wild buckwheat.
73,984	97	" 2.....	3 wild oats.....	Odd wild buckwheat.
94,686	96	" 1.....	Free.....	Odd grain of wheat.
54,878	97	" 1.....	3 wild oats.....	Odd vetch.

* Part of this car was loaded with No. 2 western oats.

PRINCE EDWARD ISLAND OATS.

The following cars of Prince Edward Island oats were cleaned and sacked at the Winnipeg cleaning elevators:—

Car Number.	Percentage of seeds Germinable in soil.	Kinds and Number per lb. of Weed Seeds mentioned in Section 6 of Seed Control Act.	Impurities not mentioned in Section 6 of Seed Control Act.
91,800	95	Free	Odd black oat and vetch.
21,320	94	"	" vetch and buckwheat.
76,520	87	"	" " "
93,620	86	"	" " "
77,140	90	1 wild oat in 1¼ lbs	" " barley.
41,170*	96	Free	" "
92,370	89	1 wild oat in 1¼ lb	" " and buckwheat.
90,880	94	Free	" " "
71,090	89	"	" " "
54,090	91	"	" " "
57,502	92	"	" " "
74,612	85	"	" " "
41,322	87	"	" " "
59,622	88	"	" " "
53,432	88	"	" " "
77,242	92	"	" " "
76,642	85	1 wild oat in 1¼ lb	" " "
49,252	92	Free	" " "
75,262	79	"	" " "
142,372	91	"	" " "
92,572	88	"	" " "
59,882	83	1 wild oat in 1¼ lb	" " "
54,592	95	Free	" " "
90,004	78	"	" " "
146,304	96	"	" " "
72,404	87	"	" " " and a little wheat.
50,904	89	1 wild oat in 1¼ lb	Odd black oat, buckwheat and barley.
38,914	90	Free	" and vetch.
91,134*	82	"	" vetch and buckwheat.
79,234	87	"	" " buckw. and barley.
98,864	91	2 wild oats in 1¼ lbs	" " and buckwheat.
45,074	100	Free	" " barley and buckw.
38,284	89	1 wild oat in 1¼ lb	" " "
55 384	82	Free	Odd vetch and buckwheat.
39,594	88	"	Odd vetch black oat, barley and wheat
91,306	87	"	" " " buckw.
77,806	84	"	" " "
56,626	80	"	" " "
44,236	90	"	" " "
38,436	93	1 wild oat in 1¼ lb	" " "
140,836	81	Free	" " "
72,156	85	"	" " "
74,266	81	"	" " "
51,466	86	"	" " "
46,676	80	"	" " wheat "
40,918	90	1 wild oat in 1½ lb	Odd black oat and buckwheat.
45,328	80	Free	" vetch, buckw. and barl.
49,328	92	1 wild oat in 1¼ lb	" " " " "
98,528	81	1 wild oat	" and vetch.
46,848	90	Free	" vetch, buckw. and barl.
40,558	92	1 wild oat in 1½ lb	" " "
93,268	93	Free	" " "
91,668	84	"	" and vetch.
53,768	86	"	" vetch and buckwheat.
76,378	91	"	" vetch, buck. and barley.
44,578	92	"	" vetch, buck. and wheat.
71,678	83	1 wild oat in 1¼ lb	" " "
90,778	94	Free	" vetch and buckwheat.
55,878	96	"	" " "
145,688	84	"	" vetch, buckw. and wheat.
75,798	89	2 wild oats in 1¼ lbs	Black oat, vetch, buckwheat and barl.

*41,170, Part of this car was loaded with No. 3 oats.
*91,134, Part of this car was loaded with No. 2 oats.

SESSIONAL PAPER No. 25c

BRITISH OATS.

The following is a summary analysis of the British seed oats cleaned and sacked at the Winnipeg elevators:—

Car Number.	Percentage of seeds Germinable in soil.	Kinds and Number per lb. of Weed Seed mentioned in Section 6 of Seed Control Act.	Impurity not mentioned in Section 6 of Seed Control Act.
16,400	87	1 wild oat	Odd cleavers.
38,610	97	Free	" and wild buckwheat.
19,620	82	"	Free cleavers "
1,820	88	"	"
41,030	94	1 wild oat in 1¼ lb.	Odd cleavers and wild buckwheat.
91,230	86	Free	" and poppyhead.
42,840	91	1 wild oat in 1¼ lb.	" and wild buckwheat.
40,050	90	2 wild oats in 1½ lbs.	"
1,150	89	1 wild oat in 1½ lb.	"
32,350	95	Free	" and wild buckwheat.
76,350	89	1 wild oat in 1¼ lb.	"
56,060	82	1 wild mustard	" and wild buckwheat.
32,560	82	1 wild oat	" "
92,570	80	Free	Odd barley grain.
41,770	94	"	Odd cleavers and wild buckwheat.
39,380	99	"	" "
21,480	92	1 wild oat in 1¼ lb.	" "
36,680	89	1 " "	" "
43,780	93	Free	" " and barley.
44,190	92	2 wild oats	" "
98,790	84	1 wild oat	"
39,890	95	Free	" and wild buckwheat.
44,102	92	1 wild oat	" "
46,102	87	Free	" "
40,402	96	2 wild mustard	" "
40,012	84	Free	" a'd poppyhead
40,712	93	1 wild oat in 1¼ lb.	" "
76,912	85	Free	Odd grain of wheat.
39,322	89	"	Odd buckwheat and black oat.
37,632	82	2 wild oats in 1½ lb.	Odd cleavers and wild buckwheat.
32,042	84	2 wild oats	Odd wild buckwheat.
142,142	84	Free	Odd cleavers.
43,052	90	1 wild oat in 1¼ lb.	"
37,152	82	2 wild oats in 1½ lb.	"
53,552	90	1 wild oat in 1½ lb.	"
1,652	87	Free	" and barley grain.
38,752	91	"	" buckwheat and barley.
40,162	83	2 wild oats, odd will mustard	Odd barley grain.
45,362	88	1 wild mustard	Odd cleavers.
78,862	84	1 wild oat in 1½ lb.	Odd barley grain.
13,072	82	1 wild oat, 1 wild mustard	Odd cleavers and wheat.
1,172	85	2 wild oats, odd wild mustard	" and wild buckwheat.
76,172	91	Free	"
54,372	84	1 wild oat in 1¼ lb	"
37,472	84	2 wild oats in 1¼ lb. and odd wild mustard	" and wild buckwheat.
35,572	93	1 wild oat, 2 wild mustard in 1½ lb	" and barley.
78,572	91	2 wild oats	"
35,872	97	Free	" and barley.
95,082	84	"	" and wild buckwheat.
42,382	86	1 wild oat	"
4,482	91	Free	"
42,682	91	1 wild oat	" and wild buckwheat.
38,882	90	Odd wild mustard	" "
4,192	85	1 wild oat in 1¼ lb.	"
54,292	83	1 pod wild mustard	"
28,392	97	1 wild mustard	" and wild buckwheat.
2,492	94	Free	Odd wild buckwheat and black oats.
45,492	85	2 wild oats	Odd cleavers and wild buckwheat.
34,404	87	Odd wild mustard	Odd cleavers and barley grain.
92,604	81	1 wild oat in 1¼ lb.	Odd cleavers and wild buckwheat.
34,604	88	1 wild oat	Odd wild buckwheat.
57,704	93	1 wild oat in 1½ lb	Odd cleavers.
2,804	91	Free	Odd cleavers and barley.

BRITISH OATS.—*Continued.*

Car Number.	Percentage of Seeds Germinable in soil.	Kinds and Number per lb. of Weed Seed mentioned in Section 6 of Seed Control Act.	Impurity not mentioned in Section 6 of Seed Control Act.
41,414	86	1 wild oat in 1¼ lb.	Odd cleavers and wild buckwheat.
94,024	80	Free	" "
4,424	96	"	Free.
42,624	91	2 wild oats	Odd cleavers and wheat.
140,924	88	1 wild oat in 1¼ lb.	Odd cleavers, wild buckwheat and poppyhead.
24,234	82	Free	Odd cleavers and wild buckwheat.
3,534	85	1 wild oat in 1½ lb	Odd cleavers.
41,631	96	Free	Odd cleavers and wild buckwheat.
91,844	95	"	Odd cleavers and buckwheat.
20,154	94	"	Odd cleavers.
11,864	87	"	Odd cleavers and wild buckwheat.
75,864	97	"	" "
45,174	89	"	" "
3,574	83	1 purple cockle in 1¼ lb.	Odd wild buckwheat.
39,184	88	1 wild oat	Odd cleavers, buckwheat and barley.
53,484	88	1 wild oat in 1½ lb	Free.
57,194	86	Free	Odd cleavers.
32,294	84	"	Odd cleavers and wild buckwheat.
40,694	91	1 wild mustard	" "
42,206	88	1 wild oat in 1½ lb.	" "
506	82	Free	Odd cleavers, buckwheat and barley.
141,506	88	2 wild oats	Odd cleavers.
35,506	83	1 wild oat, odd w. mustard	Odd cleavers and buckwheat.
22,606	95	1 wild oat in 1¼ lb.	" "
34,606	90	Free	" "
38,216	93	"	" "
145,616	89	3 wild oats	Odd cleavers.
36,226	96	Free	Odd cleavers and buckwheat.
26,326	88	1 wild oat in 1¼ lb.	Odd cleavers and wheat.
38,336	90	" 1½ lb.	1 poppyhead in 1½ lb.
72,536	82	3 wild oats, odd wild mustard	Odd cleavers.
91,246	78	2 wild oats.	Odd barley grain.
4,346	87	Free	Odd cleavers.
40,556	90	2 wild oats, odd w. mustard	Odd cleavers and buckwheat.
36,076	87	1 wild oat in 1¼ lb.	Odd cleavers and wild buckwhea
99,176	93	Free	Odd wheat and poppyhead.
42,676	90	"	Free.
42,776	85	3 wild oats, odd w. mustard	Odd cleavers and wild buckwheat.
93,186	90	1 wild oat in 1½ lb.	" "
41,096	91	2 wild oats	Odd grain barley.
42,996	92	1 wild oat in 1¼ lb.	"
42,308	97	" 1½ lb.	Odd cleavers, wild buckwheat and barley.
43,308		1 " "	" "
43,708	90	1 " "	Odd poppyhead.
30,018	91	Free	Odd cleavers and wild buckwheat.
20,418	86	2 wild oats	Odd cleavers.
41,418	94	Free	Odd cleavers and vetch.
91,518	87	2 wild oats	Odd cleavers.
20,618	87	Free	Odd cleavers and wild buckwheat.
38,718	94	"	Odd black oat.
33,028	85	2 wild oats	Odd cleavers and wild buckwheat.
41,228	85	Free	Odd grain barley.
36,328	85	"	Odd cleavers.
14,738	89	"	Odd cleavers and wild buckwheat.
38,838	93	1 wild oat	Odd cleavers.
4,448	88	2 w. o. in 1¼ lb.	"
12,158	87	Free	"
41,558	90	"	Odd cleavers and wild buckwheat.
18,558	91	"	" "
42,958	86	2 wild oats	" "
59,068*	84	Free	Odd cleavers.
144,368	93	"	Odd cleavers and wild buckwheat.
40,468	85	1 wild oat	Odd cleavers.
3,978	93	"	Odd cleavers and wild buckwheat.
44,378	93	3 w.o., odd wild mustard	Odd cleavers.
44,978	85	1 wild oat, 1 purple cockle in 1½ lbs.	Free.

*59,068 Part of this car loaded with 3 Northern wheat.

BRITISH OATS.—*Continued.*

Car Number.	Percentage of Seeds Germinable in soil.	Kinds and Number per lb. of Weed Seed mentioned in Section 6 of Seed Control Act.	Impurity not mentioned in Section 6 of Seed Control Act.
54,288	89	1 wild oat in 1¼ lb.	Odd cleavers.
3,488	94	Free	"
39,688	91	1 wild oat in 1¼ lb., odd w. mustard	Odd cleavers and wild buckwheat.
37,698	87	1 wild oat in 1¼ lb	Odd cleavers.
36,798	83	1 " "	Odd cleavers and vetch.

BRITISH OATS CLEANED AT FORT WILLIAM.

56,700	94	2 wild oats	Odd cleavers, w. b., barley and wheat.
147,950	97	2 wild oats, 1 wild mustard	" " " and shepherd's needle.
72,980	95	1 wild oat	Odd cleavers, wild buckwheat, wild radish, barley and wheat.
91,802	93	2 wild mustard, 3 wild oats	Odd cleavers, wild buckwheat, wild radish and barley.
94,712	93	3 wild oats	Odd cleavers, wild buckwheat, wild radish, wheat and barley.
92,222	85	2 "	Odd cleavers, wild buckwheat, barley and wheat.
53,632	91	3 "	Odd cleavers, buckwheat, wild radish and barley.
77,252	95	2 wild oats, 1 wild mustard	Odd cleavers, wild buckwheat, wild radish and barley.
36,752	94	2 wild mustard	Odd cleavers, wild buckwheat, wild radish, barley and shepherd's needle.
75,662	95	3 wild oats	Odd cleavers, wild buckwheat, shepherd's needle and hemp nettle.
34,762	91	3 "	Odd cleavers, wild buckwheat, barley, shepherd's needle and hemp nettle.
46,672	99	1 wild oat	Odd cleavers, wild buckwheat, barley and shepherd's needle.
94,582	84	1 wild oat, 1 wild mustard	Odd cleavers, wild buckwheat, barley and shepherd's needle.
147,492	88	3 wild oats	Odd cleavers, wild buckwheat and barley.
94,724	95	1 wild mustard	Odd cleavers, wild buckwheat, wild radish, barley and wheat.
93,654	91	3 wild oats, 2 wild mustard	Odd cleavers, wild buckwheat, wild radish and barley.
14,064	90	1 wild oat, 1 wild mustard	Odd cleavers, wild buckwheat, barley and shepherd's needle.
142,464	99	Free	Odd cleavers, wild buckwheat, wild radish, barley and wheat.
56,374	92	1 wild oat	Odd cleavers, wild buckwheat and barley.
56,384	94	4 wild oats, 1 wild mustard	Odd cleavers, wild buckwheat, wild radish, shepherd's needle and barley.
92,794	93	1 wild oat	Odd cleavers, wild buckwheat, barley and wheat.
32,206	96	3 wild oats	Odd cleavers, wild buckwheat, wild radish, barley and shepherd's needle.
54,546	93	1 wild oat, 1 wild mustard	Odd cleavers, wild buckwheat and barley.
76,946	87	5 wild oats	" " "
90,696	89	2 wild oats, 2 wild mustard	Odd cleavers, wild buckwheat, barley and shepherd's needle.
76,018	85	3 wild oats	Odd cleavers, wild buckwheat, barley and vetch.
52,718	93	1 wild oat, 3 wild mustard	Odd cleavers, wild buckwheat, barley and shepherd's needle.
43,538	91	3 wild oats	Odd cleavers, wild buckwheat, wild radish, barley and wheat.
36,948	97	3 wild oats, 1 wild mustard	Odd cleavers, wild buckwheat, wild radish and barley.
29,768	86	5 wild oats, 11 wild mustard	Odd cleavers, wild buckwheat, wild radish and barley.
91,998	97	4 wild oats, 2 wild mustard	Odd cleavers, wild buckwheat, barley and wheat.

Owing to the fact that requisitions were not received for the *Empress of Britain* shipment, which was cleaned at Fort William, until the grain was cleaned and sacked, it was impossible to get representative samples of the individual cars as billed out. An analysis was made of each car after being cleaned and the shipment proved to be very uniform throughout. From the analysis of the various cars comprising the shipment, the following general report has been made out, which may be taken as fairly accurate for any car in the list given below. Kinds and number per pound of weed seeds mentioned in section 6 of the Seed Control Act; one wild oat, one wild mustard. Kinds of weeds and other impurities not mentioned in section 6 of the Seed Control Act, odd cleavers, wild buckwheat, barley, wheat, shepherd's needle, lady's thumb, wild radish, corn ranunculus, Good King Henry, and wild vetch.

The highest number of weed seeds mentioned in section 6 found in any car of the shipment was four (wild oats), while some cars were entirely free.

The average percentage germination of the entire shipment was 88, the highest being 100 and the lowest 76. The following is a list of cars loaded from the shipment covered by the above analysis:—41,000, 41,720, 91,140, 39,740, 40,850, 43,980, 39,490, 44,502, 75,312, 43,022, 90,922, 44,432, 43,052, 91,052, 147,752, 43,862, 43,972, 38,092, 145,624, 43,724, 40,094, 42,294, 39,594, 41,516, 38,466, 43,386, 98,548, 42,078, 43,578, 42,298, 42,598, 37,998.

BARLEY.

The following is a summary analysis of the barley cleaned and shipped from Winnipeg cleaning elevators:—

Car Number.	Number of sacks in car.	Grade.	Kinds and Number per lb. of Weed Seeds mentioned in Sec. 6 of Seed Control Act.	Impurities not mentioned in Section 6 of Seed Control Act.
145,800	505	3x	1 wild oat	Odd grain wheat.
145,800	234	2x	2 wild oats	Odd tame oat and vetch.
59,800	450	2	1 wild oat, 1 purple cockle	" "
37,430	340	3x	2 wild oats	Odd grain wheat.
37,430	285	2x	Free	Odd vetch.
147,520	189	3x	2 wild oats	"
147,520	604	2x	2 "	" and tame oat.
59,360	630	2	2 " 1 purple cockle	Odd grain wheat.
91,780	115	2x	2 "	Odd vetch and tame oat.
91,780	552	3x	2 "	Odd vetch and w. buckwheat.
76,590	325	1x	1 wild oat	" "
76,690	300	2	1 wild oat, 4 purple cockle in 2 lbs.	"
54,612	468	2x	1 c.c., 1 p.c. in 2 lbs.	Odd grain wheat.
54,612	157	1x	1 wild oat	Odd wild buckwheat.
74,222	644	3x	2 wild oats	Odd vetch and w. buckwheat.
77,622	600	2x	2 "	Odd wild buckwheat.
42,442	485	2x	3 "	Odd vetch and w. buckwheat.
94,842	625	2	3 "	"
94,252	409	3x	2 "	" and w. buckwheat.
51,782	625	2	6 "	"
42,192	635	2x	1 wild oat in 2 lbs	"
90,492	465	2x	1 wild oat in 1½ lbs	"
77,592	372	2x	1 wild oat in 1½ lbs	"
77,592	68	3x	1 wild oat	Odd w. buckwheat and wheat.
48,304	331	2x	2 wild oats	Odd vetch and tame oat.
48,304	384	3x	3 "	" "
44,704	626	2	7 "	"
75,034	544	2x	1 wild oat in 2 lbs.	" and tame oat.
44,434	625	2	5 wild oats	"
58,384	445	3x	1 wild oat	Odd grain wheat and w. buckw
32,684	522	3x	1 wild oat	Odd vetch and wheat.
38,694	625	2	8 wild oats	"
99,016	427	2	1 purple cockle.	Odd grain wheat and tame oat.
37,536	625	2	5 wild oats	Odd vetch.
94,676	526	2x	1 wild oat in 2 lbs.	"
94,676	134	3x	2 wild oats	"
78,888*	525	3x	6 "	" and wheat.
37,098	550	3x	3 "	" "

* 78,888. This car also contains 120 sacks 2x barley.

BARLEY PURCHASED AT EDMONTON.

Two cars of barley were purchased at Edmonton, car No. 47822, graded No. 2, and contained 20 wild oats per pound before cleaning. Car No. 2174, graded No. 2, contained six wild oats per pound before cleaning. The car numbers given are as the grain was purchased, and these numbers may or may not correspond with the car numbers as it was billed out.

SUPPLEMENTARY REPORT OF C. C. CASTLE, PURCHASING AGENT.

WINNIPEG, MAN., September 14, 1908.

Hon. FRANK OLIVER, M.P.,
Minister of the Interior,
Ottawa, Ont.

SIR,—In continuation of my interim report of the 26th of June last, I have to report that all work in connection with my operations as Seed Grain Purchasing Agent are now concluded.

The final closing of the books, owing to a number of outstanding claims to be adjusted, was of longer duration than I had anticipated, but in a work of such magnitude there must necessarily be some disputed accounts to settle. These I am glad to say are now all satisfactorily disposed of, with the exception of the James Richardson claim in regard to the British oats imported by that firm, and which matter is still in your hands pending decision.

In my former report the exhibit last referred to was Exhibit 'M,' so that the first I now wish to draw attention to is Exhibit 'N.' This shows the quantity of each of the grades of wheat purchased for seed; total cost, &c., and the average cost price per bushel; the grade, seed weight, average cost per bushel and distribution price charged to the farmers; total sale value and the profit or loss on the sales.

Also the actual cost of each grade of wheat purchased as shown by my books on the 7th of March—the date the sale price to farmers was computed for transmission to Mr. Leech.

By referring to the latter part of this statement it will be observed that a 'loading charge' over and above actual cost of the wheat was then added to provide for the payment of premiums over the regular market price (which became operative on the 6th of March) and to provide also for contingent rise in the market price.

At the time the premium system was inaugurated, it was absolutely impossible to accurately estimate how many cars would command a premium, or the amount of money that would have to be so paid. My own idea was that about ten thousand dollars would be ample. However, when it became known that premiums of from five to twenty cents per bushel would be paid for practically pure seed, every one who had such seed shipped it out as quickly as possible, which was of special importance at this time in order that the wheat should be cleaned, sacked and distributed to the farmers in ample time for seeding operations. In addition to this the fact that premiums were to be paid had the effect of drawing out almost every car load of prime grain that was in the country within a very short time after the announcement was made; so that from the 6th of March a very large proportion of the purchases turned out to be wheat eligible to go into the premium class—much more so than was originally anticipated. The premium system was a wise move and was primarily suggested by the Hon. W. R. Motherwell. It was not, however, put into effect until after the question had been thoroughly discussed by Messrs. Motherwell, George H. Clark and myself, and the conclusion we reached was that it was in the best interests of all concerned to procure the highest quality of seed for the farmers even if to secure it it cost from five to twenty cents per bushel over the regular market price. While all

wheat bought for seed was of very choice quality that that entered the premium class was practically the purest Red Fyfe seed obtainable; very true to type and free from noxious weed seeds and other impurities. The effect of sowing such seed will be apparent in the Northwest for years yet to come. At the wind up it transpired that a very large proportion of seed wheat purchased after the 6th of March commanded a premium. In fact some $30,784.86 was paid in premiums, and while the farmers who sowed the grain received the benefit of this extra choice seed at the original price it was listed to Mr. Leech, it unfortunately resulted in a loss to the governments concerned of $21,065.62. Had the system not been instituted instead of a loss there would have been a profit on wheat sales to farmers of $9,719.24—that is to say taking into consideration the actual cost price of the grain prior to the 7th of March and the sale prices to farmers as listed with Mr. Leech on that date.

Could the amount of premiums paid have been foreseen when determining the sale price, of course it would have been raised sufficient to absorb the premium.

Exhibit 'O' gives the car number, from whom purchased and the premium allowed per bushel and the total premium paid, arranged according to grade.

Exhibit 'P' gives a detailed statement of the oat purchases.

Local oats were bought at prices ranging from 58 to 65 cents per bushel basis store Fort William.

At the beginning it was estimated that one and three quarter million bushels would be required. The total quantity purchased (seed weight) both local and imported oats amounted to 979,439.14 bushels, and, had all the above quantity been distributed as seed, the total loss would have amounted to $20,148.15.

The local 1 White oats show a profit of $432.80 and the 3 White $85.72, but the 2 White show a loss of $10,629.90 due to the fact that over 70,000 bushels of extra choice Banner oats were bought from A. E. McKenzie & Company, seedsmen, Brandon, at from 79 to 81 cents per bushel. Originally I estimated about a million bushels of local oats would be required, and that as I was only paying from 58 to 65 cents per bushel for the ordinary selected 2 White oats that the extra price to McKenzie & Company would become absorbed so as to easily permit of the oats being sold (without a loss) to the farmers at 70 cents per bushel. A reference to Exhibit 'P' shows that only about 320,000 bushels of local oats were bought altogether, which therefore accounts for this loss.

Upwards of 100,000 bushels of oats were imported from Prince Edward Island, which were also sold at a loss owing to the fact that the 30 cent per hundred rate allowed by the C.P.R. did not apply in this case (as I at first supposed) as Pictou was not a point from which this rate was applicable on account of being an Intercolonial railroad point. The Intercolonial railroad did not file with the Board of Railroad Commissioners a special seed grain tariff; consequently the ordinary grain rates from Pictou to St. John had to be paid.

Over 412,000 bushels of oats were imported from Great Britain. The first shipment via the *Empress of Britain* upon being examined on its arrival at Winnipeg was found to be practically free from all impurities, so that only one test car of the shipment was cleaned. I concluded therefore that none of the British oats would require cleaning and computed the selling price to farmers to Mr. Leech at 85 cents per bushel. However, when Mr. Leech's requisitions for oat shipments came in I then found that all these cars had to be unloaded and afterwards reloaded in other cars to suit his requisitions. In addition, the oats were put up in sacks of from 160 to 170 and 224 pounds each, so that as in any case the grain would require to be resacked, and as it would cost almost as much to do this as to have it recleaned, I decided to clean the balance of the British shipments at the elevators here. This caused the loss above referred to, otherwise there would have been a gain of 2¼ cents per bushel.

There was also a small loss in the sale of the barley. When approximating the prices I did not make sufficient allowance for waste in cleaning, and as the barley cost upwards of $1 a bushel laid down here before being cleaned, an extra shrinkage of 2 or 2½ per cent would easily account for the loss.

Most of the barley had to be run through five or six times slowly before the provincial governments representatives would pass it.

While the greatest care was exercised in purchasing seed grain both as to quantity required and also as to its quality, notwithstanding this there was a large surplus after all seed grain requirements were filled. At the commencement of operations in order to get the grain moving as quickly as possible, contracts had to be made with various persons, firms and corporations for specific quantities of the various grades of grain required; (these contracts having been made early in the season when very large quantities of seed were expected to be required, but before it could be definitely ascertained what the actual requirements were likely to be) they could not of course be repudiated. In addition to this in order to get the seed in time it was necessary to conduct purchasing operations in Great Britain, Prince Edward Island, Ontario, Winnipeg, Brandon, Regina, Moosejaw, Calgary and Edmonton, and as no grain was accepted except it came up to the very high standard that had been set, it was practically impossible to estimate how much of the grain contracted for would be actually delivered. From the commencement my endeavour was to avoid having any large surplus, but, under the circumstances above referred to it was practically impossible to keep it lower than I did. At the same time I felt it was my duty no matter what demand might be made on me, to have seed grain available upon request. I do not think that the original estimates of seed requirements was very much overstated. The amounts stated could easily have been used, but in many cases after it became known that the government intended supplying seed grain advances, it had the effect of causing the loan and mortgage companies to take a more generous view in the matter of helping their customers to secure seed.

The surplus seed grain was sold by me from time to time to the very best market advantage—Exhibits 'R' and 'S' give the details of such sales.

I attach memoranda of conference of representatives of the Dominion, Saskatchewan and Alberta governments held at Regina on the 18th of May, 1908, regarding the disposal of shortage in out-turns of cars at distributing points, and the disposal of surplus seed wheat, oats and barley at local points in Saskatchewan and Alberta. Also regarding disposal of surplus grain sacks and my office furniture.

The surplus seed grain, sacks and furniture were disposed of in accordance with this memoranda:—

'Memorandum of conference of representatives of the Dominion, Saskatchewan and Alberta governments.

Dominion government represented by—

W. W. Cory, Esq., Deputy Minister of the Interior.

C. C. Castle, Esq., Purchasing Agent.

R. E. A. Leech, Esq., Inspector Dominion Land Agencies.

Saskatchewan government—

W. R. Motherwell, Esq., Minister of Agriculture.

Alberta government—

George Harcourt, Esq., Deputy Minister of Agriculture.

Regarding the matter of net shortage in out-turn of cars at distributing points.

It is agreed, that actual shortages, which cannot be accounted for, shall be charged up to administration account. The distributing agent shall charge up all shortages to the purchasing agent, giving detailed statement as to out-turns, as verified by statutory declaration by the railway agents and homestead inspectors.

Re the disposal of surplus seed wheat at local points in Saskatchewan and Alberta.

The distributing agent is authorized to send out the following circular to mill owners, and others, asking for quotations, and is authorized to dispose of same. The grain above mentioned will be delivered f.o.b. cars at point of delivery. No quotations will be considered for prices quoted less than track price at point of delivery; separate quotations must be given for sacks in addition to the price quoted for grain.

CIRCULAR 'A.'

'A quantity of seed wheat is left over on the line of railway after all applications are filled. We are now offering this for sale, which is made up approximately as follows:—

No. 1 H.
No. 1 Nr.
No. 2 Nr.
No. 3 Nr.
No. 4 wheat.

This grain will be delivered to the purchaser's station on this line, freight free. If you desire to secure this, or any part of it, we would be pleased to have quotations separately for each grade, and also quoting price for sacks. The quantities as given above, are approximate, and the actual amounts may be more or less. No quotations less than track price your point will be considered. Separate quotations must be given for sacks, in addition to the price quoted for grain.'

Re disposal of surplus seed wheat, in hands of the purchasing agent, purchased but not distributed for seed.

That the purchasing agent be authorized to dispose of surplus of wheat now in Winnipeg, Calgary and Edmonton to the best market advantage, delivery of same to be made and sales to be completed not later than July delivery; the purchasing agent in no case being authorized to sell all or any portion of such purchase at less than the current market price of the grain at date of sale.

In the case of the wheat now at Calgary and Edmonton, the purchasing agent is authorized to dispose of same to local mills, providing he can dispose of same for better price than by shipping the wheat to Fort William for sale there.

Re the disposal of surplus seed oats at local points in Saskatchewan and Alberta.

The distributing agent shall arrange to gather up all surplus seed oats at local railway stations; that in Saskatchewan to be gathered and loaded into car lots and shipped to the order of C. C. Castle, Fort William; and in Alberta to be gathered and loaded in the same way, but to be shipped to the order of C. C. Castle, at Edmonton and Calgary, invoicing the same to Mr. Castle according to grades; English, Canadian and Prince Edward Island oats to be kept separate. Prince Edward Island oats to be billed to the order of C. C. Castle, Fort William, stop off at Winnipeg for orders.

That the purchasing agent be authorized to sell the surplus seed oats at Edmonton and Calgary locally in the province of Alberta, at not less than market price, or at a premium over the market price; bags extra. If unable to do so, to ship same to Fort William for sale to best market advantage, at or above market prices at Fort William or Port Arthur. The purchasing agent to use his discretion in disposing of these oats at such times, and in such quantities, as it may be most advantageous, so as to realize the highest market price possible. In the event of the oats being shipped to Fort William or Port Arthur the grain to be unloaded into the grain elevators there and the sacks turned over to the inspector for the account of the seed grain purchasing agent. The sacks, subsequently, to be sold to the best market advantage.

Re the disposal of surplus seed barley at local points in Saskatchewan and Alberta.

In the event of there being any surplus barley left, after applications have been filled, the same will be gathered up and shipped to the order of C. C. Castle, Fort William, to stop over at Winnipeg for instructions.

Re the distribution of grain sacks on hand after deliveries are completed.

The purchasing agent is authorized to make sale of the same to the best advantage, using his own discretion as to time and place for making sales.

Re thirteen cars of oats and two cars of wheat, purchased by the Alberta government from Mr. Castle, purchasing agent.

It is agreed that this grain shall be treated as having been handled under the ordinary distribution arrangements; that is, applications and mortgages shall be completed in proper form by the representative of the Alberta government, and transferred to R. E. A. Leech, distributing agent. The invoices which have been sent to Mr. Harcourt shall be transferred to Mr. Leech and Mr. Leech shall issue formal requisition upon Mr. Castle to cover the invoices. If, however, in connection with this transaction there have been extra freight charges, amounting to more than $1,000, the Alberta government shall pay such amount as is in excess of $1,000.

Re office furniture purchased for the seed grain offices in Regina.

If the furniture has not already been paid for by Mr. C. H. Beddoe, from the seed grain appropriation, he shall arrange to make such payment. If the Dominion Department of Public Works has paid for the furniture, Mr. Beddoe shall arrange to reimburse the Department of Public Works, by paying for same out of the seed grain appropriation. When the offices are closed the distributing agent shall dispose of the same to the best advantage.

In connection with the furniture in the Winnipeg offices, Mr. Castle shall dispose of this to the best advantage.'

(Sgd.) W. W. CORY,
GEO. HARCOURT,
W. R. MOTHERWELL.'

Dated at Regina, May 18th, 1908.

A profit and loss statement, Exhibit 'T,' is also attached , from which it will be noted that the net loss in connection with seed grain purchasing operations totals $143,457.71, or a loss if equally divided between the Dominion, Saskatchewan and Alberta governments of $47,819.23, which under the circumstances should be considered as moderate.

In this connection I desire to record my appreciation of the work of the Canadian Pacific Railway Co. and the Canadian Northern Railway Co. The former reduced the freight rate from Great Britain to West St. John from 17s. to 11s. per ton on the English oats, and further reduced the rate from West St. John to Winnipeg from 55 cents per hundred to 30 cents per hundred. In addition, both railway companies gave a reduced rate of 10 cents per hundred from Fort William or Port Arthur to Winnipeg. Also special rates from any point in Saskatchewan to Winnipeg and return to any point in Saskatchewan of nine cents per hundred, or a cent a bushel extra if such grain was delivered as clean seed in Alberta. This practically amounted to one-half the ordinary east bound export rate. In rebates on freight alone I estimate upwards of $100,000 were contributed by the above companies. In addition to this their country station agents looked after the execution of liens and mortgages and distribution of grain to individual settlers—a direct saving to the governments concerned of many thousands of dollars. In most cases the station agents did the work of distributing seed grain faithfully and well, but as at times there were from thirty to one hundred different farmers' grain in one car, this fact will explain the great difficulties the station agents had to contend with.

Sometime after I had been shipping seed grain to Mr. Leech he sent me corrected out-turns, showing cars were short of billed weight. This I found hard to understand as the cars when loaded were all carefully double checked bag by bag. However, feeling mistakes might have occurred I corrected my books to agree with Mr. Leech's reports until one day he sent me a copy of a letter from the station agent at Tisdale on the Canadian Northern Railroad. After this Mr. Leech did not send me any more corrected out-turns, and had he done so I could not have accepted them, in view of this agent's letter above referred to. In fact it was the duty of the station agent to send particulars of out-turns under oath, which has not been done in any one case. The difference in weight of grain delivered at country points between Mr. Leech's report and mine is therefore thus explainable, viz.: in many cases the agents were

unable to check over the number of bags in the car, and in many cases farmers helped themselves and reported the quantity of bags they had received. In some cases bags were found to be torn upon arrival at destination.

I attach copy of correspondence from Mr. Leech under date May the 20th relating the method of distribution by this agent:—

Mr. R. E. A. Leech,
Regina, Sask.

Dear Sir,—*Re* shortage 20 bush. oats car 91052 I am unable to say as to whether this shortage existed when car arrived, as owing to the way the oats were piled in the car, it was impossible to make a count. It was not convenient for me to be on hand at all times to check out loads as they were wanted and in a number of cases I found it necessary to allow farmers to help themselves.

It is possible that some one, either intentionally or otherwise, took more than his share causing the shortage.

There are two more cars finishing here now which are also short a few bushels.

It would have been a great deal more satisfactory to all concerned to have had a government agent to look after this grain; an agent, without assistance, at a point like this cannot close his office for hours at a time to handle some side line of business such as this without getting into trouble with the railway or their patrons.

Yours truly,

(Sgd.) R. DAVIDSON,
Agent.

No one not connected with the work can in any manner even fairly estimate the magnitude of the work of the purchasing, cleaning and sacking the large amount of grain that was distributed as seed by the government this season. Never in any civilized country has a work of such magnitude ever before been undertaken. Every bushel of wheat was bought cleaned, sacked and distributed before the 1st of April; the oats before the 7th of May and the barley before the 30th of May. Most of the barley in this country is sown after the 8th of June. To accomplish this the cleaning plants had to work night and day and often on Sundays too, as the seed had to be in the farmers' hands in time—in no one case was it delayed.

The quality of the seed supplied has already in my previons report been referred to at length, so that beyond stating again that it was all of the best quality and free from impurities there is nothing to add.

In placing the purchasing operations in my hands the governments have saved $35,000 profits which is the least any dealer would have reqnired for his services of purchasing, cleaning, sacking aand shipping the grain. My membership on the Grain Exchange saved the government one cent per bushel on all purchases and sales which non-members are reqnired to pay—and in addition to this a dealer would require a further profit for being responsible for the cleaning, recleaning, sacking and shipping. It is estimated that upwards of seven million bushels of wheat, twenty million of oats and one million of barley will be harvested from seed supplied by the government. and considering its high quality the benefit to the farmers of the Northwest must be considered of national importance.

There only remains of the work now. to deliver the surplus sacks to the purchaser (who has until December next to take delivery) and to dispose of the office furnitnre. express the office records to Ottawa and the work is completed.

In conclusion, I desire to thank you, sir, for the honour that you and the Honourable W. R. Motherwell, Commissioner of Agriculture for Saskatchewan, and the Honourable W. T. Finlay, Minister of Agriculture for Alberta, through his representative and deputy, Mr. George Harcourt, conferred when appointing me to the very responsible and onerous position of purchasing agent in the seed grain advance scheme. It was with much hesitancy and diffidence that I accepted it, and only that

you and the provincial ministers above referred to, who were associated with you in the work, laid the matter before me as a duty, my personal feeling would have been to have declined the honour. In accepting the position, however, I did so with the earnest intention of bending every effort towards procuring only the very best qualities of seed grain for the farmers of the Northwest who were in need of it and at the lowest possible price, and while I trust I have been fairly successful in this regard I might add many obstacles had to be daily overcome in the accomplishment of the results such as they are, and I trust that such results as I have achieved will merit the approval of your government and that of Saskatchewan and Alberta.

I have the honour to be, sir,

Your obedient servant,

CHARLES C. CASTLE,

Purchasing Agent.

EXHIBIT "N."

STATEMENT of wheat showing grade, seed weight, kind of grain, original cost, freight, handling charges, &c.

EXHIBIT "O."

STATEMENT of premiums on wheat, &c.

EXHIBIT "P."

STATEMENT of oats showing grade, seed weight, kind of grain, original cost, &c.

EXHIBIT "Q."

STATEMENT of barley showing grade, seed weight, cost, &c.

EXHIBIT "R."

STATEMENT of oats sold for cash, &c.

EXHIBIT "S."

STATEMENT of wheat sold for cash, &c.

EXHIBIT "T."

STATEMENT of ledger balance showing profit and loss.

EXHIBIT "N."

STATEMENT showing Grade, Weight, Kind of Grain, Original Cost, Freight, Handling Charges, Cost of Sacks, Credit Allowance for Screenings, Total Net Cost, and Average Price per Bushel of Grain Shipped to the Provinces of Saskatchewan and Alberta.

WHEAT.	Seed Weight.	Original Cost.	Freight.	Handling.	Cost of Sacks.	Credit Allowance for Screenings.	Net Cost.	Average Cost per Bushel.
	Lbs.	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.
1 Hard	1,534	1,636 36	92 14	47 17	67 88	6 40	1,837 15	1 19 76-100
1 Northern	83,133·40	91,083 58	5,192 34	2,568 82	3,491 77	872 80	101,463 71	1.22 05 100
2 "	94,805 40	97,826 60	5,513 62	2,957 72	4,013 12	596 75	109,714 31	1 15 71 100
3 "	283,988·45	278,916 09	18,717 90	8,826 92	12,374 25	1,718 40	317,116 76	1.11 66 100
No. 4	97,798	90,762 62	6,166 27	3,098 41	4,243 75	1,550 22	102,720 83	1 04 84 100
Total	561,440 05	560,225 25	35,682 27	17,499 04	24,190 77	4,741 57	632,852 76	....

STATEMENT showing Grade, Seed Weight, Total Cost, Averave Cost per Bushel, Price per Bushel Distributed at, Total Sale Value, Profit and Loss.

WHEAT.	Seed Weight.	Total Cost.	Average Cost per Bushel.	Price Distributed at.	Total Sale Value.	Profit.	Loss.	Average Loss per Bushel.
	Lbs.	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.	cts.
1 Hard	1,534	1,837 15	1.19 76 100	1 19	1,825 46	....	11 69	
1 Northern	83,133·40	101,463 71	1.22 05-100	1 18	98,097 73	....	3,365 98	
2 "	94,805·40	109,714 31	1 15 74 100	1 15	109,026 52	....	687 79	
3 "	283,988·45	317,116 76	1 11 66 100	1 07	303,867 96	....	13,248 80	
No. 4	97,978	102,720 83	1 04 84-100	1 01	98,957 78	....	3,763 05	
Total	561,440·05	632,852 76	....	....	611,775 45	....	21,077 31	0 3 75 100

STATEMENT showing the Actual Average Cost Price of the Grades of 1, 2, 3 Northern and No. 4, as shown by the Records on March 7, 1908, being the date on which Sale Prices to the Farmers was computed for transmission to Mr. R. E. A. Leech, Seed Grain Distributing Agent at Regina.

1 NORTHERN.		2 NORTHERN.		3 NORTHERN.		NO. 4.	
Including 1½% cleanings	$1.02½	Including 3% cleanings	$1.00¼	Including 2½% cleanings	$0.91	Including 3% cleanings	$0.85
Freight	0.05½	Freight	0.05½	Freight	0.05½	Freight	0.05½
Handling	0.03	Handling	0.03	Handling	0.03	Handling	0.03
Sacks	0.04¼	Sacks	0.04¼	Sacks	0.04¼	Sacks	0.04¼
*Loading	0.02¾	Loading	0.02	Loading	0.03¾	Loading	0.03¾
	$1.18		$1.15		$1.07		$1.01

*This cost was added to the above charges to provide for contingencies; viz., a rise in market price and the premiums over the market price which were advertised to be paid from March 6.

Exhibit "O."

1 NORTHERN.

STATEMENT of Premiums on Wheat, showing Car Number, Party Purchased from, Seed Weight, Premium Paid, Out-turn of Car, and Amount of Premium paid per Car.

Car No.	From whom Purchased.	Seed Weight.	Premium per Bushel.	Out-turn.	Premium paid per Car.
			cts.		$ cts.
36028	Imperial Elevator Co.	1,086	.....	1,107	50 00
43760	North Star Grain Co.	1,012	15	1,027·50	154 17
59972	G. B. Murphy & Co.	970	10	988·10	98 82
42748	R. Muir & Co ...?	1,067	10	1,088·30	109 85
41692	Sam Scott	1,039·10	10	1,073	107 30
43110	Grain Growers' Grain Co.	925·10	10	953·40	95 37
42056	R. Muir & Co.	1,037	15	1,037	155 55
37556	Grain Growers' Grain Co	998	5	1,021·10	51 05
42222	A. W. Playfair	830	10	851·30	85 15
36648	J. Richardson & Sons	1,016·30	10	1,016·30	101 65
38612	Dominion Elevator Co	1,002	5	1,015·30	50 77
830	A. Emberg	900·20	10	1,024·20	102 43
44270	Farmers Elevator Co.	1,116	5	1,138·10	56 90
30588	Northern Elevator Co.	1,020·10	5	1,028·30	51 42
22148	Western Elevator Co	654·10	5	663·40	33 18
48344	D. Steele	968·40	10	988	98 80
37940	W. Dunbar	850	15	1,004·40	150 70
42334	K. Hutchison	800·10	10	868·10	86 82
36450	Merchants Bank of Canada	975	20	1,100·40	220 14
302502	McLennan Bros.	1,023·40	10	1,061·40	106 17
35890	W. Fallis	975	15	991·20	148 75
24216	F. Dewart	657·30	10	681·50	68 17
26372	A. H. Rogers.	686·50	20	707·50	141 57
44538	R. Bell	907·30	10	1,019·30	101 95
47852	Imperial Elevator Co.	1,009·30	10	1,133·40	113 37
43210	Grain Growers' Grain Co.	1,067 30	15	1,081·30	162 23
40558	P. Jensen & Co	979	20	1,009·50	201 94
43834	S. Scott	1,002	10	1,022·50	102 25
41786	W. Galloway	710	10	825·30	82 55
43394	A. Potter	980	10	1,101	110 10
78152	Alberta Pacific Elevator Co.	1,023	5	1,025·20	51 28
44862	Alberta Grain Co.	1,135	15	1,142·20	171 40
38046	Alberta Grain Co.	936	20	941·05	188 20
28696	Royal Grain Co.	522	15	530·30	79 57
53576	W. Carson & Co	1,040	20	1,047·50	209 60
		32,921·50		34,329·35	3,899 17

2 NORTHERN.

36046	Imperial Elevator Co.	966·40	.....	1,030 10	50 00
48948	Winnipeg Elevator Co.	1,060	5	1,079·40	53 98
42654	North Star Grain Co.	1,018	15	1,050·40	157 60
1944	J. Coxworth	954	5	983	49 15
98824	Western Elevator Co.	1,024	5	1,048·40	52 43
78660	G. B. Murphy & Co.	1,017·40	5	1,052·30	52 62
92572	Wheat City Flour Mills.	1,119	10	1,119	111 90
43206	Grain Growers' Grain Co.	1,012	10	1,039	103 90
45890	Imperial Elevator Co.	1,009·30	10	1,009·30	100 95
41398	G. B. Murphy & Co.	1,093·20	5	1,093·20	54 67
146416	Western Elevator Co.	1,389·20	5	1,389·20	69 47
40164	Grain Growers' Grain Co.	1,037·50	10	1,037·50	103 79
147218	Northern Elevator Co.	1,252·30	10	1,310·10	131 05
38202	Young Grain Co	1,135	5	1,165	58 25
41170	G. B. Murphy & Co.	1,118·30	5	1,118·30	55 92
39910	W. B. Chisholm	1,040	15	1,082·10	162 32
33492	Grain Growers' Grain Co.	1,010	5	1,045·50	52 30

SESSIONAL PAPER No. 25c

Exhibit 'O.'

3 NORTHERN.—*Continued.*

Car No.	From whom Purchased.	Seed Weight.	Premium per Bushel.	Out-turn.	Premium paid per Car.
			Cts.		$ cts.
57502	H. W. Johnston	1,083·20	15	1,083·20	162 50
147924	R. A. Knight	1,365·40	5	1,402·30	70 12
37638	N. K. Agnew	1,030	15	1,076·30	161 48
146580	Northern Elevator Co	1,391 40	5	1,391 40	69 58
31702	Young Grain Co	1,075·20	15	1,100	165 00
71804	Grain Growers' Grain Co	1,023·50	5	1,037	51 85
33094	Grain Growers' Grain Co	1,014	20	1,035·10	207 03
40630	Alberta Pacific Elevator Co	969·35	10	965 35	96 95
38120	Alberta Grain Co	1,005·20	15	1,005 20	150 80
39258	W. H. Keyes	1,046	20	1,105·20	221 07
39212	Alberta Grain Co	762	20	770·35	154 10
15732	A. Neville	654	10	699 30	69 95
72318	Alberta Grain Co	940	20	959 10	191 83
77314	Alberta Pacific Elevator Co	936	10	937·55	93 80
		32,555·05		33,228 15	3,286 36

3 NORTHERN.

91582	Imperial Elevator Co	909·10		978·50	50 00
72426	North Star Grain Co	1,000	20	1,008 20	201 67
51514	Winnipeg Elevator Co	1,005	5	1,045·40	52 28
34608	North Star Grain Co	1,030	10	1,038·10	103 80
36750	Herriott & Milne	1,047	10	1,054·20	105 43
44210	Canadian Elevator Co	1,084	20	1,099·20	219 87
38328	" "	1,100	10	1,124	112 40
37858	British American Elevator Co	1,130	15	1,139·10	170 87
43756	North Star Grain Co	1,105	20	1,131	226 20
41782	Northern Elevator Co	1,160	10	1,171·30	117 13
29564	P. Jensen & Co	734	10	734·40	73 46
41820	Grain Growers' Grain Co	982	5	1,013·20	50 67
40708	International Elevator Co	993 30	10	1,036 40	103 66
44828	" "	973·20	10	989·30	98 95
76976	Winnipeg Elevator Co	1,026	5	1,051·30	52 58
37988	Smith Grain Co	1,021·30	15	1,042·10	156 40
40206	"	1,000	15	1,002·30	150 38
39078	Canadian Elevator Co	1,034	15	1,053·20	158 00
35914	Herriott & Milne	1,107	10	1,110·20	111 03
22216	Ogilvie Flour Mills Co	680	10	694·30	69 45
37034	North Star Grain Co	1,066·20	15	1,066·20	159 25
56338	Western Elevator Co	1,125·40	20	1,136·50	220 37
34886	Grain Growers' Grain Co	1,028	15	1,060	159 00
49210	International Elevator Co	973·20	10	990·50	99 08
42532	Smith Grain Co	1,050	15	1,056·40	158 50
2706	North Star Grain Co	1,080	20	1,084·50	216 97
40146	Western Elevator Co	979·40	15	1,036·30	155 47
92766	" "	1,035 10	15	1,058	158 70
26324	North Star Grain Co	734	15	751·10	112 67
57966	McLaughlin & Ellis	1,130	15	1,143·20	171 50
73000	Dunsheath & McMillan	969·30	10	1,019 30	101 95
75730	Dunsheath & McMillan	1,019 30	10	1,031	103 10
58336	Thompson Sons & Co	1,100	15	1,103	165 45
52232	W. L. Mooney	1,110	20	1,125 50	225 17
58864	Imperial Elevator Co	888·40	10	900·30	90 05
4162	British America Elevator Co	990	10	1,019 10	101 92
38520	" "	1,110	10	1,122·40	112 27
41010	" "	1,080	10	1,084·40	108 47
44518	" "	1,106	10	1,116	111 60
37736	" "	1,090	10	1,096	109 60
42998	" "	1,060	15	1,094 30	164 18
41680	" "	1,090	20	1,126.50	225 37
37168	" "	1,080	15	1,116·40	167 50
44360	Canadian Elevator Co	1,120	20	1,135·20	227 07

Exhibit 'O.'

3 NORTHERN.—*Continued.*

Car No.	From whom Purchased.	Seed Weight.	Premium per Bushel.	Out-turn.	Premium paid per Car.
			Cts.		$ cts.
892	R. Muir & Co.	1,036	15	1,059 10	158 87
35804	Western Elevator Co.	1,070	20	1,086 40	217 34
145690	" "	1,370	5	1,388 20	69 42
55756	" "	1,100	5	1,116 40	55 83
73198	Imperial Elevator Co	980	5	981 50	49 10
24376	W. L. Sargent	610	5	618 10	30 90
37878	North Star Grain Co.	1,032	20	1,057 20	211 47
2974	British American Elevator Co.	998	10	1,021 10	102 12
78024	Grain Growers' Grain Co.	1,060	5	1,072 30	53 62
54902	G. B. Murphy	1,140	10	1,155 50	115 58
21924	T. E. Findlay	635	5	640 50	32 04
140846	International Elevator Co	1,320 40	10	1,348	134 80
20086	Simpson Hepworth	703 20	10	706 30	70 65
54500	Thompson Sons & Co.	1,070	15	1,077 10	161 57
43432	D. Morrison	1,133 20	10	1,164 30	116 45
44580	D. Morrison	1,185	10	1,189 50	118 99
902	D. Morrison	1,022	10	1,056 30	105 65
39666	British America Elevator Co	1,110	10	1,112 40	111 27
42166	North Star Grain Co.	1,060	5	1,070 10	53 50
41400	C. Turner	1,068 40	5	1,095	54 75
39878	Northern Elevator Co.	1,123 20	20	1,130 10	226 03
40370	McLennan Bros	962 20	20	971 30	194 30
56412	R. Muir & Co	1,064	20	1,088 20	217 67
15952	McLaughlin & Ellis	620	20	624 10	124 83
146062	Winnipeg Elevator Co	1,330	5	1,344 30	67 22
32822	Grain Growers' Grain Co.	1,000	15	1,018 20	152 75
52654	Thompson Sons & Co	1,042	15	1,084 50	162 72
1342	F. Greentree	866	10	868 10	86 82
35922	M. McIntosh	1,034	15	1,076 50	161 52
39778	British America Elevator Co.	1,105	15	1,110	166 50
42898	" "	1,105	20	1,143 30	228 70
		76,093		78,474 40	9,823 12

SESSIONAL PAPER No. 25c

Exhibit 'O.'

3 NORTHERN.—*Continued.*

Car No.	From whom Purchased.	Seed Weight.	Premium per Bushel.	Out-turn.	Premium paid per Car.
			Cts.		$ cts.
41554	British America Elevator Co.	1,116	20	1,139	227 80
38436	" "	1,105	20	1,108·50	221 74
43516	" "	1,130	15	1,131	169 65
35806	D. Morrison	1,044	10	1,067·30	106 75
11850	Winnipeg Elevator Co.	686	5	721·20	36 07
26806	Grain Growers' Grain Co.	670	15	668·50	100 32
44104	Spencer Grain Co.	1,068	15	1,081·10	162 17
36744	"	1,030	15	1,048·20	157 25
39268	Canadian Elevator Co.	1,231·30	10	1,261·40	126 17
2790	" "	1,133·20	10	1,137·30	113 75
41482	Smith Grain Co.	1,057	10	1,070	107 00
39722	G. Hamiota	1,030	20	1,035	207 00
42954	British America Elevator Co.	1,097·20	15	1,137·30	170 63
42418	" "	1,090	15	1,118	167 70
41730	" "	1,070	20	1,108·30	221 70
37952	" "	1,110	10	1,114·20	111 43
3088	" "	1,080	15	1,115·30	167 33
38942	" "	1,120	15	1,125·10	168 77
57556	International Elevator Co.	1,093·30	15	1,097·30	164 63
48876	Herriott & Milne	1,088·40	15	1,132·40	169 90
39444	British America Elevator Co.	963·40	15	963·40	114 45
40666	" "	1,090	20	1,119	223 80
41040	" "	1,076	15	1,117·50	167 67
38030	" "	1,056	10	1,090·30	109 05
75364	Western Elevator Co.	1,077	20	1,099·20	219 87
59748	Ogilvie Flour Mills Co.	1,070·20	10	1,087·30	108 75
15666	Herriott & Milne	1,050	20	1,063·10	212 63
17598	"	990	20	1,002·20	200 46
101196	"	1,432	15	1,446·30	216 98
103515	"	1,425·35	15	1,435·30	215 33
54912	A. Kaltenbruner	880	20	1,035·50	207 20
23128	Anglo-Canadian Elevator Co.	687·20	15	707·50	106 17
25710	" "	649·20	5	677·50	33 88
35374	Alberta Grain Co.	1,006	20	1,014	202 80
43458	"	990	20	1,004·40	200 94
29700	"	710	10	721·20	72 16
147172	"	1,428·25	10	1,435	143 50
17864	Alberta Pacific Elevator Co.	700·15	10	718	71 80
55036	Alberta Grain Co	998	20	1,005·40	201 14
47752	Herman Schmidt	1,056	20	1,071·10	214 23
90928	C. N. Brett	818	20	936·15	187 27
33764	Herman Schmidt	988	20	1,032·30	206 50
59868	Alberta Grain Co.	952	20	952	190 40
92484	"	1,106	20	1,128	225 60
92488	"	1,052	15	1,056·30	158 47
43792	Alberta Pacific Elevator Co.	998	10	1,020·50	102 10
17174	Alberta Grain Co.	674	15	682	102 30
31338	"	1,000	20	1,015·10	203 03
41242	"	1,083·20	5	1,093	54 65
91376	Alberta Pacific Elevator Co.	1,006	5	1,021·50	51 10
56396	Alberta Grain Co.	1,004	10	1,024·30	102 15
		128,151·35		131,673·15	17,757 66

Exhibit "O.

No. 4.

Car No.	From whom Purchased.	Seed Weight.	Premium per Bushel.	Out-turn.	Premium paid per Car.
			Cts.		$ cts.
	Carried forward.. ..	.....	.....	.....	.....
77768	P. Jensen & Co.	1,000	10	1,013·50	101 38
58272	Spencer Grain Co.	1,046	15	1,101·50	156 27
30270	Ogilvie Flour Mills Co.	700	10	727·30	72 75
37422	Saskatchewan Elevator Co	1,630	15	1,099·50	164 97
42364	C. C. Turner	919	20	1,084	216 80
38042	British America Elevator Co....	1,083·20	10	1,119	111 90
2586	" "	1,919·10	10	1,075 30	107 55
41466	" "	1,070	10	1,119 10	111 92
58430	McLaughlin & Ellis	1,040	15	1,111·40	166 75
36970	North Star Grain Co..	1,000	10	1,050·10	105 02
38896	British America Elevator Co.....	1,058 20	15	1,094·20	164 15
38784	" "	991·40	5	1,061·10	53 07
39596	" "	1,059 10	10	1,106·40	110 67
38014	" "	1,030	10	1,099·40	109 97
39172	" "	1,000	10	1,079	107 90
36630	" "	1,033·40	15	1,049·20	157 40
44284	Joseph Wilson.	1,100 20	20	1,123·10	224 63
42198	J. Barb.....	1,010	15	1,075	161 25
21320	A. Underhill	456 30	15	521·30	78 23
54156	Herriott & Milne	1,000	15	1,076 30	161 48
74318	"	900	10	942·30	94 25
47964	"	1,020	10	1,104·10	110 42
43814	C. E. Hall.....	1,131·10	20	1,152·30	220 56
37910	British America Elevator Co	962 10	10	1,027·10	102 72
77398	R. Muir & Co	1,083·10	15	1,148·10	172 22
159402	Winnipeg Elevator Co.....	690	5	727·30	36 37
43618	John Gillies.....	948	15	1,013·40	157 05
38596	D. Morrison.....	1,076	15	1,099	164 85
15562	Grain Growers' Grain Co.... ...	644	15	698·20	104 75
147426	North Star Grain Co....	1,280	15	1,355	203 25
57992	International Elevator Co.....	1,040	10	1,051·50	105 17
43038	P. Jensen & Co.....	1,044·50	20	1,109·50	221 94
37834	Spencer Grain Co....	967·20	10	1,032·20	103 22
38878	North Star Grain Co.	1,054	10	1,118·20	111 83
56672	" "	1,132·20	10	1,133·20	113 33
55920	W. F. Hensberger	1,108	15	1,123·15	168 49
59320	Anglo-Canadian Elevator Co..	958	5	1,009·08	50 45
90732	W. Laird.....	1,022	20	1,052·05	210 40
71586	"	630 25	15	665·25	99 82
45468	"	1,027·35	20	1,097·35	219 50
13402	J. A. McHart....	1,008	15	1,101·10	165 17
140280	Alberta Pacific Elevator Co	1,280	20	1,309·30	261 90
		41,644·20		43,866·48	5,841 67

SESSIONAL PAPER No. 25c

Exhibit O.'—Con.

Grade.	No. of Cars.	Seed Weight.	Out-turn.	Premium.
				$ cts.
1 Northern	35	32,921·50	34,329 35	3,899 17
2 "	31	32,555·05	33,228·15	3,286 36
3 "	126	128,151·35	131,673·15	17,757 66
No. 4	42	41,644·20	43,866·48	5,841 67
	234	235,272·50	243,097·53	30,784 86

—	1 Northern.	2 Northern.	3 Northern.	No. 4.	Total.
	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.
Premiums paid after announcement of seed prices	3,899 17	3,286 36	17,757 66	5,841 67	30,784 86
Loss shown on seed wheat at distribution prices "Exhibit N-X."	3,365 98	687 79	13,248 80	3,768 05	21,065 62
	533 19	2,598 57	4,508 86	2,078 62	9,719 24

Total net profit which would have been made by selling seed wheat to farmers at prices shown in Exhibit "N"- XX had no system of premiums been introduced, $9,719.24.

EXHIBIT "P."

STATEMENT showing Grade, Weight, Kind of Grain, Original Cost, Freight, Handling Charges, Cost of Sacks, Credit Allowance for Screenings, Total Net Cost and Average Price per Bushel of Oats Shipped to the Provinces of Saskatchewan and Alberta.

OATS.	Seed Weight.	Original Cost.	Freight.	Handling.	Cost of Sacks.	Credit Allowance for Screenings.	Net Cost.	Average Cost per Bushel.
	Lbs.	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.
1 W.	53,673	37,405 20	1,791 08	1,647 22	1,583 35	421 77	42,005 08	0 78 26-100
2 W.	354,654·05	231,595 35	12,478 04	1,359 10	10,367 50	4,943 44	260,856 55	0 73 55-100
3 W.	29,992·20	17,700 87	958 44	858 82	776 50	285 35	20,009 28	0 66 71-100
Ontario	33,518·06	25,041 99	4,068 31	389 80	235 41	186 66	29,548 85	0 88 15-100
Picton.	94,680·04	62,032 64	19,289 86	3,353 72	2,775 45	1,537 90	85,913 77	0 90 74-100
English	410,450·32	288,990 86	54,345 62	11,461 52	665 16	3,555 88	351,907 28	0 85 73-100
Gartons	2,470·20	2,712 20	430 44	.....	129 74	.....	3,272 38	1 32 48 100
Total	979,439·19	665,479 11	93,361 79	29,070 18	16,533 11	10,931 00	793,513 19	.....

STATEMENT showing Grade, Seed Weight, Total Cost, Average Cost per Bushel, Price per Bushel Distributed at, Total Sale Value, Profit and Loss.

OATS.	Seed Weight.	Total Cost.	Average Cost per Bushel.	Price Distributed at	Total Sale Value.	Profit.	Loss.	Average Loss per Bushel.
	Lbs.	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.
1 W	15,105		0 78 26-100	0.86	12,990 30			
1 W	14,745		0.78 26-100	0.85	12,533 25			
1 W	23,823		0.78 26-100	0.71	16,914 33			
1 W	53,673	42,005 08	0.78 26 100		12,437 88	432 80		
2 W	13,125		0.73 55-100	0.85	11,156 25			
2 W	341,529·05		0 73 55-100	0.70	239,070 40			
2 W	354,654·05	260,856 55	0.73 55-100		250,226 65		10,629 90	
1 W	53,672	12,005 08	0.78 26-100		42,437 88	432 80		
2 W	354,654·05	260,856 55	0 73 55-100		250,226 65		10,629 90	
3 W	29,992·20	20,009 28	0.66 71-100	0.67	20,095 00	85 72		
Pictou	94,680·04	85,913 77	0 90 74-100	0.85	80,478 00		5,435 77	
Ontario	33,518·06	29,518 85	0.88 15-100	0.85	28,490 30		1,058 55	
English	410,450·32	351,907 28	0.85 73-100	0.85	348,883 35		3,023 93	
Gartons	2,470·20	3,272 38	1.32 48 100	1.32 48-100	3,272 38			
Total	979,493·19	793,513 19			773,883 56	518 52	20,148 15	0 02

Prince Edward Island Oats—When the purchase of these oats was entered into the point of delivery named in the agreement was Pictou, which was thought to be a point operated by the C. P. R., and that consequently the 30c. rate from St. John to Winnipeg would apply. However, upon receipt of the shipping bills it was ascertained that Pictou was an I. C. R. point, and that the shipments from Pictou had to be routed by that railway to West St. John, and thence to Winnipeg, thus causing an extra freight rate unprovided for when approximating the sale price to farmers at 85c. a bushel, thus occasioning a loss of $5,135.77, equal to 05 74 100 per bushel.

English Oats—A loss of three-quarters of a cent per bushel was made on the sale price of these oats to farmers, occasioned through recleaning and resacking for d stribution after arrival here. The oats on the whole were very clean, but were loaded in sacks of from 160 to 224 lbs. weight. Finding it would be impossible to distribute them sacked according to the weights, it was considered advisable to reclean and resack to four bushels per sack. This was unforeseen when the sale price was first decided on, otherwise a profit would have been made of 2½c. per bushel.

Exhibit "Q."

BARLEY.

STATEMENT showing Grade, Weight, kind of Grain, Original Cost, Freight, Handling Charges, Cost of Sacks, Credit Allowance for Screenings, Total Net Cost, and average price per bushel of Barley shipped to the Provinces of Saskatchewan and Alberta.

Barley.	Seed Weight.	Original Cost.	Freight.	Handling.	Cost of Sacks.	Credit Allowance for Screenings.	Net Cost.	Average cost Per Bushel.
	Lbs.	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.
B. & K.	9,708	10,457 04	426 07	299 15	429 58	61 76	11,550 08	1 18 97-100
G. M. Co.	3,940	3,569 64	747 03	.....	.....	.....	4,316 67	1 09 56-100
Canadian Malt	33,854	32,440 91	4,825 84	778 33	1,498 04	656 25	38,886 87	1 14 86-100
Total	47,502	46,467 59	5,998 94	1,077 48	1,927 62	718 01	54,753 62	1 15 26-100

STATEMENT showing Grade, Seed Weight, Total Cost, Average Cost per Bushel, Price per Bushel Distributed at, Total Sale Value, Profit and Loss.

Barley.	Seed Weight.	Total Cost.	Average Cost per Bushel.	Price Distributed at.	Total Sale Value.	Profit.	Loss.	Average cost Per bushel.
	Lbs.	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.
Total	47,502	54,753 62	1 15 26-100	1 13	53,677 26	.....	1,076 36	0 02 26-100

STATEMENT of Barley showing the Seed Weight Bought, the Number of Cars Shipped on Requisitions with the Amount of Bushels they Contained, also the Number of Bushels Sold for Cash.

Seed weight bought as per receipt book		47,502
Shipped 45 cars on requisitions as per shipment book	47,452	
Sold for cash as per shipment book	50	
Totals	47,502	47,502

Exhibit "R."

25c—9

STATEMENT of oats sold for cash, showing car number, grade and weight of shipments from elevators; also grade and weight of out-turns for which money was received.

Car No.	Weight of shipment.						Weight of out-turn.					
	1 W.	2 W.	3 W.	English.	Pictou.	Ontario.	1 W.	2 W.	3 W.	English.	Pictou.	Ontario.
32164		1,800						1,785 20				
18212	1,194						1,194					
23794		1,176						1,176				
140366		1,968						1,968				
57346	1,725						951					
56256	1,200						1,200					
54220		1,476						1,476				
22406			1,008						1,008			
73026		1,725						1,725				
93922			1,821						1,821			
31752		1,512						1,536 16				
41864		1,728						1,728				
40498			1,200						1,200			
147976	2,004						2,001					
28964		1,200						1,200				
40238		1,890						1,875				
90084		1,920						1,920				
35398		1,800					1,769 24					
141420		1,800						1,794 04				
42068		1,800					1,756 26					
53778		1,800						1,791 06				
43638		1,800						1,805 30				
37834		1,800						1,800				
56536			1,872						1,872			
41668		1,575					1,573 18					
32248		1,710					1,715 30					
24806		735						735				
39402		1,734						1,734				
32048			1,464						1,464			
40760		1,590						1,590				
73298	1,689						1,689					
38656		1,098						1,085 10				
44222		1,800						1,794 24				
40878		1,812						1,807 32				
38722		1,824						1,819 04				

Exhibit "R."—Con.

STATEMENT of oats sold for cash, showing car number, grade and weight of shipments from elevators; also grade and weight of out-turns for which money was received.—*Con.*

Car No.	Weight of Shipment.						Weight of out-turn.					
	1 W.	2 W.	3 W.	English.	Picton.	Ontario.	1 W.	2 W.	3 W.	English.	Picton.	Ontario.
23230		1,134						1,134				
51558		1,785						1,785				
77986			1,872						1,872			
73124	1,800						1,800					
145392		1,842						1,837·12				
45832			2,040						2,040			
145064		1,200						1,200				
40634		1,128						1,128				
33154		1,674						1,674				
51076		1,800					1,788·28					
39594					1,560						1,547·22	
57672						1,846						1,829·04
39688				1,592						1,588·08		
79234					1,500						1,491·06	
16862		1,176						1,176				
38278			1,878						1,878			
144618		1,326						1,326				
74266					1,200						1,200	
90880					1,200						1,200	
75262					1,500						1,512·02	
53768					1,800						1,800	
77242					1,800						1,800	
91134		408			1,392			414·26			1,397	
19074		1,200					1,206·06					
54180	1,557						1,518					
32948	1,311						1,311					
29502	1,158						1,128					
53984	1,749						1,740					
93854	1,836						1,836					
18022	1,143						1,131					
35000	1,899						1,899					
90778											1,800	
73060		1,800			1,800			1,805·10				
59690		1,143						1,113·08				

94686						1,440						1,438·08
48476						957						949·14
73984		1,350						1,355				
33258		1,872						1,872				
36626						1,293						1,276·26
91668					1,650						1,614·04	
32294				577·17						576·16		
15310		888						876·26				
147380				1,600						1,600		
54292				1,600						1,595·20		
95082				1,800						1,792·22		
91518				1,800						1,785·10		
92604				1,800						1,791·06		
140924				1,800						1,777·32		
57704				1,800						1,790·20		
53552				1,800						1,789·24		
73120	1,206						1,203					
57910	957						957					
144546		1,536						1,536				
55562	1,953						1,950					
74774		1,917·02						1,927				
74658			1,000									
74658			1,076·16									
140240				1,800						1,800		
53484				1,800						1,789·24		
91230				1,800						1,786·26		
40050				1,800						1,785·10		
55354					1,470·20						1,475	
71894					1,433·18						1,433·18	
57892				1,800					1,000	1,800		
92730				1,800					986·16	1,800		
98906				1,800						1,800		
71091				1,800						1,800		
55178				1,800						1,800		
47708				1,800						1,800		
71090				1,800						1,800		
26698						1,152·02						1,148·28
34466						1,578·18						1,571·16
37978						1,485·20						1,480·30
54670				1,800						1,800		
49072				1,800						1,800		
38830				1,800						1,800		
41906				573·18						573·18		
54248				1,800						1,800		
71534				1,800						1,800		
44739				1,800						1,800		
59092				1,800						1,800		
99154				1,800						1,800		
74376				1,800						1,800		
146256				1,800						1,800		

Exhibit "R."—Con.

STATEMENT of oats sold for cash, showing car number, grade and weight of shipments from elevators; also grade and weight of out-turns for which money was received.—*Con.*

Car No.	Weight of Shipment.						Weight of out-turn.					
	1 W.	2 W.	3 W.	English.	Picton.	Ontario.	1 W.	2 W.	3 W.	English.	Picton.	Ontario.
145810				1,800						1,800		
44872				1,800						1,800		
145218				1,800						1,800		
95034				566						564·24		
90210				1,600						1,592·22		
50844			1,594·04						1,594·04			
49360		1,965·20						1,965·20				
40070				1,176						1,176		
39030		1,379·24						1,379·24				
90170		1,515·20						1,506·06				
Wilton				365						350		
M. Tests				343						343		
Cash				76						76		
B. Walker				500						500		
D. Laird				112						112		
39460		1,630·20						1,630·20				
42274		1,798·28						1,798·28				
71656		1,732·32						1,732·32				
90170		9·14						9·14				
	24,381	76,284·24	16,825·20	64,666·01	18,306·04	9,752·06	33,318·30	66,330·32	16,735·20	64,537·10	18,300·18	9,694·24

Exhibit "R."—Con.

SUMMARY of oats showing the grade and the number of bushels shipped from the elevators which were sold for cash; also showing the number of bushels by grade which were sent out on requisitions.

	Weight of shipments from elevators.						
	1 W.	2 W.	3 W.	English.	Pictou.	Ontario.	Total.
Sold for cash	24,381	76,284·24	16,825·20	64,666·01	18,306·04	9,752·06	210,215·21
Petty cash				13,079·07			13,079·07
Shipped on requisitions	29,292	278,369·15	13,167	332,705·24	76,374	23,766	753,674·05
	53,623	354,654·05	29,992·20	410,450·32	94,680·04	33,518·06	976,968·33

Seed weight as per receipt book		976,968·33
Sold for cash as per shipment book	223,294·28	
Shipped on requisitions as per shipment book	753,674·05	
	976,968·33	976,968·33

The 223,294·28 bushels sold for cash and 753,674·05 bushels shipped out on requisitions, in all 976,968·33 bushels, account for all the seed weight of oats handled for the Dominion Seed Commission, except two cars of Garton's oats one of which was shipped to the Honourable W. R. Motherwell, Commissioner of Agriculture, Saskatchewan, and the other to the Honourable W. T. Finlay, Minister of Agriculture, Alberta, and a small amount of 23 bushels and 18 lbs. which was sold for cash.

EXHIBIT "S".

STATEMENT of wheat sold showing Car Number, grade, and weight of shipment from elevator, also grade and weight of out-turn.

CAR No.	Weight of Shipments.					Weight of Out-turn.			
	1 Nor.	2 Nor.	3 Nor.	No. 4.	1 Hard.	1 Nor.	2 Nor.	3 Nor.	No. 4.
77450				1,000					999
144164			1,200					1,195	
22798				700					702·40
35752				1,050					1,050
142916		978					976·30		
142916			222					221·10	
33530				940·40					935·50
71094				1,100					1,102·40
146058				720					724·50
146058			680					680	
46076			1,006					1,002	
2174		912					912		
55036			998					998	
72274			1,070					1,068	
14772			1,070					1,068	
43642	965·40					973·50			
2790	628					627·10			
2790			372					370·30	
41410	1,600					991·40			
145922			688					688	
146416			332					311·10	
146416	868					889·40			
38046	936					802			
49078			988·20					966·40	
38596		928·40					940·40		
Bin		430·50					430·50		
41242			1,072					1,074	
17114				500					497·50
92484			1,106					1,126	
59868			952					1,004	
39212		762					744		
140280				1,280					1,280
43792			998					996	
31338			1,000					1,002	

91376			1,006					1,006	
56396			1,004					1,008	
42522				1,000					996·10
36610				960					797·10
94852				792					795·10
57090		800					791·10		
42000		1,600					919·50		
147930		1,000					1,004		
71382		1,000					1,005·20		
90008		1,000					1,001·30		
52642		1,000					1,002·30		
52020		188					185·50		
52020	812					808·40			
43234	1,000				996				
38882	1,000					1,000·50			
58342	466					465			
58342		534				534			
76960		128				129·50			
76960			872					870·40	
36512			1,000					1,000	
36866			1,000					996·50	
93910			1,000					998·10	
36058			1,000					996·20	
26714		624·20					624·20		
36594			1,046					1,046	
98560			988·40					988·40	
54470		1,012·20					1,012·20		
36648	1,016·30					1,016·30			
41170		1,118·30					1,118·30		
39444			963·40					963·40	
37034			1,066·20					1,066·20	
42114	1,204·30					1,204·30			
56674				1,133·20					1,133·20
42056	1,037					1,037			
Petty sales			1,308·45					1,308·45	
	10,933·40	13,416·40	26,069·45	11,176	996	10,480·40	12,669·20	26,019·55	11,014·40

EXHIBIT "S".

SUMMARY of wheat showing the grade and the number of bushels shipped from the elevators which was sold for cash; also showing the number of bushels by grade which were sent out on requisitions.

	Weight of Shipments from Elevators.					
	1 Hard.	1 Nor.	2 Nor.	3 Nor.	No. 4.	Total.
Sold for cash	....	10,933·10	13,416·10	26,009·45	11,176	61,536·05
Shipped on requisition	1,534	72,200	81,389	257,979	86,802	499,904
	1,534	83,133·10	94,805·10	283,988·45	97,978	561,440·05

Seed weight as per receipt book	.....	561,440·05
Sold for cash as per shipment book	61,536·05	.....
Shipped on requisitions as per shipment book	499,904	.....
	561,440·05	561,440·05

STATEMENT of barley showing the seed weight bought, the number of cars shipped on requisitions with the amount of bushels they contained, also the number of bushels sold for cash.

Seed weight as per receipt book	.....	47,502
Shipped 45 cars on requisitions as per shipment book	47,452	.....
Sold for cash as per shipment book	50	.....
	47,502	47,502

SESSIONAL PAPER No. 25c

WINNIPEG, September 10, 1908.

INVENTORY ACCOUNT.

Bag Account :—

Anchor Elevator Co., Limited	18,280 @ 3½c.	$639 80	
" " "	3,635 @ 1 c.	36 35	
		$676 15	
Less allowance (sorting)		15 00	
			$ 661 15
In store, Modern Laundry	148,000 @ 6c.		8,880 00
a In store, Winnipeg Elevator, Regina	45,000 @ 6c.		2,700 00
In store, Scott Bathgate's	6,500 @ 6c.		390 00
b In store, Scott Bathgate's	19,500 @ 4c.		780 00
			$13,411 15

INSURANCE ACCOUNT.

RYAN AGENCY, LIMITED. Date of Inventory—September 10.

Policy	8403317	Company	L. & L. & G.	$47 00
"	3606282	"	Guardian	55 68
"	6579713	"	Atlas	34 92
"	1716810	"	Queen	27 94
"	16166	"	Sovereign	34 92
"	110312	"	Rimouski	41 91
				$242 37

SUMMARY.

Bag account	$13,411 15
Insurance	242 37
	$13,653 52

Bag inventory	Brought forward	$13,411 14
a 45,000 @ 6c. should be 4c.	$900 00	
b 19,500 @ 4c. should be 5c.	195 00	
		705 00
		$12,706 00
Bag inventory		$12,706 00

EXHIBIT "T."

L. F.	Ledger Balance.	Assets and Liabilities.				Profit and Loss.	
		Dr.	Cr.	Dr.	Cr.	Dr.	Cr.
		$ cts.	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.
1	Bag account	50,485 16				50,485 16	
2	Wheat account		35,709 86				35,709 86
3	Oat account		18,737 94				18,737 94
4	Barley account		6,966 83				6,966 83
5	Freight account	139,684 47				139,684 47	
6	Bank of Montreal		1,547,216 33		1,547,216 33		
7	Insurance	2,170 63				2,170 63	
9	Distributing account	1,200,823 58		1,200,823 58			
10	Handling account	47,176 49				47,176 49	
11	Storage	317 40				317 40	
12	Alberta Government	903 73		903 73			
13	J. Richardson & Sons		1,340 38		1,340 38		
14	Anchor Elevator Co		1,500 00		1,500 00		
15	Saskatchewan Government	1,889 55		1,889 55			
16	Oat sales account		11,474 71				11,474 71
16	Barley sales account		45 23				45 23
17	Wheat sales account		1,150 06				1,150 06
18	Brokerage	6 63				6 63	
19	Wheat screenings		4,744 57				4,744 57
20	Oat screenings		10,930 99				10,930 99
21	Canadian Pacific Railway Co	814 31		814 31			
22	Claim account		814 31				814 31
23	Receiver General's Department	216,590 14		216,590 14			
25	R. E. A. Leech (per Martin)	330 03		330 03			
28	Option account (purchases)		8,109 37				8,109 37
28	Option account (sales)	904 10				904 10	
34	Freight account (special)	831 79				831 79	
35	Barley screenings		710 14				710 14
38	Freight account (petty sales)	576 05				576 05	
43	R. E. A. Leech (sales account)		24,651 51		24,651 51		
41	" (rejections)		6,639 94		6,639 94		
45	" (special freight)	3,335 43		3,335 43			
46	J. P. Graves	255 16		255 16			
47	Inventory	13,653 52		13,653 52			
	Loss			142,752 71			142,752 71
		1,680,742 17	1,680,742 17	1,581,348 16	1,581,348 16	242,146 72	242,146 72

N.B.

L.F. 1—Bag account should be		$51,190 16
47—Inventory account should be.		12,948 52
	(*See* Inventory Statement).	
Loss brought forward		$142,752 71
Bag account		705 00
Total loss		$143,457 71

Certified correct,—

F. G. MATTHEW,
R. J. HOWDEN, *Accountant.*

CHARLES C. CASTLE,
Purchasing Agent.

REPORT OF MR. CHAS. H. BEDDOE, CHIEF ACCOUNTANT.

OTTAWA, January 9th, 1909.

The Honourable FRANK OLIVER,
Minister of the Interior,
Ottawa, Ont.

SIR,—I have the honour to submit the following report relating to the Seed Grain Distribution, 1908:—

On a report of the Committee of the Privy Council, approved by His Excellency the Governor General, dated the 30th January, 1908, it was decided that a supplementary estimate for the fiscal year 1908-1909 be submitted to the House of Commons asking for the following appropriations:—

(*a*) To provide seed grain for homestead settlers in the provinces of Alberta and Saskatchewan; the cost of said grain to be repaid by the settlers with interest at the rate of five per centum per annum and until repayment to be a lien or charge upon the lands of the settler held under homestead entry..	$ 585,000
(*b*) Advances to the government of Alberta for the purchase of seed grain to settlers..	440,000
(*c*) Advances to the government of Saskatchewan for the purchase of seed grain to settlers..	1,825,000

It was provided in the said report that the sale and distribution of the seed grain should be made to homestead settlers, under such regulations as might be made by the Minister of the Interior, approved by His Excellency the Governor General in Council.

It was also provided that no advance could be made to either of the provinces of Alberta or Saskatchewan until a duly certified copy of an order in council approved by His Excellency the Lieutenant Governor of each province had been received giving authority to borrow from the government of Canada the respective sums set forth in the supplementary estimate above mentioned and stipulating that if the said sums or any part thereof which might be advanced were not repaid to the Dominion treasury on or before the 31st March, 1909, together with interest at the rate of five per centum per annum, the same should thereupon become a charge upon any subsidy, allowance grant or money which for any purpose whatsoever might at any time thereafter become payable by the government of Canada to the respective governments of Alberta and Saskatchewan.

On the 6th February, 1908, His Excellency the Governor General in Council approved of the regulations respecting the purchase, sale and distribution of grain to homestead settlers. On the 7th February, 1908, a memorandum of agreement was entered into between the Dominion government and the province of Alberta and on the same date a memorandum of agreement was also entered into between the Dominion government and the province of Saskatchewan. Provisoes 5, 6, 7, 8, 9 and 10 of these agreements have reference to the duties of the officer entrusted with the disbursements, and read as follows:—

PROVINCE OF ALBERTA.

5. Whenever the said loan of $440,000 to the province for the purchase of seed grain is authorized by the parliament of Canada it is hereby agreed on behalf of the government of Alberta, which agreement in this behalf shall be ratified by the Lieutenant Governor in Council, that the said sum or such part thereof as may be required shall be paid from time to time by the Minister of Finance of Canada to such person as may be designated by the minister to be by such person applied in pay-

ment of purchases of seed grain and otherwise for the purposes of carrying out the intention of these presents.

6. An officer shall be designated and appointed by the minister, to be approved by the Minister of Agriculture of the province of Alberta, who shall be the officer to whom payments by the Minister of Finance under the next preceding paragraph are to be made, and it shall be the duty of such officer to make all the disbursements under this agreement and said regulations and furnish complete accounts of the same to the respective governments on whose behalf such disbursements are made. Such officer shall, whenever practicable, obtain vouchers for all disbursements and all vouchers and books of account connected therewith shall be open to audit and inspection by the auditors of the respective governments on whose behalf such disbursements are made.

7. Salaries of all officials employed by the governments of Canada, Saskatchewan and Alberta for the purpose of purchasing, selling and distributing seed grain under these presents and said regulations shall be paid respectively by the government of which such official is the appointee and shall not be chargeable to the sum appropriated by the government of Canada or loaned by the government of Canada to the said respective provinces for the purchase, sale and distribution of seed grain.

8. An account of the fees chargeable by the secretary-treasurers of local improvement districts under said regulations shall be kept by the officer in charge of the central distributing office referred to in the said regulations, and the said fees in respect of the applications of homesteaders shall be paid by the officer in charge of disbursements mentioned in paragraph 6 of this agreement and debited to the government of Canada account, but the same shall not form part of the costs of administration within the meaning of 'costs of administration' in these presents. The fees payable on applications made by others than homesteaders shall be payable by the respective governments of the respective provinces in which such applicants reside.

9. The cost of the grain as defined in regulation 12 of Schedule A charged applicants to whom delivery has been made shall for the purposes of accounting be debited to the government of Canada in the case of homesteaders and debited to the governments of Alberta and Saskatchewan respectively, in the case of applicants other than homesteaders within the respective provinces.

10. All the costs, charges and expenses incurred in connection with the purchase, sale and distribution of seed grain, and which are not embraced in the last three preceding paragraphs shall be regarded as costs of administration, to be paid in the first instance out of the moneys available for the purchase, sale and distribution of seed grain, and when the said distribution is completed and such cost, charges and expenses ascertained, a division of the same shall be made and the liability of each government in respect thereof shall bear the same ratio to the total cost of administration which the cost of seed grain debited to each government as set out in the next preceding paragraph bears to the total cost of the same to the three governments concerned. The amount payable by the said province of Alberta in respect of said costs of administration shall be paid forthwith, on being ascertained, to the officer mentioned in paragraph 6.

PROVINCE OF SASKATCHEWAN.

5. Whenever the said loan of $1,825,000 to the province for the purchase of seed grain is authorized by the parliament of Canada it is hereby agreed on behalf of the government of Saskatchewan, which agreement in this behalf shall be ratified by the Lieutenant Governor in Council, that the said sum, or such part thereof as may be required, shall be paid from time to time by the Minister of Finance of Canada to such person as may be designated by the minister, to be by such person applied in payment of purchases of seed grain and otherwise for the purpose of carrying out the intention of these presents.

6. An officer shall be designated and appointed by the minister to be approved by the commissioner, who shall be the officer to whom payments by the Minister of Finance under the next preceding paragraph are to be made, and it shall be the duty of such officer to make all disbursements under this agreement and said regulations, and to furnish complete accounts of the same to the respective governments on whose behalf such disbursements are made. Such officer shall, whenever practicable, obtain vouchers for all disbursements, and all vouchers and books of account connected therewith shall be open to audit and inspection by the auditors of the respective governments on whose behalf such disbursements are made.

7. Salaries of all officials employed by the governments of Canada, Saskatchewan and Alberta, for the purpose of purchasing, selling and distributing seed grain under these presents, and said regulations shall be paid respectively by the governments of which such official is the appointee, and shall not be chargeable to the sum appropriated by the government of Canada or loaned by the government of Canada to the said respective provinces for the purchase, sale and distribution of seed grain.

8. An account of the fees chargeable by the secretary-treasurers of local improvement districts and rural municipalities under said regulations shall be kept by the officer in charge of the central distributing office referred to in the said regulations, and the said fees in respect of the applications of homesteaders shall be kept by the officer in charge of disbursements mentioned in paragraph 6 of this agreement, and debited to government of Canada account, but the same shall not form part of the costs of distribution within the meaning of 'costs of administration' in these presents. The fees payable on applications made by others than homesteaders shall be payable by the respective governments of the provinces in which such applicants reside.

9. The cost of the grain as defined in regulation 12 of Schedule 'A,' charged applicants to whom delivery has been made shall, for the purpose of accounting, be debited to the government of Canada in the case of homesteaders and debited to the governments of Saskatchewan and Alberta, respectively, in the case of applicants other than homesteaders within the respective provinces.

10. All the costs, charges and expenses incurred in connection with the purchase, sale and distribution of seed grain, and which are not embraced in the last three preceding paragraphs, shall be regarded as costs of administration, to be paid in the first instance out of the moneys available for the purchase, sale and distribution of seed grain, and when the said distribution is completed and such costs, charges, and expenses ascertained, a division of the same shall be made, and the liability of each government in respect thereof shall bear the same ratio to the total cost of administration which the cost of seed grain debited to each government as set out in the next preceding paragraph bears to the total cost of the same to the three governments concerned. The amount payable by the said province of Saskatchewan in respect of said costs of administration shall be paid forthwith, on being ascertained, to the officer mentioned in paragraph 6.

In accordance with the provision for the selection of an official to whom payments were to be made by the Minister of Finance, the following correspondence took place:—

MINISTER OF THE INTERIOR,
CANADA.

OTTAWA, February 8, 1908.

DEAR SIR,—I hereby appoint and designate Charles H. Beddoe, accountant of the Department of the Interior, to be the officer to whom payments by the Minister of Finance are to be made under the agreement of yesterday's date entered into between myself as Minister of the Interior, and yourself, as Minister of Agriculture, on behalf

of the province of Alberta in respect of the purchase, sale and distribution of seed grain.

Yours very truly,
(Sgd.) FRANK OLIVER,
Minister of the Interior.

Hon. W. T. FINLAY,
Minister of Agriculture,
For the Province of Alberta.

MINISTER OF THE INTERIOR,
CANADA.

OTTAWA, February 8, 1908.

DEAR SIR,—I hereby appoint and designate Charles H. Beddoe, of the Department of the Interior, to be the officer to whom payments by the Minister of Finance are to be made under the agreement of yesterday's date entered into between myself as Minister of the Interior, and yourself, as Commissioner of Agriculture, on behalf of the province of Saskatchewan in respect of the purchase, sale and distribution of seed grain.

Yours very truly,
(Sgd.) FRANK OLIVER,
Minister of the Interior.

Hon. W. R. MOTHERWELL,
Commissioner of Agriculture,
For the Province of Saskatchewan.

MINISTER OF THE INTERIOR,
CANADA.

OTTAWA, February 8, 1908.

DEAR SIR,—I am in receipt of your favour of even date intimating that you have designated and appointed Charles H. Beddoe, accountant of the Department of the Interior, to receive payments from the Minister of Finance of the money to be advanced by the government of Canada by way of loan to the province of Alberta, and to disburse the same in connection with the purchase, sale and distribution of seed grain.

I hereby, pursuant to the agreement referrred to in your letter, approve of the appointment of Mr. Beddoe to receive and make the disbursements contemplated in the said agreement.

Yours very truly,
(Sgd.) GEO. HARCOURT,
Deputy Minister of Agriculture,
for Alberta.

Hon. FRANK OLIVER,
Minister of the Interior,

MINISTER OF THE INTERIOR,
CANADA.

OTTAWA, February 8, 1908.

DEAR SIR,—I am in receipt of your favour of even date intimating that you have designated and appointed Charles H. Beddoe, accountant of the Department of the Interior, to receive payments from the Minister of Finance of the money to be advanced by the government of Canada by way of loan to the province of Saskatchewan,

and to disburse the same in connection with the purchase, sale and distribution of seed grain.

I hereby, pursuant to the agreement referrred to in your letter, approve of the appointment of Mr. Beddoe to receive and make the disbursements contemplated in the said agreement.

Yours faithfully,

(Sgd.) W. R. MOTHERWELL,
Commissioner of Agriculture,
Saskatchewan.

Hon. FRANK OLIVER,
Minister of the Interior,
Ottawa.

Acting under your instructions I proceeded to Winnipeg on the 12th February, 1908, and arranged for office accommodation in the immigration building but found that it was impracticable to undertake the work at such a distance from the office of the purchasing agent and Mr. Castle, therefore, provided space for me in his own office, which was conveniently situated in Market Square and near the Grain Exchange.

In regard to the payments for seed grain, care was taken to see that the official weighing and inspection certificates were furnished, and no cheques were issued unless supported by properly certified vouchers.

The total cheques issued up to the 31st December, 1908, amounted to $1,655,144.07, and the refunds amounted to $281,335.80, making the net expenditure on the above date $1,373,808.27.

The following is a summary of the net expenditure:—

Wheat	$459,530 22
Oats	529,896 12
Barley	42,621 51
Freight on grain	133,701 32
Handling and cleaning grain	47,719 48
Duty on oats and barley	35,425 07
Special freight on grain sold	6,005 63
Insurance, weighing, &c.	6,996 65
Sacks, twine and needles	50,543 71
Administration expenses	58,416 54
Fees paid secretary-treasurers	2,952 02
	$1,373,808 27

The total distribution amounted to $1,086,946.46; the net cost of the seed grain distribution is $283,709.74. The cost outside of administration expenses is due to the following causes:—

(1) Shortly after the purchasing agent commenced operations it was realized that the supply of seed oats from the west would not be sufficient to fill the applications and it was agreed to purchase over 400,000 bushels from Great Britain. A customs duty of 7 cents per bushel is exacted by the Federal government on imported seed grain, so that the duty had to be paid on the imported oats and on a quantity of seed barley imported from the United States. A duty was also imposed on sacks, and as the English oats were sacked in the old country a duty had to be paid on them.

The duty, &c., paid amounted to $35,425.07.

(2) The supplementary estimate of $2,850,000 was based on reports of the requirements in the frosted areas throughout the west, and instructions were given to the purchasing agent on the 31st January, 1908, to purchase at once 800,000 bushels of

wheat, 1,500,000 bushels of oats, and 300,000 bushels of barley, and as very few sacks were procurable at that time orders were given for a supply which it was thought would be needed. Contracts were let for 535,013 wheat sacks, 220,954 oat sacks, and 5,000 barley sacks. Over 400,000 bushels of English oats were sacked before shipment from Liverpool, and the applications for wheat were very much less than estimated, consequently the purchasing agent had a large surplus of sacks which were subsequently sold by tender and realized much less than was paid for them.

(3) Shortly after authority was given to the purchasing agent to secure certain quantities of grain there was a perceptible change in the financial condition of the west. The banks, loan companies and private individuals came to the assistance of those requiring seed grain, so that the applications fell very far short of the original estimated requirement, and although the purchases made were much less than the quantity authorized to be purchased, yet after the distribution had been made there was a large surplus of wheat and oats which had to be disposed of when prices of wheat had dropped, and a very large quantity of oats had to be sold for feed. These conditions were unavoidable and account materially for the heavy cost of the seed grain distribution.

(4) The price to be charged to the farmers for the different grades of seed wheat was arrived at on March 7, 1908. Applications for shipments to various points were at that time mailed to the purchasing agent's office and had to be filled at once. Up to the date mentioned only a small proportion of the seed wheat had been purchased. The restrictions as to cleanliness were enforced and very few cars were selected each day as fit for seed. One dealer had 36 cars rejected in a few days. This restriction caused a deadlock and it seemed as if sufficient wheat for seed purposes could not be procured. It was then decided to offer a premium above the market price on the different grades of wheat as follows:—

A.—Containing no noxious weeds, 20 cents premium.

B.—Containing maximum of 1 noxious weed per lb., 15 cents premium.

C.—Containing maximum of 5 noxious weeds per lb., 10 cents premium.

D.—Containing maximum of 8 noxious weeds per lb., 5 cents premium.

The above decision to give a premium had the effect of bringing out the grain. It, however, added very materially to the price of the wheat as compared with the price which had been arranged to charge to the farmers.

(5) Infinite care was taken to supply the seed grain as free from noxious weeds as possible. The grain was cleaned and re-cleaned many times, and the screenings were, therefore, heavy. The shrinkage was small considering the quantity of grain handled.

(6) The limited time for the purchase and distribution of the grain necessitated the employment of a large staff at the distribution office at Regina, and also at Winnipeg and Ottawa, and as much of the business had to be transacted without delay, the cost for telegrams and telephoning was heavy.

(7) The payment of a small fee to the railway station agents for delivering the grain to the farmers and obtaining execution of the liens and mortgages entailed an expenditure of $3,219.20 which was not anticipated. The agents received no extra remuneration from the companies, and as these duties were performed outside of their ordinary duties, it was decided to give them a small remuneration based on the numbers of liens and mortgages which were executed.

The above ingredients must be considered when computing the cost of the seed grain distribution.

The following statements relating to the expenditure are hereto attached:—

No. 1. Expenditure to December 31, 1908.

No. 2. Statement of grain purchases.

No. 3. Statement of sack purchases.

No. 4. Details of expenses of administration.

No. 5. Fees paid to secretary-treasurers of local improvements districts *re* applications for seed grain.

No. 6. Statement of refunds.

No. 7. Seed grain distributed to settlers by agencies.

No. 8. Cost of seed grain distribution to Dominion government and the provinces of Alberta and Saskatchewan.

No. 9. Grain and sacks purchased, distributed and sold.

The figures shown in the several statements submitted were made up to December 31, 1908, but there are a few minor matters which cannot yet be settled. There are some small claims still to be adjusted and a few cheques may have to be issued for fees for applications and for freight charges. These, however, will not materially affect the statements, but a further adjustment can be made between the Dominion government and the two provinces when these small matters have been finally settled.

I have the honour to be, sir,

Your obedient servant,

CHAS. H. BEDDOE,

Chief Accountant.

STATEMENT No. 1—Statement showing the Expenditure in connection with the Seed Grain Advance Account, 1908.

		Gross Amount.	Key.	Refunds.	Net Amount.
WHEAT.	$ cts.	$ cts.		$ cts.	$ cts.
No. 1 Northern	93,316 87				
No. 2 "	99,195 56				
No. 3 "	284,125 14				
No. 4 "	90,317 19				
No. 1 Hard	596 03				
		567,550 79	2	108,020 57	459,530 22
OATS.					
No. 1 White Western	38,046 42				
No. 2 "	230,882 15				
No. 3 "	17,700 87				
English	290,330 77				
Prince Edward Island	66,300 00				
Ontario	23,959 44				
Edmonton Special	1,233 30				
Garton's Abundance	2,712 20				
"Regenerated"	4 00				
		671,169 18	2	141,273 06	529,896 12
BARLEY.					
No. 1	3,569 64				
No. 2	16,842 78				
No. 1X	1,833 54				
No. 2X	17,870 43				
No. 3X	6,186 24				
		46,302 63	2	3,681 12	42,621 51
Freight on grain		133,781 17	10	79 85	133,701 32
Handling and cleaning grain		47,719 48	11	.....	47,719 48
Duty on oats and barley		35,425 07	12	.....	35,425 07
Special freight on grain sold		6,005 63	....	.....	6,005 63
Insurance, weighing, etc		10,194 61	13	3,197 96	6,996 65
Sacks, twine and needles		67,881 76	3	17,338 05	50,543 71
Administration expenses		66,161 73	4	7,745 19	58,416 54
Fees paid Secretary Treasurers		2,952 02	5	.....	2,952 02
		1,655,144 07	...	281,335 80	1,373,808 27

STATEMENT No. 2.—Statement showing Expenditure in connection with purchases of Wheat, Oats and Barley.

Name.	Barley.	Oats.	Wheat.	Amount.
	Bush.	Bush.	Bush.	$ cts.
Anchor Elevator Co.		5,534·04		3,351 56
Alberta Pac. Elevator Co.		42,896·01	7,268·48	32,526 61
Anglo-Can. Elevator Co.			2,394·50	2,334 86
Agnew, W. K.			1,076 30	1,238 66
Alberta Grain Co.		1,645·10	18,729·50	21,000 81
Anderson, W.		1,191 21		705 01
British American Elevator Co.			75,181·50	71,032 70
Broadfoot, P.			9,229 30	9,339 88
Barre, T. U. A		1,465 30		804 12
Baleouskie & Woodlinger		1,720·20		980 08
Billet, M.		1,238·08		732 63
Brennan, Mat.		2,409·29		1,450 56
Bell, Robert			1,019·30	1,164 07
Brimacombe, J. W.		1,417·22		858 16
Bordt, C. M.			936 10	1,064 43
Brackman-Ker Milling Co.	[9,896·32	20,982·12		26,020 39
Bush, Sydney, J.		1,740		1,023 86
Cummings, Hazlett Co.		3,627·22	2,940·40	4,636 63
Canadian Elevator Co.		1,245·20	29,035	28,289 30
Castle, C. C.			712·30	732 86
Carson, Wm & Co.		18,050	1,047·50	12,680 71
Campbell, B. A.			1,736·20	1,775 44
Coxworth, John			983	1,046 00
Cusach, T.		1,859·24		1,113 31
Can. Malting Co.	6,240			6,552 00
Cheyne, Jas. G.		1,967·12		1,177 79
Chambers, D.			1,032·30	977 99
Chisholm, W. B.			1,082·10	1,272 69
Carruthers, Jas & Co.	18,395·30	12,928·08		23,687 31
Crowe, F. S.	1,246·42			934 50
Campbell & Wilson			1,146·40	1,212 80
Dominion Elevator Co.		2,207·12	5,172·40	6,538 46
Donald Morrison & Co.		1,890	6,657·30	7,719 69
Dunsheath, McMillan & Co.			2,050·30	2,120 45
Dewart, Fred.			681·50	778 85
Dunbar, W.			1,004·40	1,202 20
Embury, A.			1,024·20	1,167 92
Findlay, F. E.			641	636 43
Foster, George		2,105·30		1,260 78
Farmers Elevator Co			1,138·10	1,249 06
Follis, Wm.			991·70	1,170 35
Fraser, H. A.		2,248·08		1,346 05
Fraser, A.		1,712·22		1,031 05
Grain Growers' Grain Co		32,634·04	27,319·10	46,891 69
Graves, J. P.			2,574·50	2,435 41
Gilanders, D.		3,753·08		2,152 33
Geddes, John		4,557·50		4,734 60
Galloway, Wm			825·30	941 78
Greentree, F.			868·10	936 53
Gillis, Bros.		1,812·22		1,078 96
Goldie Milling Co.	3,940			3,569 64
Garton Seed Co. (Eng.)		2,467·22		2,716 20
Harriot & Milne		2,440·30	22,272	23,367 56
Hall, C. E.			2,258·10	2,055 32
Howe, C. E.		1,978·08		1,204 49
Hansburger, W. T.			2,211·50	2,077 97
Hamilton, G			1,035	1,141 21
Harty, J. T.			1,005·10	1,019 30
Haldisty Bros.		1,532·07		918 68
Imperial Elevator Co		3,840·10	35,126·10	36,487 33
International Elevator Co.		9,426·26	19,078·20	24,205 43
Johnston, R. R		1,969·04		1,158 77
Johnston, H. W.			2,172·40	2,300 00

STATEMENT No. 2.—Statement showing Expenditure in connection with purchases of Wheat, Oats and Barley—*Continued.*

Name.	Barley.	Oats.	Wheat.	Amount.
	Bush.	Bush.	Bush.	$ cts.
Kattenbringer, A			1,035 50	1,180 97
Keyes, W. H.			1,105 20	1,301 28
Knight, R. A.			2,489 30	2,561 42
Lamb Bros			1,059 30	1,088 83
Laird, W.			2,814 20	2,988 18
Lee, R. S.		1,555 20		936 43
Lake of the Woods Milling Co.		1,763 28		1,062 13
Lane, W. S.		1,869 24		1,100 23
Langley, H. G.		1,987 12		1,135 71
Murphy, G. B. & Co.		7,624 24	7,733	12,456 12
Muir, Robert & Co.			6,553 20	7,043 54
MacLennan Bros.			1,719 30	1,797 38
Maple Leaf Flour Mills			7,027 50	7,379 99
McLaughlin, W. S. & Co.		993 18	697 30	1,192 38
McRae, J. A.		1,791 26		983 02
Madson, John		1,781 26		977 53
Morrison, George			1,122	1,053 01
Mickelwright, A.			1,101	1,151 70
Manitoba Commission Co.		25,529 14		15,357 85
McLean, D.			4,038 50	3,933 31
McNair, W. L.		19,775	1,954	14,030 44
Makepiece, Andrew		1,311 26		789 55
McGill, Colin			999	1,042 48
McLaughlin & Ellis			2,879 10	2,994 51
McKenzie, A. E. & Co.		76,029 22		55,555 26
McLaren, James		1,216 26		695 84
McNair, George			2,083	2,286 20
Murchison, Kenneth			868 10	1,005 30
Mooney, W. T.			1,125 50	1,283 63
McIntosh, M.			1,076 50	1,215 62
McLellan Bros			1,061 40	1,210 96
Maharg, J. A.			1,101 10	1,102 72
Merchants' Bank			1,100 40	1,360 48
North Star Grain Co.			60,442 10	55,660 83
Northern Elevator Co.		15,903 18	22,298 40	32,002 77
Neville, A.			699 30	749 33
Ogilvie Flour Mills Co.		7,647 02	2,509 20	6,824 01
Ogden, J. F.		1,965 20		982 80
Playfair, A. W.			851 30	971 75
Potter, Alfred			1,101	1,251 46
Parker, W. J.		1,166 06		709 37
Pollard, J. C.		1,650 30		971 40
Royal Grain Co.		44,851 07	2,266 30	28,812 39
Randall, Gee & Mitchell		18,330	1,721 10	12,548 64
Rose, E.		1,020		602 35
Rogers, A. H			707 50	879 36
Read, Jos. & Co. (P.E.)		102,000		66,300 00
Richardson, Jas. & Sons	11,088 26	125,803 31	3,045 20	301,977 57
" "		1,864		1,255 28
Amount allowed for rejections on shipments on S.S. *Montrose* and *Sardinian*—				
English oats				1,872 61
Saskatchewan Elevator Co.		11,529 04	13,535 40	18,672 74
Spencer Grain Co.		5,826 16	5,255 40	8,366 69
Simpson, Hepworth & Co.			2,398 40	2,175 16
Spink, Samuel			976 40	923 97
Scott, John			1,134 30	1,079 03
Scott, Samuel		1,236 26	5,334 50	5,905 97
Sterling, E.		1,955 10		1,072 81
Sexton, G. W.			1,193 30	1,134 34
Shilson, Fred.		1,239 04		688 04
Speers, C. W.			984 20	1,016 55

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STATEMENT No. 2.—Statement showing Expenditure in connection with purchases of Wheat, Oats and Barley—*Continued.*

Name.	Barley.	Oats.	Wheat.	Amount.
	Bush.	Bush.	Bush.	$ cts.
Smith Grain Co.			4,171 45	4 371 41
Skelton, J. R.		1,860 20		1,113 86
Sargent, W.L.			618 10	610 83
Stephenson, Joseph			1,043 30	1,084 57
Steele, D.			988	1,144 91
Snow, M.			666 40	689 90
Schmidt, Herman			2,103 40	2,328 69
Strassburger, Jacob			936 10	935 51
Steele Briggs Seed Co., Ont.		19,476		14,754 80
Thompson, Sons & Co.		1,385 10	9,191 30	9,918 22
Turner, C. C. & Co			3,221 30	2,975 44
Tolke, R. J.		1,720 10		1,029 80
Temple, Wm.		1,751 26		1,048 65
Thompson, E.		3,875 23		2,269 38
Union Grain Co		1,947 32	2,175 40	3,318 67
Underwood, A			521 30	504 16
VanDusen, Harrington Co.		1,622 12		954 59
Western Elevator Co.			54,464 30	52,090 13
Winnipeg Elevator Co.		3,118 18	13,454 20	14,797 97
Wilson, Joseph			1,123 10	1,152 83
Western Canada Flour Mills Co.		2,109 14	3,047 20	4,639 84
Watson, James		2,009 04		1,223 30
Waddell, Thos.		1,853 18		1,115 91
Wells, Colin		1,069 14		626 48
Wheat City Flour Mills Co			1,119	1,249 27
Young Grain Co.			2,889 20	3,080 02
	50,807 34	1,024,959 09	577,364 33	1,280,755 24

KEY TO STATEMENT No. 2.—Statement showing details of Grain purchased by C. C. Castle, Purchasing Agent at Winnipeg, in connection with Seed Grain Advances, 1908.

—	Price.	Bushels.	Freight.	Sundries.	Amount.
	$ cts.		$ cts.	$ cts.	$ cts.
Anchor Elevator and Warehouse Co.—					
No. 2 W. Oats	0 60	1,810 10	6 15		1,080 03
"	0 61	3,723·28			2,271 53
		5,534·04	6 15		3,351 56
Alberta Pacific Elevator Co.—					
No. 1 Wheat	1 01⅜	1,022·20			1,030 52
No. 2 Wheat	0 96⅞	987			950 97
"	0 99⅝	937·55		0 65	933 75
"	1 06⅛	969·33			1,028 69
No. 3 Wheat	0 94½	1,021·50		0 65	961 14
"	0 98½	1,020·40		0 65	1,008 52
No. 4 Wheat	1 02½	1,309 30		0 65	1,336 28
		7,268·48		2 60	7,249 87
No. 1 W. Oats	0 61	6,332·20		1 95	3,860 93
No. 2 W. Oats	0 60	21,217·23		59 65	12,671 57
No. 3 W. Oats	0 57	15,345·26		3 25	8,744 24
		42,896·01		64 85	25,276 74
Anglo-Canadian Elevator Co.—					
No. 3 Wheat	1 10⅛	677·50	77 27	7 43	661 76
"	1 20½	707 50	80 69	7 73	761 86
No. 4 Wheat	1 02½	1,009·10	116 20	10 74	911 24
		2,394·50	274 16	25 90	2,334 86
Agnew, W. K.—					
No. 2 Wheat	1 25¼	1,076·30	96 88	11 42	1,238 66
Alberta Grain Co.—					
No. 1 Wheat	1 11½	1,142 20		0 65	1,268 77
"	1 15½	941·65		0 65	1,087 45
No. 2 Wheat	1 10½	1,005·20		0 65	1,106 45
"	1 13½	770·35		0 65	876 80
"	1 14½	959·10		0 65	1,094 00
No. 3 Wheat	0 89½	1,061·30		0 65	945 42
"	0 93½	1,093		0 65	1,017 20
"	0 97½	1,024·30		0 65	996 97
"	0 99½	2,874·20		1 95	2,868 78
"	1 04½	1,738·30		1 30	1,808 91
"	1 09½	4,100·50		2 60	4,471 18
"	1 10½	1,014		0 65	1,122 35
"	1 09½	1,004·40		0 65	1,103 23
		18,729·50		12 35	19,767 51
No. 1 W. Oats	0 75	1,645.10		0 65	1,233 30
Anderson, W.—					
No. 2 W. Oats	0 66	1,191·21	68 88	12 57	705 01

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KEY TO STATEMENT No. 2.—Statement showing details of Grain purchased by C. C. Castle, Purchasing Agent at Winnipeg, &c.—*Continued.*

—	Price.	Bushels.	Freight.	Sundries.	Amount.
	$ cts.		$ cts.	$ cts.	$ cts.
British American Elevator Co.—					
No. 2 Wheat	1 06⅜	1,174	154 97	0 65	1,097 63
"	1 09½	984·50	89 99	0 65	984 06
No. 3 Wheat	1 00⅜	28,187·30	3,887 76	16 90	24,494 13
"	1 10¾	4,419·20	598 25	2 60	4,302 57
"	1 13½	2,133·40	291 23	1 30	2,134 52
"	1 14¾	1,090·30	145 40	0 65	1,098 48
"	1 15⅝	1,021·10	143 06	0 65	1,037 01
"	1 15¾	4,463·10	613 82	2 60	4,549 69
"	1 18¼	4,496·10	525 99	2 60	4,710 61
"	1 19⅝	4,322·40	539 70	2 60	4,607 05
"	1 20½	1,126·50	148 74	0 65	1,211 27
"	1 23½	1,108·30	155 30	0 65	1,215 82
"	1 24⅝	4,510 10	475 11	1 95	4,971 32
No 4 Wheat	0 93½	3,159	416 99	1 95	2,542 61
"	1 00⅝	2,153·10	286 30	1 30	1,879 03
"	1 03⅝	1,061·10	142 93	0 65	956 05
"	1 03½	3,313·40	437 41	1 95	2,998 56
"	1 08½	3,285·20	439 54	1 95	3,127 20
"	1 08¾	1,027·10	135 59	0 65	980 80
"	1 13⅝	2,143·50	300 34	1 30	2,134 29
		75,181·50	9,928 42	44 20	71,032 70
Broadfoot, P.—					
No. 1 Wheat	1 10½	1,084·30	86 32	11 50	1,100 55
"	1 13	2,366 30	184 60	24 97	2,464 57
No. 2 Wheat	1 07⅓	1,140·20	94 05	12 05	1,119 76
"	1 10	1,199·50	93 59	12 65	1,213 58
"	1 11¾	2,240·10	200 66	1 30	2,301 42
No. 3 Wheat	1 04	1,198·10	93 46	12 63	1,140 00
		9,229·30	752 68	75 10	9,339 88
Barre, T. U. A.—					
No. 2 W. Oats	0 61	1,465 30	74 76	15 31	804 12
Baleooskie & Woodlinger—					
No. 2 W. Oats	0 57	1,720·20		0 65	980 08
Billet, M.—					
No. 2 White Oats	0 66	1,238 08	71 57	13 03	732 63
Brennan, Mat.—					
No. 1 White Oats	0 67	2,409·29	139 29	24 75	1,450 56
Belle, Robert—					
No. 1 Wheat	1 23⅛	1,019·30	80 33	10 85	1,164 07
Brimacombe, J. H.—					
No. 2 W. Oats	0 66	1,417·22	62 66	14 83	858 16
Borde, C. M.—					
No. 3 Wheat	1 25⅛	936 10	96 95	10 01	1,064 43
Brackman-Ker Milling Co.—					
No. 1 W. Oats	0 75	19,020·25		65 65	14,258 38
No. 2 "	0 75	1,961·21			1,471 23
		20,982·12		65 65	15,729 61
Barley	1 04	9,896·32		1 75	10,290 78

KEY TO STATEMENT No. 2.—Statement showing details of Grain purchased by C. C. Castle, Purchasing Agent at Winnipeg, &c.—*Continued.*

	Price.	Bushels.	Freight.	Sundries.	Amount.
	$ cts.		$ cts.	$ cts.	$ cts.
Bush, Sydney J.—					
No. 2 W. Oats	0 66	1,740	106 49	18 05	1,023 86
Cummings, Hazlett Co.—					
No. 3 Wheat	1 00½	1,013·30	98 78	0 65	919 13
No. 4 Wheat	0 91	854·40	102 00	0 65	675 09
"	0 95½	1,072 30	115 83	0 65	907 75
		2,940·40	316 61	1 95	2,501 97
No. 2 W. Oats	0 65	3,627·22	222 01	1 30	2,134 66
Canadian Elevator Co.—					
No. 1 Wheat	1 07⅛	1,057·40	84 18	0 65	1,052 16
"	1 13⅜	960·20	78 00	0 65	1,013 73
"	1 14½	1,024·50	110 68	0 65	1,062 10
No. 2 Wheat	1 08⅜	685 40	53 48	0 65	687 25
"	1 09⅝	1,068·10	83 33	0 65	1,087 00
"	1 10⅛	1,057 30	82 49	0 65	1,081 43
No. 3 Wheat	1 02	15,246·15	2,073 35	9 10	13,468 74
"	1 14⅛	2,399·10	304 48	1 30	2,432 26
"	1 15½	1,124	149 86	0 65	1,143 49
"	1 19½	1,053	147 02	0 65	1,110 35
"	1 23⅜	1,135·20	159 06	0 65	1,245 27
"	1 25⅛	1,099·10	146 56	0 65	1,228 12
No. 4 Wheat	0 95	1,124	148 36	0 65	918 79
		29,035·	3,620 85	17 55	27,531 19
No. 2 W. Oats	0 65	1,245·20	50 82	0 65	758 11
Castle, C. C.—					
No. 2 Wheat	1 11¾	712 30	55 57	7 78	732 86
Campbell, D. A.—					
No. 1 Wheat	1 12⅛	673·50	53 09	7 39	695 05
No. 2 Wheat	1 10⅝	1,062 30	83 72	11 28	1,080 39
		1,736·20	136 81	18 67	1,775 44
Campbell and Wilson—					
No 1 Wheat	1 13⅜	1,146·40	89 44	0 65	1,212 80
Carson, Wm., & Co.—					
No. 1 Wheat	1 14 1/16	1,047·50		0 65	1,198 85
No. 1 W. Oats	0 61	2,006·16		0 65	1,223 30
No. 1 "	0 71·22	2,247·42	80 54	17 68	2,131 03
No. 2 "	0 60	5,611 26		1 95	3,365 11
No. 3 "	0 57	2,431·36			1,386 10
B. C	0 71·22	4,851 26	76 64	1 95	3,376 32
		17,150·10	157 18	22 23	11,481 86
Coxworth, John—					
No. 2 Wheat	1 15⅞	983	82 57	10 48	1,046 00
Cusach, T.—					
No. 2 W. Oats	0 66	1,859·24	94 85	19 25	1,113 31
Canada Malting Co.—					
No. 2 Barley	1 65	6,240			6,552 00

SESSIONAL PAPER No. 25c

KEY TO STATEMENT No. 2.—Statement showing details of Grain purchased by C. C. Castle, Purchasing Agent at Winnipeg, &c.—*Continued.*

—	Price.	Bushel.	Freight.	Sundries.	Amount.
	$ cts.		$ cts.	$ cts.	$ cts.
Cheyne, Jas. G.—					
No. 2 W. Oats	0 66	1,967 12	100 34	20 32	1,177 79
Chambers, D.—					
No. 3 Wheat	1 06¾	1,032 30	113 22	10 98	977 99
Chisholm, W. B.—					
No. 2 Wheat	1 26¾	1,082 10	87 48	11 47	1,272 69
Carruthers, Jas., & Co.—					
Ont. Oats	0 70	12,928 08	17 50	13 64	9,018 61
Barley	0 80	18,395 30	38 71	9 10	14,668 70
Crowe, F. S.—					
Ont. Barley	0 75	1,246 42		0 65	934 50
Dominion Elevator Co.—					
No. 1 Wheat	1 13½	1,004	78 31	0 65	1,060 58
"	1 17	1,015 30	79 21	0 65	1,108 28
No. 2 Wheat	1 11½	1,012 20	91 11	0 65	1,036 99
No. 3 Wheat	1 05½	2,140 50	231 32	1 30	2,026 06
		5,172 40	479 85	3 25	5,231 91
No. 2 W. Oats	0 65	2,207 12	127 58	0 65	1,306 55
Donald Morrison & Co.—					
No. 3 Wheat	1 14⅝	1,067 30	147 32	0 65	1,070 31
"	1 15⅝	3,410 50	393 17	1 95	3,552 93
No. 4 Wheat	0 94⅝	1,080 10	142 58	0 65	881 58
"	1 11⅝	1,099	145 07	0 65	1,083 79
		6,657 30	828 14	3 90	6,588 61
No. 1 W. Oats	0 66	1,890	115 67	0 65	1,131 08
Dunsheath, McMillan & Co.—					
No. 3 Wheat	1 14⅞	2,050 30	233 76	1 30	2,120 45
Dewart, Fred.—					
No. 1 Wheat	1 23⅛	681 50	53 18	7 47	778 85
Dunbar, W.—					
No. 1 Wheat	1 28	1,004 40	73 07	10 70	1,202 20
Embury, A.—					
No. 1 Wheat	1 23	1,024 20	81 12	10 89	1,167 92
Findlay, F. E.—					
No. 3 Wheat	1 09⅛	641	56 00	7 06	636 43
Foster, Geo.—					
No. 2 W. Oats	0 66	2,105 30	107 40	21 71	1,260 78
Farmer's Elevator Co.—					
No. 1 Wheat	1 18	1,138 10	93 33	0 65	1,249 06
Fallis, Wm.—					
No. 1 Wheat	1 28⅛	991 20	89 22	10 57	1,170 35
Fraser, H. A.—					
No. 2 W. Oats	0 66	2,248 08	114 66	23 13	1,346 05

KEY TO STATEMENT No. 2.—Statement showing details of Grain purchased by C. C. Castle, Purchasing Agent at Winnipeg, &c.—*Continued.*

	Price.	Bushels.	Freight.	Sundries.	Amount.
	$ cts.		$ cts.	$ cts.	$ cts.
Fraser, A.—					
No. 2 W. Oats	0 66	1,712·22	81 52	17 78	1,031 05
Grain Growers' Grain Co.—					
No. 1 Wheat	1 07¼	1,064 40	83 04	0 65	1,060 83
"	1 12½	1,029	83 60	0 65	1,073 38
"	1 13½	1,078·50	92 01	0 65	1,133 16
"	1 13½	1,130·10	90 03	0 65	1,194 86
"	1 16	1,021·10	74 64	0 65	1,115 64
"	1 21	968·10	75 52	0 65	1,101 36
"	1 26½	1,081·30	85 21	0 65	1,284 94
No. 2 Wheat	1 06	1,722·40	156 25	1 30	1,677 09
"	1 09½	800·40	75 86	0 65	797 22
"	1 14	2,082·50	166 64	1 30	2,208 08
"	1 18½	1,037·50	74 72	0 65	1,155 75
"	1 18	1,039	78 40	0 65	1,158 36
"	1 29½	1,035	94 58	0 65	1,241 21
No. 3 Wheat	0 99½	2,064·40	231 35	1 30	1,826 85
"	1 03	1,053·20	114 91	0 65	969 37
"	1 03½	736·30	70 70	0 65	690 93
"	1 08½	1,072·30	96 53	0 65	1,062 46
"	1 10½	1,013·30	98 27	0 65	1,023 53
"	1 19½	668·50	69 62	0 65	726 48
"	1 19½	1,060	114 48	0 65	1,155 55
"	1 20½	1,018·20	97 76	0 65	1,131 21
No. 4 Wheat	0 90	1,118·20	120 78	0 65	885 07
"	0 92	681·40	61 35	0 65	565 14
"	0 94½	1,041·40	106 25	0 65	881 37
"	1 11	698·20	92 18	0 65	682 32
		27,319·10	2,504 68	18 20	27,802 16
No. 2 W. Oats	0 54	1,821·16	92 89	0 65	890 06
"	0 60	3,963 28	222 60	1 30	2,154 61
"	0 65	26,846·18	1,380 60	26 74	16,044 86
		32,631·28	1,696 09	28·69	19,089 53
Graves, J. P.—					
No. 1 Wheat	1 12½	830	65 30	0 65	868 74
No. 3 Wheat	1·00½	708·30	85 88	0 65	625 51
"	1·03½	1,036·20	126 90	0 65	941 16
		2,574·50	278 17	1 95	2,435 41
Gilanders, D.—					
No. 2 W. Oats	0 61	1,891·16	96 46	19 56	1,037 78
"	0 66	1,861·26	94 95	19 27	1,114 55
		3,753·08	191 41	38 83	2,152 33
Geddes, John—					
No. 1 Wheat	1 13½	1,084·10	144 57	0 65	1,089 38
No. 3 Wheat	1 25½	1,097·40	131 72	0 65	1,247 95
"	1 13½	1,362·20	163 48	0 65	1,385 52
No. 4 Wheat	1 11½	1,013·40	121 64	0 65	1,011 75
		4,557·50	561 41	2 60	4,734 60
Galloway, Wm.—					
No. 1 Wheat	1 23½	825·30	65 70	8 91	941 78

SESSIONAL PAPER No. 25c

KEY TO STATEMENT No. 2.—Statement showing details of Grain purchased by C. C. Castle, Purchasing Agent at Winnipeg, &c.—*Continued.*

——	Price.	Bushels.	Freight.	Sundries.	Amount.
	$ cts.		$ cts.	$ cts.	$ cts.
Greentree, F.—					
No. 3 Wheat	1 16¾	868·10	67 72	9 33	936 53
Gillis Bros.—					
No. 2 W. Oats	0 66	1,812·22	98 61	18 78	1,078 96
Goldie Milling Co.—					
No. 1 Barley	1 05	3,940	567 36	.....	3,569 64
Garton Seed Co.—					
Oats, Eng	2 00	2	.....	.....	4 00
"	1 10	2,465·22	.....	.....	2,712 20
	.....	2,467·22	.....	.....	2,716 20
Herriott & Milne.—					
No. 3 Wheat	0 98¾	1,101·50	145 44	0 65	941 96
"	0 99⅝	1,002·20	132 30	0 65	868 11
"	1 00⅝	1,063·10	140 33	0 65	928 83
"	1 02	1,446·30	190 93	0 65	1,283 85
"	1 02⅝	1,435·30	189 48	0 65	1,283 01
"	1 14½	1,110·20	161 49	0 65	1,109 19
"	1 15⅛	1,054·20	140 58	0 65	1,072 57
"	1 18¾	1,132·40	169 90	0 65	1,174 49
"	1 19	2,227·50	295 54	0 65	2,354 29
"	1 19⅝	3,244·30	428 35	1 95	3,422 98
"	1 24⅝	3,297·20	440 43	1 95	3,650 44
"	1 24½	1,043	139 06	0 65	1,154 91
No. 4 Wheat	1 06¼	2,046·40	306 99	1 30	1,866 30
"	1 10⅝	1,075·50	163 00	0 65	1,029 17
	.....	22,281·50	3,043 82	12 35	22,140 10
No. 1 W. Oats	0 58	1,209·04	106 88	0 65	593 76
No. 2 W. Oats	0 60	1,231·26	104 70	0 65	633 70
	.....	2,440·30	211 58	1 30	1,227 46
Hall, C. E.—					
No. 4 Wheat	0 90¾	1,105·40	145 95	0 65	856 79
"	1 17¼	1,152·30	152 13	0 65	1,198 53
	.....	2,258·10	298 08	1 30	2,055 32
Howe, C. E.—					
No. 2 W. Oats	0 66	1,978·08	80 71	20 43	1,204 49
Hansburger, W. T.—					
No. 4 Wheat	0 98	1,088·40	117 58	11 54	937 77
"	1 13⅜	1,123·10	121 31	11 88	1,140 20
	.....	2,211·50	238 89	23 42	2,077 97
Hamilton, G.—					
No. 3 Wheat	1 25⅛	1,035	142 83	11 00	1,141 21
Harty, J. F.—					
No. 2 Wheat	1 11¼	1,005·10	93 27	10 70	1,019 30
Hardisty, Bros.—					
No. 2 W. Oats	0 61	1,532·07	.....	15 97	918 68

KEY TO STATEMENT No. 2.—Statement showing details of Grain purchased by C. C. Castle, Purchasing Agent at Winnipeg, &c.—*Continued.*

	Price.	Bushels.	Freight.	Sundries.	Amount.
	$ cts.		$ cts.	$ cts.	$ cts.
Imperial Elevator Co.—					
No. 1 Wheat	1 11	4,566·40	496 65	2 60	4,569 77
"	1 12	712·40	82 07	0 65	715 45
"	1 21⅝	1,133·40	123 67	0 65	1,255 90
No. 2 Wheat	1 08⅜	1,270·40	140 76	0 65	1,240 45
"	1 08⅞	6,973·40	838 91	4 55	6,827 20
"	1 09	8,771	923 42	5 20	8,631 78
"	1 18⅞	1,009	112 39	0 65	1,086 41
No. 3 Wheat	1 02⅞	5,090 30	556 70	3 25	4,676 80
"	1 03	3,716	421 49	2 60	3,403 37
"	1 07⅞	981 50	109 31	0 65	949 20
"	1 12⅞	930	106 26	0 65	915 50
		35,126 10	3,905 63	22 10	34,271 83
No. 2 W. Oats	0 60	1,241 06	75 96	0 65	668 10
"	0 65	2,599 04	141 39	0 65	1,547 40
		3,840 10	217 35	1 30	2,215 50
International Elevator Co.—					
No. 1 Wheat	1 07⅜	2,069·20	215 90	1 30	2,012 51
"	1 12⅝	1,097·50	119 77	0 65	1,118 75
No. 2 Wheat	1 09⅛	1,302·20	145 01	0 65	1,280 40
"	1 09⅞	2,256·10	250 26	1 30	2,230 60
No. 3 Wheat	0 98⅜	991·50	109 31	0 65	869 47
"	0 99¾	1,636·10	176 71	1 30	1,454 06
"	1 04⅛	2,011·10	226 29	1 30	1,874 08
"	1 04⅝	1,105	121 77	0 65	1,036 45
"	1 13⅛	1,348	150 08	0 65	1,374 20
"	1 14⅞	990·50	108 63	0 65	1,028 93
"	1 15⅜	2,026·10	222 14	1 30	2,121 85
"	1 18⅜	1,097·30	128 33	0 65	1,174 30
No. 4 Wheat	0 97¼	91·10	...	...	88 54
"	1 06¾	1,051·50	128 14	0 65	994 04
		19,078·20	2,102 34	11 70	18,658 18
No. 2 W. Oats	0 65	9,426·26	576 91	3 25	5,547 25
Johnston, R. B.—					
No. 2 W. Oats	0 66	1,964·04	120 51	20 34	1,158 77
Johnston, H. W.—					
No. 1 Wheat	1·04⅜	1,089·20	84 97	11 55	1,040 47
No. 2 Wheat	1·25⅛	1,083·20	84 50	11 48	1,259 53
		2,172·40	169 47	23 03	2,300 00
Kattenbrimer, A.—					
No. 3 Wheat	1 25⅞	1,035·50	111 87	11 01	1,180 97
Keyes, W. H.—					
No. 2 Wheat	1 29¾	1,105·20	121 19	11 70	1,301 28
Knight, R. A.—					
No. 2 Wheat	1 10½	1,087	97 83	11 52	1,087 71
"	1 15⅛	1,492·30	126 23	14 68	1,473 71
		2,489·30	224 06	26 20	2,561 42
Lamb Bros.—					
No. 2 Wheat	1 11¾	1,059·30	83 90	11 25	1,088 83

SESSIONAL PAPER No. 25c

KEY TO STATEMENT No. 2.—Statement showing details of Grain purchased by C. C. Castle, Purchasing Agent at Winnipeg, &c.—*Continued.*

	Price.	Bushels.	Freight.	Sundries.	Amount.
	$ cts.		$ cts.	$ cts.	$ cts.
Laird, W.—					
No. 4 Wheat	1 12½	665·20	64 00	7 30	679 69
"	1 17½	1,097·30	105 37	11 63	1,176 67
"	1 18¼	1,052	101 00	11 17	1,131 82
		2,814 50	270 37	30 10	2,988 18
Lee, R. S.—					
No. 2 W. Oats	0 66	1,555·20	74 05	16 21	936 43
Lake of the Woods Milling Co.—					
No. 2 W. Oats	0 65	1,763·28	83 71	0 65	1,062 13
Lane, W. S.—					
No. 2 W. Oats	0 66	1,869·24	114 43	19 35	1,100 23
Langley, H. G.—					
No. 2 W. Oats	0 66	1,987·12	155 41	20 58	1,135 71
Murphy, G. B. & Co.—					
No. 1 Wheat	1 22½	987·50	108 34	0 65	1,104 80
No. 2 Wheat	1 05½	1,045·20	114 03	0 65	990 77
"	1 13½	1,093·10	120 49	0 65	1,122 34
"	1 14½	1,052·30	113 67	0 65	1,094 73
"	1 15½	1,118·10	88 56	0 65	1,205 07
No. 3 Wheat	1 04½	1,280·10	139 66	0 65	1,199 06
"	1 13½	1,155·50	90 16	0 65	1,216 72
		7,733	774 91	4 55	7,953 45
No. 2 W. Oats	0 65	7,624 24	430 83	2 60	4,522 63
Muir, Robert & Co.—					
No. 1 Wheat	1 21½	1,098 30	87 42	0 65	1,249 36
"	1 26½	1,037	.....	.....	1,313 09
No. 3 Wheat	0 99½	1,122·10	127 92	0 65	975 36
"	1 18½	1,059·10	152 52	0 65	1,104 60
"	1 25½	1,088·20	124 07	0 65	1,243 85
No. 4 Wheat	1 12½	1,148·10	130 89	0 65	1,157 28
		6,553·20	622 82	3 25	7,043 54
Maclennan Bros.—					
No. 1 Wheat	1 07½	503·50	61 03	0 65	481 21
No. 2 "	1 04½	244·10	27 83	4 52	223 40
No. 3 "	1 25½	971·30	128 23	0 65	1,092 77
		1,719·30	217 09	5 82	1,797 38
Maple Leaf Flour Mills Co.—					
No. 2 Wheat	1 14	1,000	.....	.....	1,140 00
No. 3 "	1 08	4,999·30	.....	.....	5,399 46
No. 4 "	0 92	1,028·20	104 89	0 65	840 53
		7,027·50	104 89	0 65	7,379 99
McLaughlin, W. S. & Co.—					
No. 4 Wheat	0 96¾	697 30	66 96	0 65	607 23
No. 2 W. Oats	0 65	993·18	60 00	0 65	585 15
McRae, J. A.—					
No. 2 W. Oats	0 61	1,791·26	91 38	18 57	983 02

KEY TO STATEMENT No. 2.—Statement showing details of Grain purchased by C. C. Castle, Purchasing Agent at Winnipeg, &c.—*Continued.*

—	Price.	Bushels.	Freight.	Sundries.	Amount.
	$ cts.		$ cts.	$ cts.	$ cts.
Madson, John—					
No. 2 W. Oats	0 61	1,781 26	90 87	18 42	977 53
Morrison, Geo.					
No. 3 Wheat	1 04	1,122	102 00	11 87	1,053 01
Mickelwright, A.—					
No 1 Wheat	1 13⅝	1,101	87 65	11 66	1,151 70
Manitoba Commission Co.—					
No. 2 W. Oats	0 65	25,529 14	1,127 71	8 45	15,357 85
McLean, D—					
No. Wheat	1 13½	1,125 50	123 44	11 91	1,142 46
"	1 13⅝	1,133	123 62	11 98	1,151 77
No. 3 Wheat	1 03½	233	25 16	2 98	213 30
"	1 04⅛	1,060			
"	1 04½	425	167 08	17 42	1,364 94
"	0 98⅛	62			60 84
		4,038 50	439 30	44 29	3,933 31
McNair, W. L.—					
No. 1 Wheat	1 14⅝	1,954	154 74	20 84	2,064 18
No. 2 W. Oats	0 66	19,775	879 66	205 55	11,966 26
Makepiece, Andrew—					
No. 2 W. Oats	0 66	1,311 26	62 44	13 77	789 55
McGill, Colin—					
No. 1 Wheat	1 13½	999	80 74	10 64	1,042 48
McLaughlin & Ellis.—					
No. 3 Wheat	1 19⅞	1,143 20	164 64	0 65	1,205 27
"	1 23⅝	624 10	82 40	0 65	701 85
No. 4 Wheat	1 12⅝	1,111 40	166 75	0 65	1,087 39
		2,879 10	413 79	1 95	2,994 51
McKenzie, A. E. & Co.—					
No. 1 W. Oats	0 84	2,142 32	131 15		1,668 92
No. 2 W. Oats	0 77	53,994 07	2,814 26	5 85	38,755 42
"	0 79	1,982 32	121 36		1,445 16
"	0 82	16,007 07	919 10	2 60	12,204 20
"	0 84	1,902 12	116 42		1,481 56
		76,029 22	4,102 29	8 45	55,555 26
McLaren, James—					
No. 3 W. Oats	0 63	1,216 26	57 92	12 82	695 84
McNair, Geo.—					
No. 1 Wheat	1 14⅝	1,039	81 04	11 04	1,098 87
"	1 22¾	1,044	82 67	11 09	1,187 33
		2,083	163 71	22 13	2,286 20
Murchison, Kenneth—					
No. 1 Wheat	1 24¾	868 10	68 41	9 33	1,005 30
Mooney, W. T.—					
No. 3 Wheat	1 25⅞	1,125 50	121 59	11 91	1,283 63
McIntosh, M.—					
No. 3 Wheat	1 21¾	1,076 50	83 99	11 42	1,215 62

SESSIONAL PAPER No. 25c

KEY TO STATEMENT No. 2.—Statement showing details of Grain purchased by C. C. Castle, Purchasing Agent at Winnipeg, &c.—*Continued.*

—	Price.	Bushels.	Freight.	Sundries.	Amount.
	$ cts.		$ cts.	$ cts.	$ cts.
MacLellan Bros.—					
No. 1 Wheat	1 22⅛	1,061·40	84·93	0 65	1,210 96
Maharg, J. A.—					
No. 4 Wheat	1 12	1,101·10	118 93	11 66	1,102 72
Merchants Bank—					
No. 1 Wheat	1 32⅛	1,100·40	87 61	11 66	1,360 48
Neville, A.—					
No. 2 Wheat	1 19⅛	699 30	76 30	7 65	749 33
North Star Grain Co.—					
No. 1 Wheat	1 10⅞	2,077·50	220 04	1 30	2,082 45
"	1 27⅛	1,027·40	153 98	0 65	1,172 58
No. 2 Wheat	1 25⅛	1,050·40	138 69	0 65	1,175 31
No. 3 Wheat	1 02⅝	12,088·20	1,690 52	7 80	10,853 93
"	1 03	11,195	1.792 05	8 45	12,807 75
"	1 10⅜	1,070·20	152 26	0 65	1,032 49
"	1 15⅝	1,038·10	112 12	0 65	1,090 20
"	1 19⅛	1,817·30	253 44	114 63	1,810 66
"	1 23⅝	1,057·20	140 98	0 65	1,165 50
"	1 24⅛	1,084·50	143 20	0 65	1,210 84
"	1 25⅛	2,139·20	149 29	0 65	2,417 35
No. 4 Wheat	96⅛	4,478·30	584 31	2 60	3,751 63
"	0 97	11,284·50	1,408 56	7 15	9,530 58
"	0 97⅛	1,368·20	166 70	0 65	1,171 90
"	1 07⅛	2,251·40	465 69	1 90	2,073 07
"	1 07⅛	1,050·10	127 91	0 65	1,004 28
"	1 11¼	1,355	203 25	0 65	1,310 31
		60,435·10	7,903 02	150 38	55,660 83
Northern Elevator Co.—					
No. 1 Wheat	1 10	2,986·20	236 81	1 95	3,046 21
"	1 12⅞	1,081·10	85 17	0 65	1,134 55
"	1 13⅜	1,047·50	95 27	0 65	1,095 98
"	1 18⅜	1,028·40	93 97	0 65	1,126 92
No. 2 Wheat	1 08	1,855	158 82	1 30	1,843 28
"	1 14⅞	1,391·40	126 51	0 65	1,461 08
"	1 19	1,310·30	142 90	0 65	1,415 89
No. 3 Wheat	1 02	4,982·10	585 52	3 25	4,493 04
"	1 15⅝	1,171·30	154 63	0 65	1,193 40
"	1 25⅛	1,130·10	149 18	0 65	1,271 35
No. 4 Wheat	0 95	4,313·40	492 23	2 60	3,603 14
		22,298·40	2,321 07	13 65	21,684 84
No. 1 W. Oats	0 71½	1,232·12	62 85	0 65	805 30
No. 2 W. Oats	0 69½	14,671·06	678 39	5 20	9,512 63
		15,903·18	741 24	5 85	10,317 93
Ogilvie Flour Mills Co.—					
No. 3 Wheat	1 14⅛	1,087·30	97 87	0 65	1,142 59
"	1 14⅝	694·20	76 14	0 65	720 72
No. 4 Wheat	1 07¼	727·30	65 48	0 65	714 12
		2,509·20	239 49	1 95	2,577 43
No. 2 W. Oats	0 58½	1,866·06	95 18	9 98	986 59
"	0 60	3,716·06	183 47	1 30	2,044 94
"	0 65	2,064·24	126 36	0 65	1,215 05
		7,647·02	405 01	11 93	4,246 58

KEY TO STATEMENT No. 2.—Statement showing details of Grain purchased by C. C. Castle, Purchasing Agent at Winnipeg, &c.—*Continued.*

—	Price.	Bushels.	Freight.	Sundries.	Amount.
	$ cts.		$ cts.	$ cts.	$ cts.
Ogdur, J. F.—					
No. 2 W. Oats	0 50	1,965·20	.....	.....	982 80
Playfair A. W—					
No. 1 Wheat	1 23	851·30	66 42	9 17	971 75
Potter, Alfred—					
No. 1 Wheat	1 23½	1,101 00	92 48	11 66	1,251 46
Parker, W. J—					
No. 2 W. Oats	0 66	1,166·06	48 00	12 31	709 37
Pollard, J. C—					
No. 2 W. Oats	0 66	1,650·30	101 03	17 16	971 40
Royal Grain Co—					
No. 1 Wheat	1 12⅜	530·30	.....	0 65	596 03
No. 2 Wheat	1 04⅝	1,028·30	119 03	0 65	953 81
No. 3 Wheat	0 99¾	707 30	81 10	0 65	623 97
	.....	2,266·30	200 13	1 95	2,173 81
No. 1 W. Oats	0 61	5,270·00	.....	1 30	3,213 41
No. 2 W. Oats	0 60	29,337·16	.....	13 70	17,588 83
No. 3 W. Oats	0 57	10,243·25	.....	2 60	5,836 34
	.....	44,851·07	.....	27 60	26,638 58
Randall, Gee & Mitchell—					
No. 3 Wheat	0 98½	1,721·10	185 88	1 30	1,499 57
No. 1 W. Oats	0 61	5,353·08	.....	1 95	3,263 53
No. 2 W. Oats	0 60	3,750	.....	1 30	2,248 45
"	0 65	9,226·26	457 08	3 25	5,537 09
	.....	18,330	457 08	6 50	11,049 07
Rose, E—					
No. 2 W. Oats	0 66	1,020	60 00	10 85	602 35
Rogers, A. H—					
No. 1 Wheat	1 33½	707·50	55 21	7 73	879 36
Read, Jos. & Co—					
F. E. I. Oats	0 65	69,562	.....	.....	45,215 30
Oats	.....	32,438	.....	.....	21,084 70
	.....	102,000	.....	.....	66,300 00
Richardson, Jas. & Sons—					
No. 1 Wheat	1 08¼	1,042·30	94 77	0 65	1,033 08
"	1 12	986 20	71 01	0 65	1,033 03
"	1 22	1,016·30	73 19	0 55	1,166 29
	.....	3,045·20	238 97	1 95	3,232 40
Barley	0 75	2,564 28	6 50	1 30	1,915 61
"	1 00	3,512·21	.....	176 37	3,336 13
"	1 05	5,011·22	.....	226 77	5,035 27
	.....	11,088·26	6 50	404 44	10,287 01

KEY TO STATEMENT No. 2.—Statement showing details of Grain purchased by C. C. Castle, Purchasing Agent at Winnipeg, &c.—*Continued.*

—	Price.	Bushels.	Freight.	Sundries.	Amount.
	$ cts.		$ cts.	$ cts.	$ cts.
English Oats	0 65	75,085·08			48,805 42
"	0 66	159,585·10			105,326 28
"	0 67	56,496·31			37,852 92
"	0 70	25,877 22			18,114 38
"	0 71	74,292·10			52,747 53
"	0 74	23,828·14			17,633 04
"	0 75	10,638 04			7,978 59
		425,803·31			288,458 16
Amount allowed for rejections on shipments on *S. S. Montrose and Sardinian*					1,872 61
					290,330 77
Banner Oats	0 68	1,864			1,255 28
Saskatchewan Elevator Co—					
No. 1 Wheat	1 32½	1,009 50	133 30	0 65	1,200 29
No. 3 Wheat	1 01½	4,356·10	612 10	2 60	3,812 25
"	1 04½	916·40	100 51	0 65	860 19
"	1 15½	734·40	80 55	0 65	769 17
No. 4 Wheat	0 90	2,239·20	269 14	0 65	1,744 96
"	0 94½	1,055·40	145 68	0 65	852 59
"	1 07½	1,013·40	111 15	0 65	975 35
"	1 12½	1,009 50	154 88	0 65	1,079 03
"	1 16½	1,109·50	146 50	0 65	1,144 42
		13,535·40	1,753 81	7 80	12,438 25
No. 2 W. Oats	0 54	1,188·08	72 72	0 65	568 28
"	0 55	1,852·32	113 40	0 65	905 07
"	0 60	4,660 20	286 15	1 30	2,508 91
"	0 65	3,827·12	234 23	1 30	2,252 23
		11,529·04	706 50	3 90	6,234 49
Spink, Samuel—					
No. 2 Wheat	1 04½	976·40	96 00	0 65	923 97
Scott, John—					
No. 2 Wheat	1 09½	1,134 30	149 83	11 99	1,079 03
Spencer Grain Co.—					
No. 2 Wheat	1 09½	992·40	112 85	0 65	969 75
No. 3 Wheat	1 19½	2,129·20	283 93	1 30	2,251 34
No. 4 Wheat	1 06½	1,032 20	117 69	0 65	979 80
"	1 12½	1,101·20	121 41	0 65	1,114 19
		5,255·40	635 88	3 25	5,315 08
No. 2 W. Oats	0 55	3,810 10	229 21	1 30	1,865 13
"	0 65	2,016·06	123 39	0 65	1,186 48
		5,826·16	352 60	1 95	3,051 61

KEY TO STATEMENT No. 2.—Statement showing details of Grain purchased by C. C. Castle, Purchasing Agent at Winnipeg, &c.—*Continued.*

—	Price.	Bushels.	Freight.	Sundries.	Amount.
	$ cts.		$ cts	$ cts.	$ cts.
Simpson, Hepworth & Co.—					
No. 3 Wheat	1 00½	628·10	60 92	0 65	569 74
"	1 14	706·20	56 23	0 65	748 34
No. 4 Wheat	0 92	1,064·10	121 30	0 65	857 08
		2,398·40	238 45	1 95	2,175 16
Scott, Samuel—					
No. 1 Wheat	1 21½	1,073	96 57	0 65	1,207 81
"	1 22½	1,022 50	92 05	0 65	1,156 44
No. 2 Wheat	1 08½	1,016·30	79 29	0 65	1,021 69
No. 4 Wheat	0 92	1,086·30	143 42	0 65	855 51
"	0 94½	1,136	149 95	0 65	924 34
		5,334·50	561 28	3 25	5,165 79
No. 2 W. Oats	0 65	1,236·20	63 07	0 65	740 18
Sterling, E.—					
No. 2 W. Oats	0 61	1,955·10	99 72	20 20	1,072 81
Sexton, G. W.—					
No. 3 Wheat	1 04½	1,193·30	101 78	12 58	1,134 34
Shilson, Fred.—					
No. 2 W. Oats	0 61	1,239·04	54 77	13 04	688 04
Speers, C. W.—					
No. 1 Wheat	1 13	984 20	85 25	10 50	1,016 55
Smith Grain Co.—					
No. 3 Wheat	1 14½	1,070	143 40	0 65	1,077 09
"	1 19½	2,045·05	273 39	1 30	2,169 19
"	1 19⅝	1,056·40	140 89	0 65	1,125 13
		4,171·45	557 68	2 60	4,371 41
Skelton, J. R.—					
No. 2 W. Oats	0 66	1,860·20	94 89	19 25	1,113 86
Sargent, W. L.—					
No. 3 Wheat	1 09⅝	618 10	60 00	6 83	610 83
Stephenson, Joseph—					
No. 1 Wheat	1 13	1,043·30	83 49	11 09	1,084 57
Steele, D.—					
No. 1 Wheat	1 24⅜	988	77 06	10 53	1,144 94
Snow, M.—					
No. 3 Wheat	1 15⅞	660 40	75 00	0 65	689 90
Schmidt, Herman—					
No. 3 Wheat	1 25½	2,103·40	281 18	22 34	2,328 69
Strassburger, Jacob—					
No. 2 Wheat	1 10½	936·10	146 04	10 01	935 51
Steel Briggs Seed Co.—					
Ontario Oats	0 75	13,466			10,099 50
"	0 80	6,010	152 70		4,655 30
		19,476	152 70		14,754 80

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KEY TO STATEMENT No. 2.—Statement showing details of Grain purchased by C. C. Castle, Purchasing Agent at Winnipeg, &c.—*Continued.*

—	Price.	Bushels.	Freight.	Sundries.	Amount.
	$ cts.		$ cts.	$ cts.	$ cts.
Thompson Sons & Co.—					
No. 2 Wheat	1 04½	1,031·10	112 50	0 65	964 41
"	1 04⅝	1,011	80 05	0 65	974 53
"	1 05⅛	1,095	117 26	0 65	1,039 06
No. 3 Wheat	1 00½	765·50	121 29	0 65	647 71
"	1 02½	1,047·30	82 95	0 65	986 16
"	1 03¾	1,185·50	92 50	0 65	1,137 14
"	1 19½	1,103	121 55	0 65	1,200 02
"	1 19	1,077·10	187 43	0 65	1,093 75
"	1 20¾	1,084·50	105 73	0 65	1,203 55
		9,401·30	1,021 26	5 85	9,246 33
No. 2 W. Oats	0 55	1,385·10	98 37	0 65	671 89
Turner, C. C. & Co—					
No. 3 Wheat	1 19	1,095	151 11	0 65	1,060 96
No. 4 Wheat	0 90	1,042·30	143 87	0 65	793 73
"	1 17¼	1,084	149 59	0 65	1,120 75
		3,221 30	444 57	1 95	2,975 44
Tooke, R. J.—					
No. 2 W. Oats	0 66	1,720·10	87 74	17 86	1,029 80
Temple, William—					
No. 2 W. Oats	0 66	1,751·26	89 34	18 17	1,048 65
Thompson, E.—					
No. 2 W. Oats	0 61	2,052·05		18 89	1,038 75
No. 3 W. Oats	0 58	1,823·18		21 17	1,230 63
		3,875·23		40 06	2,269 38
Union Grain Co.—					
No. 2 Wheat	1 06½	1,100·40	99 06	0 65	1,072 50
No. 4 Wheat	1 11⅜	1,075	96 75	0 65	1,099 81
		2,175·40	195 81	1 30	2,172 31
No. 2 W. Oats	0 65	1,947·32	119 22	0 65	1,146 36
Underwood, A.—					
No. 4 Wheat	1 12⅜	521 30	76 00	5 87	504 16
Vandusen Harrington Co.—					
No. 3 W. Oats	0 65	1,622 12	99 29	0 65	954 59
Western Elevator Co.—					
No. 1 Wheat	1 11	8,160·40	704 83	4 55	8,348 95
"	1 18¾	663·30	52 29	0 65	734 96
No. 2 Wheat	1 09	5,700·10	526 50	3 25	5,671 79
"	1 09⅞	1,414·40	127 32	0 65	1,426 39
"	1 13⅝	1,389·20	108 37	0 65	1,469 59
"	1 11⅞	1,048·40	114 99	0 65	1,089 81
No. 3 Wheat	1 03	16,329·50	2,081 00	9 75	14,728 94
"	1 05⅜	1,120 50	107 60	0 65	1,077 03
"	1 04	1,027·30	80 15	0 65	987 80
"	1 08⅝	2,505	195 39	1 30	2,524 35
"	1 18	2,094·30	252 27	1 30	2,217 14
"	1 23	1,136·50	170 53	0 65	1,227 12
"	1 23⅝	1,086·40	163 00	0 65	1,179 77
"	1 24⅜	1,099·20	164 90	0 65	1,199 00
No. 4 Wheat	0 97	8,376·10	1,068 64	5 20	7,051 01
"	0 97⅞	1,310·50	125 84	0 65	1,156 48
		54,464 30	6,043 62	31 85	52,090 13

KEY TO STATEMENT No. 2.—Statement showing details of Grain purchased by C. C. Castle, Purchasing Agent at Winnipeg, &c.—*Continued.*

—	Price.	Bushels.	Freight.	Sundries.	Amount.
	$ cts.		$ cts.	$ cts.	$ cts.
Winnipeg Elevator Co.—					
No. 2 Wheat	1 09⅞	1,085·40	119 65	0 65	1,072 57
"	1 11	717·30	77 49	0 65	718 28
"	1 15½	1,079·40	123 08	0 65	1,119 23
No. 3 Wheat	1 04⅝	1,287·30	143 33	0 65	1,206 28
"	1 04½	1,068·40	124 31	0 65	991 79
"	1 05	1,306	145 44	0 65	1,225 21
"	1 09⅛	721·20	56 26	0 65	730 25
"	1 09½	1,051·30	121 70	0 65	1,029 04
"	1 10⅛	1,045·40	120 40	0 65	1,030 50
"	1 10¼	1,344·30	131 04	0 65	1,357 34
No. 4 Wheat	0 98	1,009·20	109 01	0 65	879 49
"	0 98¾	1,009·30	98 40	0 65	897 82
"	1 02¼	727·30	74 21	0 65	668 10
	.....	13,454·20	1,444 32	8 45	12,925 90
No. 2 W. Oats	0 65	3,118 18	153 68	1 30	1,872 07
Wilson, Joseph—					
No. 4 Wheat	1 17½	1,123·10	155 00	11 88	1,152 83
Western Canada Flour Mills Co.—					
No. 1 Wheat	1 32½	989 20	77 95	0 65	1,232 26
No. 2 Wheat	1 19¼	1,056 20	82 39	0 65	1,175 31
No. 3 Wheat	1 04⅝	1,001·40	80 13	0 65	962 20
	.....	3,047·20	240 47	1 95	3,369 77
No. 2 W. Oats	0 65	2,109·14	100 40	0 65	1,270 07
Watson, James—					
No. 2 W. Oats	0 66	2,009·04	81 97	20·74	1,223 30
Waddell, Thos.—					
No. 2 W. Oats	0 66	1,853·18	88 23	19 19	1,115 91
Wells, Colin—					
No. 2 W. Oats	0 66	1,069·14	68 00	11 34	626 48
Wheat City Flour Mills Co.—					
No. 2 Wheat	1 20½	1,119	87 28	11 84	1,249 27
Young Grain Co.—					
No. 2 Wheat	1 04½	624 20	60 09	0 65	591 70
"	1 14	1,165	104 85	0 65	1,222 60
"	1 24⅛	1,100	99 00	0 65	1,265 72
	.....	2,889·20	263 94	1 95	3,080 02

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STATEMENT No. 3.—Statement of sacks, twine and needles purchased by Mr. C. C. Castle, Purchasing Agent at Winnipeg in connection with Seed Grain Advances of 1908.

Name of firm from whom purchased.	No. of Wheat bags purchased.	Net cost.	No. of Oat bags purchased.	Net cost.	No. of Barley bags purchased.	Net cost.
1908.		$ cts.		$ cts.		$ cts.
Feb. 20 Bemis Bros.	15,000	1,306 80				
" 25 "	25,000	2,178 00	30,000	1,915 65		
" 27 "	10,000	871 20				
" 29 "	15,000	1,306 80				
Mch. 5 "	20,000	1,742 40	25,000	1,596 38		
" 6 "	5,000	435 60				
" 7 "	5,000	435 60				
" 10 "	5,000	435 60				
" 10 "	5,000	435 60				
" 11 "	5,000	435 60				
" 11 "	10,000	871 20				
" 13 "	5,000	435 60				
" 16 "	10,000	871 20				
" 20 "	15,000	1,306 80				
" 23 "	10,000	871 20				
" 24 "	5,000	435 60				
" 26 "	5,000	435 60				
" 30 "	5,000	435 60				
Apl. 16 "			1,000	68 31		
Mch. 4 R. J. Whitla & Co.	30,000	2,967 03				
" 12 " "	35,000	3,461 54				
" 5 Nicholson & Bain	65,000	5,985 20				
" 6 Merrick, Anderson & Co.	65,013	5,953 57	20,000	1,358 28		
" 21 " "			31,000	2,105 34		
May 9 Gartons, Ltd.			499	129 74		
Feb. 25 Smart Bag Co	80,000	7,266 60	35,000	2,356 20		
Mch. 13 "	20,000	1,816 65	16,000	1,077 12		
" 16 " "	5,000	454 16				
" 19 " "	30,000	2,724 97			5,000	389 81
" 19 " "	10,000	908 32				
" 21 " "	5,000	454 16	5,000	336 60		
" 23 " "			5,000	336 60		
" 24 " "	10,000	908 32				
" 26 " "	5,000	454 16	5,000	394 76		
" 31 " "			11,000	868 47		
" 31 " "			9,000	710 57		
" 31 " "			10,000	789 53		
" 31 " "			2,010	197 80		
" 31 " "	1,000	98 41				
Apl. 3 " "			5,000	394 76		
" 6 " "			5,000	394 76		
" 6 " "	2,505	246 51				
" 9 " "			1,433	113 14		
July 27 adjustment of contract	1,006	62 30				
Total	539,524	49,007 90	216,942	15,144 01	5,000	389 81

	No. of Sacks	Net Cost.
		$ cts.
Wheat bags purchased	539,524	49,007 90
Oat bags purchased	216,942	15,144 01
Barley bags purchased	5,000	389 81
	761,466	64,541 72
Storage of sacks		722 74
Twine		1,242 93
Needles		40 71
Tees & Persse, to cancel contract		25 60
Freight		1,308 06
		67,881 76
Less refunds		17,338 05
Net expenditure		50,543 71

STATEMENT No. 4.—Statement showing the net expenses in connection with the administration of Seed Grain Advance Account of 1908 to December 31st.

—	Total.	Regina.	Ottawa.	Winnipeg.	Edmonton
	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.
Travelling expenses	10,379 94	6,702 73	599 80	1,360 40	2,317 01
Living expenses	4,907 85	3,687 65			1,220 20
Salaries	18,544 55	9,739 05	2,407 31	6,208 79	189 40
Stationery and printing	5,446 39	1,710 92	2,078 77	1,570 64	86 06
Advertising	4,816 23	191 74		4,611 39	13 10
Furniture and fixtures	532 86	506 41		26 45	
Rent	1,279 10	784 10		495 00	
Sundries	1,282 40	191 30	25 80	1,016 40	48 90
Telegraph and telephones	4,735 69	1,616 95	795 50	1,951 06	372 18
Express charges	1,058 75	399 77	298 44	335 69	4 85
Expenses *re* sale of grain	77 25	77 25			
Postage	1,368 91	1,074 36		155 60	138 95
Excess postage	111 47	111 47			
Cartage	75 95	75 95			
Railway agents	3,219 20	3,219 20			
	58,416 54	30,088 85	6,205 62	17,731 42	4,390 65

NOTE.—For details of expenses at Regina see Statement 4 *A*; at Ottawa, 4 *B*; at Winnipeg, 4 *C*; at Edmonton, 4 *D*.

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STATEMENT No. 4A.—DETAILS of Expenditure in connection with the Seed Grain Office at Regina.

TRAVELLING EXPENSES OF EMPLOYEES OTHER THAN HOMESTEAD INSPECTORS.

Particulars.	Amount.	Particulars.	Amount.
	$ cts.		$ cts.
R. G. Evans, clerk	106 85	D. C. McNab, clerk	26 70
G. E. Wilson "	68 15	E. H. Crockett "	53 65
M. Sharkaye "	84 08	W. R. Johnson	5 00
W. C. Cowell "	104 15	Geo. Stevenson	25 50
R. E. A. Leech, distributing agent	1,910 60	John Ashby	5 85
Henry Mohr, clerk	25 40	A. L. Robertson	7 40
Miss M. Stewart, clerk	5 75	B. P. O. Nare	12 75
R. A. Gibson "	93 10	D. Buchanan	90 45
W. T. Rollins "	184 15	R. Ruttan	130 00
H. B. Hill "	58 40	R. Robertson	76 60
S. A. O'Hara "	8 75		
J. C. Gariepy "	25 55		
J. C. Bolduc "	25 00		3,133 23

TRAVELLING EXPENSES—HOMESTEAD INSPECTORS.

G. A. Bell	122 80	W. E. Gladstone	134 55
L. Duggan	220 97	D. McLeod	290 00
James Moffat	91 45	W. F. Nichol	241 90
J. T. Dodd	104 28	A. W. Brooke	279 05
R. J. Pentland	161 00	C. Sutton	380 36
F. Kennedy	239 12	J. S. Gibson	91 97
G. H. Clouston	118 65	A. S. McLean	161 15
D. J. McCarthy	200 45	N. G. McCallum	73 00
F. J. Vollmer	252 15	Alex. Skene	38 20
Ed. Oliver	211 89		
A. McLeod	156 56		3,569 50

LIVING EXPENSES, &c., OF CLERKS.

S. A. O'Hara	368 50	J. C. Gariepy	128 58
J. P. Bolduc	384 81	M. C. Sharkaye	84 00
E. H. Crockett	349 15	W. C. Cowell	257 56
R. A. Gibson	384 78	Geo. Stevenson	233 00
D. C. McNab	303 44	A. W. Brooke	70 50
W. T. Rollins	386 78	Meals for staff	16 80
Miss M. Stewart	344 50		
G. E. Wilson	375 31		3,687 65

SALARIES.

Name.	From	To	Rate per Month.	Amount.	——
				$ cts.	
W. J. Allison	Feb. 21	Aug. 13	Feb. at $65 / $75	428 86	Feb. 24 to 29 night duty
John Ashby	25	Feb. 29	$65	11 21	
W. Broderick	22	April 11	Feb. $65 / Bal. $75	120 43	
H. J. Black	24	Mar. 10	$65	34 42	
G. T. Brown	24 P.M.	4–31.	Feb. $65 / March $75	80 07	
C. M. Cumming	17 P.M.	4	Feb. $65 / Bal. $75	113 02	
W. Campbell	20 P.M.	14	$65	50 64	
S. K. Duff	21	Aug. 12	Feb. $65 / Bal. $75	352 89	April 1 to 18. / May 19 to 31.
E. J. Daly	24	Mar. 10	$65	34 36	
L. W. E. Evans	22	Aug. 13	Feb. $65 / Bal. $75	424 38	
R. A. Gibson	10	19	$200	1,137 93	
H. B. Hill	15	18	$100	609 78	
Mrs. M. Harris	24	Mar. 31, April, May, June, July	Feb. $55 / March $60	162 58	Part time only.
F. G. Haultain	24	Aug. 13	Feb. $65 / Bal. $75	419 90	
F. W. Morton	25 P.M.	13	Feb. $65 / Bal. $75	394 77	April $72.58. / July less 8 days.
H. M. McCallum	11	Feb. 29	$75	36 21	
H. McNally	24	29	$75	13 45	6 days night work.
E. R. Patti	24	Mar. 18	$65	48 05	Less ½ day March. / 4 days night work.
Miss May Rattray	15	April 14	Feb. $45 / Bal. $50	96 61	
D. G. Ramage	24	" 4 (less ½ day)	Feb. $65 / Bal. $75	87 56	Less 4½ days March.
J. H. Symons	21	July 20 (less ½ day)	Feb. $65 / Bal. $75	369 77	
Geo. W. Smith	21	Mar. 4–31.	Feb. $65 / March $75	87 91	
J. W. Wilde	12	July 21 (less ½ day)	Feb. $45 / Bal. $50	260 16	Less ½ day in April.
F. Woodrow	24	July 16	Feb. $65 / Bal. $75	352 15	
W. T. Rollins	9	Aug. 18	$150	1,095 72	
W. E. H. Stokes	Night work in February..			7 50	
R. Nichol	Night work in February..			8 80	
W. C. Betchen	Night work in February..			8 00	
H. C. Birnie	Night work in February..			7 30	
H. S. Blake	Night work in February..			7 50	
G. E. Burr	Mar. 13	Aug. 13	$75	376 21	
P. Francombe	Feb. 27	June 30	$75	285 63	Less 8 days.
C. R. Kerr	Mar. 14	Mar. 31	$75	41 13	Refund $2.42.
N. S. Duff	April 8	Aug. 13	$75	313 95	
D. McIntyre	8	July 21 (less ½ day)	$75	257 10	
C. S. Read	22	July 21 (less ½ day)	$75	222 10	
Miss B. Smith	15	June 30	$50	126 67	
W. S. Thair	2	Aug. 12	$75	311 53	
Miss B. Grant	May 9	June 8	$50	49 60	
Miss Ida M. Longmore	7	Aug. 13	$50	160 46	Less ½ day.
W. H. Munroe	23	July 21 (less ½ day)	$65	126 85	
Miss R. S. Calvert	June 19	July 14	$50	42 58	
H. B. Duff	12	Aug. 13	$65	133 43	
Miss A. Rankin	18	Aug. 14	$50	55 54	July 7 days.
Miss M. B. Steimnous	1	July 24	$50	76 23	Less 7½ days.
Miss Helen Marshall	1	Aug. 13	$50	70 97	
Miss G. McCourtie	1	15	$50	74 19	
J. C. Swift	1	July 21 (less ½ day)	$75	42 98	
Miss G. Woods	9	July 31	$50	37 10	
C. A. Baynes	May 30	June 23	$75	62 34	
A. J. Cracknell	Mar. 9	Mar. 14	$65	11 53	5½ days.
				$9,739 65	

Particulars.	Amount.	Totals.
	$ cts.	$ cts.
Printing and stationery—		
'Leader' Publishing Co., printing	472 08	
W. M. Van Valkenburg, stationery, &c.	112 90	
Canadian Drug and Book Co., stationery, &c.	78 30	
Richardson Stationery Manufacturing Co., printing and binders	31 50	
Department of Printing and Stationery, stationery and printing	970 54	
Wilson Stationery Co., stationery, &c.	43 75	
McCarthy Supply Co., cash box	1 60	
H. Prizeman, stamp pad, &c.	0 25	
		1,710 92
Advertising—		
'Leader' Publishing Co., sale of seed grain	105 34	
Saskatoon 'Phoenix'	86 40	
		191 74
Furniture and fixtures—		
Wright Bros., desks and furniture	516 30	
Whiteford Bros. (Dept. Public Works), electric fixtures	93 90	
Office Specialty Manufacturing Co., filing appliances	338 80	
R. J. Little, hat and coat rack	2 45	
	951 41	
Less—Sales of furniture	445 04	
		506 41
Rent of offices—		
F. M. Darke, rent from Feb. 15 to Sept. 15.		748 10
Sundries—		
H. Prizeman, rubber stamps	9 70	
A. T. Brooke, rent of typewriter one month	5 00	
City of Regina, electric light	97 55	
Star Provision Co., soap, &c.	3 75	
J. H. Wilde, caretaker and laundry	10 65	
R. H. Williams, towels for office	6 00	
Wilson Stationery Co., rent of typewriter	10 00	
M. Jakeman, scrubbing office	15 30	
Rent of post office box	5 75	
The Typewriter Exchange, rent and repairs to typewriter	10 25	
Anderson & Co., benzine	0 25	
J. G. Nowlan, taking affidavits	0 50	
A. C. Michaelson, affidavit, seed grain lien	0 25	
F. M. Crapper, glass	5 55	
E. P. Fulton, taking affidavits	0 50	
Wright Bros., crating and packing furniture	7 50	
E. S. Duff, packing and moving furniture	2 50	
Rubber stamp	0 30	
		191 30
Telegraph and telephone—		
Receiver General	64 29	
C.P.R. Telegraph	1,240 46	
Bell Telephone Co	312 20	
		1,616 95
Express charges—		
Dominion Express Co.	293 42	
Canadian Northern Railway Co. Express	106 35	
		399 77
Expenses *re* sale of grain—		
Alex. McIvor, handling grain	40 00	
Western Canada Flour Co., re-piling wheat	1 25	
John Gulloson, services as interpreter	36 00	
		77 25
Postage		1,074 36
Excess postage		111 47
Cartage		75 95
Railway agents fees on applications for grain (*see* 4 *aa*)		3,219 20
		30,088 85

STATEMENT No. 4AA.—STATEMENT of Fees paid to the Railway Agents in the Provinces of Alberta and Saskatchewan in connection with the Seed Grain Distribution, 1908.

Date.	Name.	Station.	Cheque No.	Amount.
1908.				$ cts.
Aug. 3	A. E. Thompson	Nanton	53	10 00
" 4	Elias Marshall	Walsh	78	3 50
" 5	P. B. Spaikman	Stoney Plain	83	10 50
" 5	N. W. Sverard	Stavely	84	4 50
" 2	D. McNabb	Sedgewick	85	3 75
" 2	W. L. MacDonald	Millet	86	13 75
2	L. A. Walkley	Olds	87	24 25
2	C. W. McKinnon	Okotoks	88	1 50
2	J. R. Hinsberger	Vermilion	89	61 25
" 2	W. C. Donlevey	Carstairs	90	7 50
" 2	G. H. Lindsay	Red Deer	91	26 75
" 2	R. A. Johnston	Penhold	93	3 75
" 2	G. McManus	Wetaskiwin	94	35 75
" 2	A. G. Fox	Stettler	95	20 25
" 2	J. W. Webber	Fillmore	96	19 25
" 7	T. M. Ryan	Mundare	98	11 75
" 7	F. B. Kane	Bowden	99	20 00
" 7	M. A. Murphy	Cowley	100	3 50
" 7	E. J. Taylor	Daysland	101	28 75
" 7	E. Finkle	Didsbury	102	17 75
" 7	F. Stephens	Macleod	103	2 00
" 7	J. C. Pope	Cochrane	104	22 50
" 7	H. A. Schuman	Crossfield	105	3 25
	Cancelled		106	... ...
" 7	J. H. Boyle	Granum	107	1 25
" 7	A. Chard	Fort Saskatchewan	108	22 00
	Cancelled		109	... ...
" 7	W. Somerton	High River	110	23 25
" 7	F. B. Hughes	Irvine	111	8 00
" 7	W. Waterfield	Islay	112	24 00
" 7	H. H. Hall	Alix	113	6 50
" 7	G. D. McLeod	Bawlf	114	18 50
" 7	R. A. Bennet	Lamont	115	20 00
" 7	M. C. Carey	Langden	116	2 25
" 7	C. D. Strong	Medicine Hat	117	11 25
" 7	S. W. Muncey	Lloydminster	118	74 75
" 10	H. J. Sullivan	Edmonton	123	9 25
" 10	Angus Smith	Bassano	128	0 25
" 14	T. J. West	Ponoka	129	30 00
" 14	L. C. Matthews	Vegreville	131	27 00
" 14	J. Dowler	Airdrie	133	2 50
" 24	T. F. English	Calgary	827	11 00
" 24	J. T. Graham	Lethbridge	828	1 75
" 25	J. R. Henseiger	Vermilion	829	9 75
" 25	C. Adams	Disley	830	2 00
" 27	F. J. Mooney	Morinville	842	29 00
" 27	A. G. Taylor	Blackfalds	843	2 00
" 27	S. B. Mitchell	Taber	845	3 25
Sept. 1	W. A. Legault	Pincher	880	1 25
" 9	G. W. Comer	Manville	1,041	30 75
" 9	R. H. Christie	Strathcona	1,042	29 50
Oct. 5	Wm. Slocomb	Innisfree	1,352	14 70
" 5	E. C. Barnwell	Camrose	1,353	23 25
Aug. 3	R. L. Harrop	Fielding	1	3 00
" 3	T. S. Hooper	Estevan	2	18 25
" 3	W. J. Learmouth	Duck Lake	3	1 75
" 3	H. M. Smith	Dubuc	4	39 75
" 3	O. E. Gallagher	Balgonie	5	10 50
" 3	C. Adams	Disley	6	8 00
" 3	W. McLean	Dana	7	23 75
" 3	R. S. Henderson	Creelman	8	28 25
" 3	R. B. Law	Condie	9	2 25

Date.	Name.	Station.	Cheque No.	Amount.
1908.				
Aug. 3....	W. Whitemarsh	Churchbridge	10	27 25
	Cancelled		11	
" 3....	A. F. Trenough	Carievale	12	5 50
" 3....	Geo. J. Gill	Broadview	13	17 00
" 3....	W. McQuay	Beinfait	14	17 75
" 3....	R. D. Irland	Battleford	15	66 00
" 3....	A. A. Eaman	Balgonie	16	27 00
" 3....	J. R. Anderson	Arcola	17	43 00
" 3....	H. Evans	Alameda	18	23 00
" 3....	J. T. Davidson	Abernethy	19	9 00
" 3....	J. J. Henderson	Grayson	20	58 50
" 3....	A. H. Gordon	Greufell	21	23 25
" 3....	C. Blair	Govan	22	42 50
" 3....	A. B. Stewart	Gainsboro'	23	9 50
" 3....	J. E. McFeteridge	Frobisher	24	29 75
" 3....	J. S. Cordingly	Francis	25	23 50
" 3....	B. F. O'Toole	Forget	26	71 50
" 14....	J. S. Brunston	Rouleau	27	25 25
" 3....	Geo. A. Hall	Halbrite	28	15 75
" 3....	D. Findlay	Fleming	29	2 50
" 3....	W. Crosby	Heward	30	23 25
" 3....	W. R. Russell	Humboldt	31	30 25
" 3....	H. E. Schwalm	Invermay	32	25 00
" 3....	R. A. McLean	Kamsack	33	31 50
" 3....	J. G. McRobie	Kinistino	34	6 75
" 3....	J. H. Wawson	Kronau	35	4 75
" 3....	W. V. Hessey	Lang	36	3 75
" 3....	J. C. Litster	Langham	37	3 25
" 3....	J. B. Ross	Lashburn	38	39 25
	Cancelled		39	
" 3....	M. Jull	Macoun	40	44 25
" 3....	G. M. Ross	Maidstone	41	16 50
" 3....	H. Fraser	Manor	42	24 25
" 3....	C. W. McKellar	Marshall	43	23 25
" 3....	F. W. Hern	Maymont	44	9 25
" 3....	A. A. Hern	Melfort	45	18 00
" 3....	Jas. Fitzgerald	Midale	46	15 00
" 3....	L. E. Fulmore	Milestone	47	17 00
" 3....	W. C. Goudy	Moose Jaw	48	13 50
" 3....	A. T. Trenough	Moosomin	49	13 00
" 3....	C. M. Wheeler	Morse	50	15 25
" 3....	F. A. Smith	McLean	51	9 25
" 3....	W. Lappen	McTaggert	52	1 00
" 3....	F. T. Armson	Neudorf	54	13 00
" 3....	F. T. Torrey	N. Battleford	55	14 50
" 3....	R. E. Green	Oxbow	56	9 50
" 3....	J. McFadyen	Parkbeg	57	2 75
" 3....	W. D. Hughes	Paynton	58	14 00
" 3....	W. H. Bergman	Pilote Butte	59	2 25
" 3....	C. A. Edgley	Prince Albert	60	1 75
" 3....	E. P. Benoit	Qu'Appelle	61	15 75
" 3....	B. L. Lewis	Radisson	62	12 00
" 3....	L. W. Clark	Quill Lake	63	25 00
" 3....	Samuel Rutherford	Roche Percee	64	1 00
" 3....	J. Phelan	Saskatoon	65	23 50
" 3....	F. W. Anglin	Saltcoats	66	97 50
" 3....	W. P. Rudkin	Tyvan	67	12 00
" 3....	R. D. Davidson	Tisdale	68	30 75
" 3....	H. W. Baldwin	Theodore	69	32 50
" 3....	W. A. Sewell	Strassburg	70	8 25
" 4....	C. H. Henry	Star City	71	17 25
" 4....	W. H. McNally	Sheho	72	47 25
" 4....	G. M. Shaw	Sedley	73	15 00
" 4....	R. Jarvis	Venda	74	16 75
" 4....	F. G. Masson	Wolseley	75	20 50

Date.	Name.	Station.	Cheque No.	Amount.
1908.				
Aug. 4	A. H. McLeod	Yellow Grass	76	25 50
" 4	L. C. Robinson	Wadena	77	71 25
" 4	Jas. J. Foster	Yorkton	79	101 25
" 4	A. R. Douglas	Warman	80	3 50
" 4	C. F. Williams	Wapella	81	16 00
" 5	A. M. Hein	Carlyle	82	13 75
" 4	D. B. Hart	Buchanan	92	25 50
" 7	D. A. Campbell	Whitewood	97	17 75
" 7	F. McQuillin	Redvers	119	40 75
" 10	F. R. Law	Antler	120	36 25
" 10	H. Casey	Wauchope	121	21 50
" 10	H. G. Moffat	Aberdeen	122	4 75
" 10	L. Bertrand	Langenburg	124	56 00
" 10	W. R. Fowler	Osler	125	0 25
" 10	H. K. Bryce	Hague	126	0 25
" 10	F. W. Ingle	North Portal	127	0 75
" 14	Geo. T. Allen	Tantallon	130	5 00
" 14	R. J. Burdette	Regina	132	25 25
" 24	S. R. McKee	Togo	825	36 25
" 24	T. P. L. Dohan	Swift Current	826	53 25
" 27	R. C. Hooper	Glen Ewan	840	13 00
" 27	G. F. Guernsey	Weyburn	841	31 25
" 27	M. R. Young	Nokomis	844	32 00
Sept. 1	C. Watkin	Cupar	867	57 50
" 1	C. A. Baker	Craik	868	16 25
" 9	J. C. Cobb	Asquith	1,043	8 75
" 9	E. McColl	Wilcox	1,044	0 25
" 16	S. J. Morrisson	Earl Grey	1,253	19 50
" 16	C. E. Jestly	Stoughton	1,254	42 50
Oct. 1	C. A. Arnold	Rouleau	1,343	9 50
" 2	G. T. Goulding	Summerberry	1,344	0 50
" 5	R. M. Sutherland	Girvin	1,356	5 25
" 5	J. A. Whelan	Veregin	1,357	26 75
" 6	C. B. McLean	Carnduff	1,364	3 75
" 6	H. G. Potts	Balcarres	1,363	40 00
" 6	W. D. Grieve	Bladworth	1,362	8 25
" 12	C. F. Thomas	Bethune	1,365	15 50
" 13	F. L. Marshall	Lumsden	1,370	12 25
	L. J. Kelly	Osage, account per distributing grain		2 00
	J. Q. Brandon	Osage, account per distributing grain		12 00
	J. B. Ross	Lashburn, assistance		20 00
		Total		3,219 20

SESSIONAL PAPER No. 25c

STATEMENT No. 4 "B."

Details of Expenditure in Connection with the Seed Grain Office at Ottawa.

Particulars.	Amount.	
	$ cts.	$ cts.
Travelling Expenses—		
W. W Cory	414 80	
Geo. D. Pope	185 00	
		599 80
Salaries—		
Miss M. C. Ramage, from Feb. 4 to Aug. 31 at $41.66 per month	287 31	
Miss C. Fortier, from Feb. 6 to Aug. 31 at $41.66 per month	284 44	
T. T. Smythe, from May 26 to Aug. 31 to July 31, 875. Bal. $100	264 52	
I. Lafrance, from Feb. 5 to Aug. 31 to July 31, $500 per yr. Bal. $600	294 21	
R. A. Gibson, from Aug. 1 to Sept. 2 at $1,900 per yr.	194 42	
G. B. Herridge, from May 26 to Aug. 31 at $60 per month	191 61	
G. M. Smith, from June 11 to Sept. 12 at $60 per month	184 00	
A. T. Macfarlane, from June 8 to Aug. 31 at $60 per month	166 00	
S. P. Eagleson, from June 13 to Sept. 30, at $41.66 per month	149 98	
A. P. Capreol, from May 28 to Aug. 31, at $41.66 per month	130 36	
A. Gravel, from June 22 to Aug. 5, at $60 per month	87 68	
W. R. Burrill, from July 24 to Aug. 31, at $60 per month	75 48	
Miss J. M. McCormick, from July 21 to Aug. 31, at $41.66 per month	56 44	
H. B. Hill, from Aug. 21 to Aug. 31, at $100 per month	35 48	
Miss A. Hancock, from Aug. 28 to Aug. 31, at $41.66 per month	5 38	
		2,407 31
Stationery and Printing—		
Ottawa Free Press	1,429 50	
Dept. of Public Printing	649 27	
		2,078 77
Telegraph and Telephone—		
C.P.R. Telegraph	539 44	
Receiver General	162 45	
G.N.W. Telegraph Co	93 61	
		795 50
Express Charges—		
Dominion Express Co		298 44
Sundries—		
Ottawa Transfer Co., transferring mail	4 75	
Remington Typewriter Co., rep. typewriter	1 50	
E. P. McGrath Co., packing cases	19 55	
		25 80
		6,205 62

STATEMENT No. 4 "C."

Details of Expenditure in Connection with Seed Grain Office at Winnipeg.

Particulars.	Amount.	
	$ cts.	$ cts.
Travelling Expenses—		
C. H. Beddoe	834 20	
C. C. Castle	485 25	
D. Manson	40 95	
		1,360 40
Salaries—		
R. J. Howden, from Apr. 1 to July 31, Apr. $200, bal. $250	950 00	
F. J. Mathew, from Feb. 11 to Sept. 15, at $125 per month	894 40	
D. Manson, from Feb. 17 to Sept. 30, at $100 per month	744 83	
C. B. Piper, from Feb. 8 to July 15, at $125 per month	564 65	
W. D. Drummond, from Feb. 17 to July 31, Feb. $65, bal. $80	429 14	
P. J. O'Dwyer, from Feb. 13 to July 31, at $75 per month	418 97	
J. A. Wilson, from March 18 to July 16, March, April and May, at $75 per month, bal. $100, 45 hrs. overtime at 40c an hr.	353 48	
Laura E. Smith, from Feb. 18 to Aug. 6, to May $155 per month, bal. $65	340 76	
G. Ringwood, from Feb. 10 to July 31, Feb. $50, bal. $60	334 48	
E. Stanley Forbes, from May 1 to July 18, May $80, bal. $100 per month	238 06	
M. Robinson, from Feb. 13 to Apr. 30, at $80 per month	206 90	
H. E. Kirk, from Apr. 15 to June 10, at $110 per month	205 34	
P. Laker, from March 1 to July 25, Mar. $30, Apr. $35, bal. $40 per month	177 25	
J. Spence, from Feb. 21, to May 15, at $50 per month	140 52	
W. R. Johnson, from Mar. 1 to Apr. 22, at $65 per month	112 67	
Ruth Wallace, from June 16 to July 15, at $55 per month	55 00	
Harry Tront, from Mar. 5 to Mar 18 inclusive, at $55 per month	24 84	
C. Struthers, 4 days	10 00	
Ulric Hambly, 3 days	7 50	
		6,208 79
Stationery and Printing—		
Free Press Job Dept., printing, &c	442 00	
Amalgamated Press Printing and Stationery	376 20	
Dept. of Printing and Stationery, 6,000 books	241 99	
Richardson Stat'y. & Mfg. Co., printing	207 50	
Richardson & Bishop	170 45	
Wilson Stationery Co., stationery, &c	54 95	
Office Specialty Mfg. Co., folders, guides, &c	16 50	
Lampman Beamish Co., books	22 50	
J. H. Ashdown Co., cash box	3 00	
Russell Lang & Co., stationery	2 80	
Bulleman Bros., rebinding books	2 00	
Books	0 75	
		1,570 64
Advertising—		
(See List), No. 4 cc		4,611 39
Furniture and Fixtures—		
John Leslie	62 70	
Less sale of furniture	36 25	
		26 45
Rent of Offices—		
Martin, Bole & Wynne Co., rent from Feb. to Sept 15, at $75 per month	489 00	
W. J. Ashby, rent of office in Brandon, 1 month	6 00	
		495 00
Telegraph and Telephones—		
C.P.R. Telegraph	1,743 22	
Manitoba Government Telephones	93 85	
G.N.W. Telegraph	35 73	
C.N.R. Telegraph	34 12	
Jas. Richardson & Sons	42 79	
Geo. Hill	1 35	
		1,951 06

SESSIONAL PAPER No. 25c

STATEMENT No. 4 "C."

Details of Expenditure in Connection with Seed Grain Office at Winnipeg.—*Continued.*

Particulars.	Amount.	
	$ cts.	$ cts.
Sundries—		
Hudson, Howell, Ormond & Marlett legal services	321 82	
E. Turner, cleaning offices $87.50, packing cases $6	93 50	
C. Hamill, livery 12 days at $4, 12 days at $3	84 00	
Canadian Fairbanks Co., grain testers' scales, etc	67 00	
Manitoba Stencil and Stamp Works, rubber stamps and stencils	63 51	
Wm. Ridgeshaw, livery 18 days at $3	54 00	
Winnipeg Electric Street Ry., electric light	42 67	
" " " car tickets	36 00	
Geo. Hill, coal oil, &c., cartage and expenses	39 72	
Remington Typewriter Co., rent and repairs of typewriters	35 75	
C.P.R., freight on 8 cases to Ottawa	31 02	
J. W. Forbes, street car tickets $16, cartage $1	17 00	
C. C. Castle, 5 sacks Eng. oats	17 00	
" 5 bus. Eng. oats at 85c	6 80	
J. H. Ashdown, Hardware Co., hardware	15 70	
Baker & Gregg, rent and repairs of typewriter	15 00	
C. N. Bell, arbitration fees	14 00	
Sutton's Express, delivering, &c	8 25	
Rent of P.O. Box	4 50	
Sundries	4 25	
F. L. Kenny, sign cards	4 00	
Dominion Elv. Co. Com. Option account	1 87	
H. G. Middleton, empty cases	1 70	
N.W. Grain Dealers Calculator	1 25	
Messenger Service	0 60	
Chas. Danderault, cleaning seed oats	3 00	
Jas. Cuddy, street car and toll exp	11 00	
C. C. Castle, balance	27 49	
		1,016 40
Express Charges—		
Dominion Express Co	332 03	
Canadian Northern Express	3 60	
		335 69
Postage Stamps		155 60
		17,731 42

STATEMENT No. 4 *CC*.—Details of Advertising at Seed Grain Office, Winnipeg.

Name of Paper.	Place of Publication.	Amount.	Sale of Seed Grain.	Purchase of Seed Grain.	Tenders for Sacks, &c.
		$ cts.	$ cts.	$ cts.	$ cts.
Manitoba 'Free Press'	Winnipeg, Man.	792 13	414 95	295 81	81 37
'Telegram' Publishing Co	" "	697 00	257 50	344 00	95 50
'Tribune' Publishing Co	" "	666 35	284 25	304 00	78 10
'Albertan' Publishing Co	Calgary, Alta	418 96		398 16	26 80
'Phoenix'	Saskatoon, Sask	332 16		332 16	
'Bulletin' Co	Edmonton, Alta	231 71	35 00	196 71	
'Farmers Advocate'	Winnipeg, Man	173 60	69 60	88 00	16 00
'Leader' Publishing Co	Regina, Sask	186 09	45 00	112 50	28 59
'Northwest Farmer'	Winnipeg, Man	141 12	31 36	98 00	11 76
Alberta 'Herald'	Edmonton, Alta	51 00	16 20	34 80	
'Nordwesten' Publishing Co	Winnipeg, Man	49 84	12 48	37 36	
'Journal' Co	Edmonton, Alta	81 84	81 84		
'Herald' Publishing Co	Calgary, Alta	87 68	66 64		21 04
'Globe' Printing Co	Toronto, Ont	84 00		30 00	54 00
Calgary 'News'	Calgary, Alta	53 20	53 20		
'Courier de la D'Ouest'	Edmonton, Alta	51 70	51 70		
Calgary 'Albertan'	Calgary, Alta	44 08	44 08		
'Advocate' Publishing Co	Prince Albert, Sask	43 50		43 50	
Moosejaw 'Times'	Moosejaw, Sask	38 00	2 00	36 00	
Saskatchewan 'Courier' Publishing Co	Regina, Sask	30 19	18 15	12 04	
'Western Home Monthly'	Winnipeg, Man	20 00		20 00	
'Amalgamated Press'	Winnipeg, Man	18 00	18 00		
Red Deer 'News'	Red Deer, Alta	16 80	16 80		
'Daily News'	Calgary, Alta	16 12			16 12
Edmonton 'News'	Edmonton, Alta	13 42	13 42		
Alberta 'Homstead'	Edmonton, Alta	13 42	13 42		
Innisfail 'Lance'	Innisfail, Alta	13 00	13 00		
St. Albert 'Gazette'	St. Albert, Alta	12 60	12 60		
Innisfail 'Province'	Innisfail, Alta	12 60	12 60		
Tofield 'Standard'	Tofield, Alta	11 40	11 40		
'Representative'	Leduc, Alta	10 80	10 80		
Ponoka 'Herald'	Ponoka, Alta	10 50	10 50		
'Farm and Ranch Review'	Calgary, Alta	10 50	10 50		
Vermillion 'Signal'	Vermillion, Alta	10 40	10 40		
Didsbury 'Review'	Didsbury, Alta	10 20	10 20		
Lacombe 'Advertiser'	Lacombe, Alta	10 00	10 00		
Calgary 'Herald'	Calgary, Alta	9 80	9 80		
Nanton 'News'	Nanton, Alta	9 80	9 80		
Strathcona 'Plain Dealer'	Strathcona, Alta	9 15	9 15		
Lethbridge 'Herald'	Lethbridge, Alta	8 75	8 75		
Western Publishing Co	Brandon, Man	8 00	8 00		
High River 'Times'	High River, Alta	8 00	8 00		
Okotoks 'Review'	Okotoks, Alta	7 00	7 00		
Camrose 'Mail'	Camrose, Alta	6 75	6 75		
'Eye Opener'	Calgary, Alta	6 00	6 00		
Bawlf 'Sun'	Bawlf, Alta	5 85	5 85		
Stettler 'Independent'	Stettler, Alta	5 30	5 30		
Macleod 'Advance'	Macleod, Alta	5 25	5 25		
'The Times'	Medicine Hat, Alta	5 25	5 25		
'Western Globe'	Lacombe, Alta	5 25	5 25		
Western Canada Publishing Co	Winnipeg, Man	5 00	5 00		
Claresholm 'Review'	Claresholm, Alta	4 88	4 88		
Taber 'Free Press'	Taber, Alta	4 50	4 50		
Pincher Creek 'Echo'	Pincher Creek, Alta	4 00	4 00		
Vegreville 'Observer'	Vegreville, Alta	3 50	3 50		
Daysland 'Press'	Daysland, Alta	3 00	3 00		
Wetaskiwin 'Herald'	Wetaskiwin, Alta	3 00	3 00		
Ft. Saskatchewan 'Reporter'	Ft. Saskatchew'n, Alt	2 80	2 80		
Strathcona 'Chronicle'	Strathcona, Alta	2 80	2 80		
'Chronicle' Publishing Co	Macleod	2 50	2 50		
Olds 'Gazette'	Olds, Alta	2 25	2 25		
Carstairs 'Journal'	Carstairs, Alta	2 10	2 10		
Lloydminster 'Times'	Lloydminster, Sask	2 00	2 00		
'Voice' Publishing Co	Winnipeg, Man	5 00	5 00		
Total		4,611 39	1,805 07	2,383 04	423 28

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STATEMENT No. 4D.—Details of Expenditure in connection with the Seed Grain Office at Edmonton.

Particulars.	Amount.	Totals.
	$ cts.	$ cts.
Travelling Expenses—Homestead Inspectors—		
H. Bowtell	359 38	
J. E. Stauffer	266 90	
T. W. Bryant	234 46	
T. J. Cunningham	229 24	
J. McDiarmid	218 04	
I. S. Doze	182 45	
S. M. Robertson	163 45	
A. Helmer	126 56	
W. D. Magee	114 38	
Adam Link	74 70	
		1,969 56
Travelling Expenses other than Homestead Inspectors—		
J. W. Martin	272 65	
Roy Lee	41 15	
J. A. Bannerman	17 90	
F. Vickerson	10 00	
Arthur Elliott	5 75	
		347 4
Living Expenses—		
J. W. Martin	373 50	
L. Alexander	337 95	
J. A. Bannerman	263 75	
J. R. Lee	243 25	
Meals	1 75	
		1,220 20
Salaries—		
E. P. Fulton	55 20	
Thos. Lyon	42 00	
Harriet Holdsworth	38 00	
Miss Thornton	26 00	
Miss Fullerton	22 00	
K. W. McKenzie	6 20	
		189 40
Printing and Stationery—		
Deputy Minister of Agriculture, Alberta	56 01	
'Bulletin' Co	8 00	
Miscellaneous	22 05	
		86 06
Advertising—		
'Le Courier de l'Ouest,' sale of seed grain	8 00	
Alberta 'Herald'	5 10	
		13 10
Telegraph and Telephone—		
C.P.R. Telegraph	269 09	
C.N.R. Telegraph	12 17	
Telephone	48 45	
Sundry telegrams	42 47	
		372 18
Sundries—		
Livery	33 00	
Repairing typewriter	14 00	
Cartage	1 25	
Cement	0 35	
Exchange on cheque	0 15	
K. W. McKenzie	0 15	
		48 90
Express charges		4 85
Postage		138 95
		4,390 65

STATEMENT No. 5.—STATEMENT of Fees paid to the Secretary Treasurers of the Local Improvement Districts in connection with Seed Grain Applications, 1908.

Number.	Name of Secretary Treasurer.	Local Improvement District.			Number of Applications.	Total Amount paid.	Chargeable to Alberta Government.	Chargeable to Saskatchewan Government.	Chargeable to Dominion Government.
						$ cts.	$ cts.	$ cts.	$ cts.
4	M. Hogan	27	S	4	29	7 25	7 00	....	0 25
5	John Moir	11	P	2	36	9 00	....	4 75	4 25
6	Geo. S. Robinson	1	C	2	22	5 50	....	4 50	1 00
7	Geo. Milton	2	B	1	7	1 75	1 75	....	....
8	Axel. Olsen	10	A	2	55	13 75	....	12 75	1 00
9	E. G. Rodell	23	S	4	73	18 25	17 50	....	0 75
10	C. J. Lutes	21	M	2	60	15 00	....	6 25	8 75
11	A. Wallace Shaw	11	B	2	30	7 50	....	4 25	3 25
12	E. A. Quantz	23	M	4	32	8 00	3 75	....	4 25
13	C. A. Chase	3	A	2	32	8 00	....	7 50	0 50
14	Arthur Nelson	2	C	2	85	21 25	....	21 25	....
15	William Hewson	17	D	2	81	20 25	....	2 00	18 25
16	H. A. Glaspell	26	J	4	31	7 75	6 75	....	1 00
17	W. F. White	8	T	4	4	1 00	0 25	....	0 75
18	George Kelbaugh	17	B	2	121	30 25	....	14 75	15 50
19	L. A. Duncan	1	D	2	56	14 00	....	13 00	1 00
20	D. Palmer	10	C	2	75	18 75	....	18 25	0 50
21	John Kent	21	E	3	7	1 75	....	0 50	1 25
22	W. Pullyblank	22	S	4	9	2 25	2 25	....	....
23	B. E. Andrews	26	S	4	61	15 25	15 00	....	0 25
24	Walter Armstrong	21	N	2	24	6 00	....	2 50	3 50
25	Gwillyn Lewis	11	B	2	31	7 75	....	6 00	1 75
26	J. McPherson	17	J	2	48	12 00	....	6 25	5 75
26	" (add. cheque)	17	J	2	2	0 50	....	0 25	0 25
27	J. C. O. Adam	P. M. Arbury.			20	5 00	....	....	5 00
28	R. M. Johnson	9	S	2	3	0 75	....	0 25	0 50
29	E. Covey	26	C	4	264	51 00	6 25	....	44 75
30	Geo. W. Sawyer	22	N	4	31	7 75	7 00	....	0 75
31	T. G. Morrison	12	H	2	64	16 00	....	8 50	7 50
32	Lewis P. Larson	23	T	4	14	3 50	2 50	....	1 00
33	J. W. Kinkade	5	P	2	18	4 50	....	0 50	4 00
34	O. P. Klein	25	S	4	66	16 50	16 00	....	0 50
34	" (add. cheque)	25	S	4	2	0 50	0 25	....	0 25
35	D. Jamieson	15	R	2	36	9 00	....	0 50	8 50
36	William M. Graham	18	S	4	21	5 25	0 50	....	4 75
37	James W. Grant	13	H	2	59	14 75	....	3 25	11 50
38	E. A. Shirtcliff	21	A	5	5	1 25	1 00	....	0 25
39	J. W. Hutchieson	19	N	2	74	18 50	....	0 75	17 75
40	J. A. Howse	12	R	2	18	4 50	....	1 75	2 75
41	Stanley Dolejsi	11	C	2	112	28 00	....	18 75	9 25
42	M. N. Carr	8	E	2	6	1 50	....	1 50	....
43	E. V. Cooper	8	H	2	47	11 75	....	8 25	3 50
43	" (add. cheque)	8	H	2	3	0 75	....	0 75	....
43	" "	8	H	2	5	1 25	....	1 00	0 25
44	F. B. Carlton	18	A	3	42	10 50	....	4 75	5 75
45	W. H. Close	11	R	2	10	2 50	....	0 50	2 00
46	A. M. Stephen	4	B	1	22	5 50	....	4 75	0 75
47	Geo. Dulton	8	H	3	28	7 00	....	....	7 00
47	" (add. cheque)	8	H	3	6	1 50	....	....	1 50
48	R. F. Coleman	4	E	2	32	8 00	....	6 25	1 75
49	Hugh Davidson	3	M	2	27	6 75	....	1 00	5 75
50	Frank B. Sparrow	6	J	2	32	8 00	....	7 00	1 00
51	E. N. French	20	B	5	28	7 00	3 50	....	3 50
52	Daniel T. Greene	24	H	4	9	2 25	0 25	....	2 00
53	Robert Brown	7	C	2	40	10 00	....	8 00	2 00
54	T. W. Hutchinson	22	S	4	43	10 75	10 00	....	0 75
55	E. D. Gardiner	16	R	2	28	7 00	....	1 00	6 00
56	John Edward	11	S	2	17	4 25	....	....	4 25
56	" (add. cheque)	11	S	2	3	0 75	....	....	0 75
57	A. Locke	12	M	2	137	34 25	....	10 25	24 00
59	Herman A. Scholz	27	N	4	3	0 75	0 75	....	....

SESSIONAL PAPER No. 25c

STATEMENT No. 5.—STATEMENT of Fees paid to the Secretary Treasurers of the Local Improvement Districts, &c.—*Continued.*

Number.	Name of Secretary Treasurer.	Local Improvement District.	Number of Applications.	Total Amount paid.	Chargeable to Alberta Government.	Chargeable to Saskatchewan Government.	Chargeable to Dominion Government.
				$ cts.	$ cts.	$ cts.	$ cts.
62	Geo. Tinney	28 T 4	31	7 75	7 25	.....	0 50
63	Henry Trenhaile	26 M 4	13	3 25	3 00	.....	0 25
64	R. H. Yeo	18 J 2	78	19 50	.....	3 75	15 75
65	E. N. Maltby	4 A 2	32	8 00	.....	7 25	0 75
67	W. W. Batson	21 S 4	46	11 50	9 50	.....	2 00
68	F. S. Proctor	11 M 2	30	7 50	.....	6 50	1 00
69	Thos. Murray	5 N 2	21	5 25	.....	1 00	4 25
70	D. J. Low	10 A 1	39	9 75	.....	9 25	0 50
71	Wm. H. Wilkins	13 J 2	104	26 00	.....	6 50	19 50
72	Henry J. Veal	11 A 1	88	22 00	.....	19 75	2 25
73	L. Manner	18 R 2	28	7 00	.....	4 50	2 50
74	J. E. Anderson	18 H 2	73	17 25	.....	4 25	13 00
75	Wm Trevethick	22 N 2	29	7 25	.....	3 75	3 50
75	" (add. cheque)	22 N 2	6	1 50	.....	1 25	0 25
76	C. B. Bergerson	3 N 2	24	6 00	.....	0 50	5 50
77	John Carse	12 J 2	60	15 00	.....	8 25	6 75
78	A. H. Birch	12 W 2	23	5 75	.....	2 75	3 00
79	R. Manle	18 B 3	12	3 00	.....	0 75	2 25
80	D. W. Patten	2 E 2	110	27 50	.....	18 50	9 00
81	A. Cartwright	25 H 4	10	2 50	0 75	.....	1 75
82	E. Walter Simpson	20 T 4	4	1 00	1 00	.....	.....
83	William Kirton	12 W 4	4	1 00	1 00	.....	.....
84	Peter Svarich	27 M 4	26	6 50	6 00	.....	0 50
85	F. Senberlich	14 N 2	80	20 00	.....	0 75	19 25
86	J. F. Burnett	17 M 2	72	18 00	.....	4 00	14 00
87	David Verne	20 T 2	6	1 50	.....	0 75	0 75
88	A. R. Lockhart	16 D 2	31	7 75	.....	1 00	6 75
89	Ed. Field	17 H 2	44	11 00	.....	3 00	8 00
90	E. Boucher	21 W 2	5	1 25	.....	0 50	0 75
91	Geo. F. Wanless	10 D 2	21	5 25	.....	5 00	0 25
92	A. J. Blackwell	25 A 4	65	16 25	5 75	.....	10 50
93	V. B. Hallgrimson	16 M 2	13	3 25	.....	0 50	2 75
94	Wm. Carpendale	1 A 2	22	5 50	.....	5 00	0 50
95	A. J. Langford	1 B 1	12	3 00	.....	3 00	.....
96	C. N. Syme	5 B 1	19	4 75	.....	3 75	1 00
96	" (add. cheque)	5 B 1	8	2 00	.....	0 75	1 25
97	C. J. Blonquist	25 T 4	92	23 00	20 75	.....	2 25
98	W. T. Cunningham	8 T 2	6	1 50	.....	.....	1 50
99	Gilbert McDonald	17 S 2	48	12 00	.....	0 75	11 25
99	" (suppl. cheque)	17 S 2	8	2 00	.....	0 25	1 75
100	J. C. Warner	6 B 2	10	2 50	.....	2 25	0 25
101	R. Burnside	4 N 2	18	4 50	.....	2 00	2 50
102	M. W. Cazakoff	15 A 2	49	12 25	.....	3 00	9 25
103	Hugh. E. Jones	22 J 2	32	8 00	.....	7 50	0 50
105	J. S. Thompson	18 J 3	7	1 75	.....	.....	1 75
106	G. Morris	28 S 4	4	1 00	1 00	.....	.....
107	E. C. Williamson	25 W 3	87	21 75	.....	11 25	10 50
108	Wm. Mason	29 R 4	2	0 50	0 25	.....	0 25
109	R. Cail	8 A 1	10	2 50	.....	2 00	0 50
110	A. MacKenzie	1 B 2	22	5 50	.....	4 25	1 25
111	C. S. Godbout	28 R 4	20	5 00	4 75	.....	0 25
112	F. W. Tobey	23 N 3	29	7 25	.....	2 75	4 50
113	W. Buzicka	23 J 4	20	5 00	2 00	.....	3 00
114	Alex. McArthur	24 M 4	28	7 00	1 00	.....	6 00
115	John Riglin	11 B 1	43	10 75	.....	7 75	3 00
116	H. B. Shively	22 A 5	12	3 00	0 75	.....	2 25
117	T. N. Irvine	21 P 2	8	2 00	.....	0 75	1 25
118	John H. Ridall	10 B 2	22	5 50	.....	4 50	1 00
119	M. Murphy	3 D 2	34	8 50	.....	6 50	2 00
120	T. W. Hood	11 C 3	10	2 50	.....	.....	2 50
121	Frank Ewald	24 N 4	50	12 50	8 25	.....	4 25
122	O. E. Olesburg	23 N 4	31	7 75	6 50	.....	1 25

STATEMENT No. 5.—STATEMENT of Fees paid to the Secretary Treasurers of the Local Districts, &c.—*Continued.*

Number.	Name of Secretary Treasurer.	Local Improvement District.	Number of Application.	Total Amount Paid.	Chargeable to Alberta Government.	Chargeable to Saskatchewan Government.	Chargeable to Dominion Government.
				$ cts.	$ cts.	$ cts.	$ cts.
123	Wm. Hinde	12 Z 4	8	2 00	2 00		
124	Geo. A. Scott	14 W 2	66	16 50		7 25	9 25
125	J. A. Weir	17 W 4	44	11 00	9 00		2 00
126	G. M. Muir	14 A 1	52	13 00		8 50	4 50
127	I. H. Lackey	3 D 2	23	5 75		5 00	0 75
128	J. I. Nichol	6 M 2	23	5 75		5 00	0 75
128	" (supplementary)	6 M 2	7	1 75		1 50	0 25
129	Harry Young	14 M 2	12	3 00			3 00
130	D. McKnight	2 B 2	66	16 50		16 00	0 50
131	J. A. Balfour	11 H 2	37	9 25		8 50	0 75
132	J. C. Starr		123	30 75		29 00	1 75
133	Thos F. Terry	8 B 1	8	2 00		1 75	0 25
134	Wm. Toone	5 A 1	35	8 75		4 25	4 50
135	J. Stanley Trask	11 Z 2	34	8 50		2 25	6 25
136	Geo. A. Loades	24 J 4	19	4 75	0 25		4 50
137	M. W. McLeod	7 E 2	55	13 75		10 00	3 75
138	J. H. Lane	6 E 2	69	17 25		9 50	7 75
139	J. A. Lemay	3 B 1	58	14 50		12 00	2 50
140	J. L. Anderson	13 A 1	150	37 50		23 50	14 00
141	A. C. Elliot	24 S 3	54	13 50		1 00	12 50
142	Dan. Coleman	11 A 3	13	3 25		0 25	3 00
143	Hugh Fulton	19 M 4	7	1 75			1 75
144	Phillip J. Hoffman	18 P 2	80	20 00		5 75	14 25
145	James McNichol	20 W 4	10	2 50	2 50		
146	Geo. Milne	14 P 2	43	10 75			10 75
147	A. C. Moynes	3 C 2	47	11 75		11 25	0 50
148	John J. Ellingson	12 D 2	42	10 50		8 50	2 00
149	N. B. McKenn	20 P 3	23	5 75			5 75
150	J. A. Clarke	10 A 3	28	7 00		0 25	6 75
152	E. R. Olmstead	22 W 4	42	10 50		7 50	3 00
154	Lawrence Dunn	17 Q 2	48	12 00		0 50	11 50
155	K. McLeod	15 D 3	9	2 25		1 50	0 75
156	H. Holmes	13 P 2	49	12 25		1 25	11 00
157	L. Baird	26 R 4	19	4 75		3 50	1 25
158	P. H. W. Service	25 C 4	43	10 75	8 75		2 00
159	J. Simpson Dick	15 J 2	22	5 50		0 75	4 75
160	P. W. Cessna	23 P 2	11	2 75			2 75
161	A. Sinclair	8 C 2	20	5 00		4 25	0 75
162	James Templeton	19 H 2	20	5 00		0 25	4 75
163	Jonas Smith	25 R 4	30	7 50	3 25		4 25
164	W. C. Carrothers	5 E 2	57	14 25		12 25	2 00
165	T. McKee	10 A 5	11	2 75	2 25		0 50
166	C. T. Willis	11 E 2	15	3 75		3 75	
167	A. H. Salmon	6 B 1	15	3 75		3 25	0 50
168	W. H. C. Saunderson	14 B 1	51	12 75		2 00	10 75
169	John G. Stamper	29 A 5	10	2 50	1 00		1 50
170	John McKenney	14 J 2	24	6 00		0 25	5 75
171	R. White	3 A 1	64	16 00		13 50	2 50
172	P. Russell	20 S 4	2	0 50	0 50		
173	W. A. Smith	2 M 2	9	2 25		0 25	2 00
174	C. Devenbaugh	16 C 2	25	6 25		3 00	3 25
175	E. Challen Clark	17 A 1	51	12 75		6 75	6 00
176	E Coleridge Roper	24 R 4	14	3 50	3 25		0 25
177	John Campbell	26 A 4	74	18 50	3 00		15 50
178	W. Granville	10 B 2	62	15 50		12 75	2 75
178	" (add. cheque)	10 B 2	9	2 25		2 25	
179	Frank J. Stowers	12 C 2	98	24 50		21 50	3 00
180	N. A. Donaldson	21 R 4	12	3 00	2 75		0 25
181	F. E. Rhodes	10 T 4	6	1 50			1 50
182	Herman J. Michels	18 T 2	40	10 00		3 00	7 00
183	Edward J. Fream	18 W 4	75	18 75	15 75		3 00
184	S. L. Price	24 T 4	22	5 50	3 75		1 75

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STATEMENT No. 5.—STATEMENT of Fees paid to the Secretary Treasurers of the Local Improvement Districts, &c.—*Continued.*

Number.	Name of Secretary Treasurer.	Local Improvement District.	Number of Applications.	Total Amount paid.	Chargeable to Alberta Government.	Chargeable to Saskatchewan Government.	Chargeable to Dominion Government.
				$ cts.	$ cts.	$ cts.	$ cts.
185	A. F. Dickson	19 C 3	13	3 25	.....	1 50	1 75
186	Samuel Martin	3 B 2	105	26 25	.....	24 50	1 75
187	A. C. McIntyre	9 T 4	49	12 25	3 75	.....	8 50
188	Geo. M. Brown	20 W 2	31	7 75	.....	6 25	1 50
189	Edward Zinn	8 T 4	13	3 25	0 25	.....	3 00
190	J. H. McArthur	17 T 4	17	4 25	0 75	.....	3 50
192	David Butson	14 H 2	69	17 25	.....	2 50	14 75
193	John Brough	12 A 3	8	2 00	.....	.....	2 00
194	John A. Brown	9 A 1	18	4 50	.....	2 00	2 50
195	Chas. R. Brown	16 T 2	2	0 50	.....	.....	0 50
196	J. H. Brierley	8 D 2	41	10 25	.....	8 25	2 00
197	E. W. Bond	2 F 2	20	5 00	2 25	2 75	.....
198	Wm. Booker	14 B 3	3	0 75	.....	0 25	0 50
199	Charles Blunden	6 S 4	4	1 00	1 00	.....	.....
202	F. C. Berisford	16 P 2	8	2 00	.....	0 50	1 50
203	M. D. Barker	11 A 2	66	16 50	.....	14 00	2 50
204	Wm. Ashworth	26 B 4	52	13 00	1 75	.....	11 25
205	J. Anderson	10 S 2	27	6 75	.....	2 25	4 50
206	A. Allan	17 T 2	5	1 25	.....	.....	1 25
206	" (add. cheque)	17 T 2	13	3 25	.....	.....	3 25
207	A. B. Clark	20 P 4	9	2 25	1 25	.....	1 00
208	J. H. Currie	20 A 3	13	3 25	.....	2 25	1 00
209	B. Cook	24 T 2	20	5 00	.....	0 75	4 25
210	H. E. Clinite	8 J 3	34	8 50	.....	2 50	6 00
211	W. F. Carefoot	5 D 2	75	18 75	.....	13 25	5 50
212	H. L. Carpenter	6 D 2	53	13 25	.....	7 50	5 75
213	A. A. Campbell	4 B 2	32	8 00	.....	7 50	0 50
214	H. M. Dahl	12 P 2	27	6 75	.....	2 75	4 00
215	Wm. Davey	14 C 3	6	1 50	.....	0 25	1 25
215	" (add. cheque)	14 C 3	3	0 75	.....	.....	0 75
216	Wm. Davies	13 D 2	27	6 75	.....	4 25	2 50
216	" (add. cheque)	13 D 2	1	0 25	.....	0 25	.....
218	W. Harford Davis	10 N 2	40	10 00	.....	9 00	1 00
219	Geo. W. Dodge	13 B 3	14	3 50	.....	1 50	2 00
222	W. G. Dunkley	11 B 3	19	4 75	.....	.....	4 75
223	E. G. Eagleson	7 M 2	1	0 25	.....	.....	0 25
224	P. A. Edquist	17 H 3	9	2 25	.....	0 50	1 75
225	J. T. Enright	17 E 2	58	14 50	.....	5 75	8 75
226	Jos. Kershaw	7 I 2	21	5 25	.....	.....	5 25
228	L. J. Kelly	6 H 2	15	3 75	.....	3 50	0 25
229	J. H. Holmes	2 H 2	15	3 75	.....	2 00	1 75
230	F. G. Hemmgin	15 A 3	8	2 00	.....	1 25	0 75
231	C. Hingley	10 E 2	25	6 25	.....	3 75	2 50
232	T. S. Hayward	17 P 2	39	9 75	.....	3 00	6 75
233	G. Jenkins	6 B 4	7	1 75	0 75	.....	1 00
234	J. B. Hawkes	9 N 2	35	8 75	.....	8 50	0 25
235	J. H. Huffman	7 H 2	45	12 00	.....	9 25	2 75
236	Gilbert Hughes	12 A 2	77	19 25	.....	17 75	1 50
238	W. C. Huston	21 T 4	16	4 00	3 50	.....	0 50
239	John Jansusson	16 H 2	42	10 50	.....	3 75	6 75
240	Carl Johnson	13 A 3	17	4 25	.....	1 25	3 00
243	H. Campken	Mun. Indian Head	17	4 25	.....	3 75	0 50
244	John Redmond	13 W 4	5	1 25	1 25	.....	.....
245	H. Tilston Jones	12 C 3	15	3 75	.....	.....	3 75
246	G. M. Cundal	26 D 4	52	13 00	0 75	.....	12 25
246	" (add. cheque)	26 D 4	8	2 00	.....	.....	2 00
247	O. T. Wilson	24 P 4	14	3 50	3 25	.....	0 25
248	John Martin	10 R 2	4	1 00	.....	1 00	.....
249	T. A. Hart	16 J 2	13	3 25	.....	1 00	2 25
250	C. Stanley Hall	24 T 3	40	10 00	.....	4 00	6 00
250	" (add. cheque)	24 T 3	17	4 25	.....	1 75	2 50

STATEMENT No. 5.—STATEMENT of Fees paid to the Secretary Treasurers of the Local Improvement Districts, &c.—*Continued.*

No.	Name of Secretary Treasurer.	Local Improvement District.			Number of Applications.	Total Amount paid.	Chargeable to Alberta Government.	Chargeable to Saskatchewan Government.	Chargeable to Dominion Government.
						$ cts.	$ cts.	$ cts.	$ cts.
253	Gus Gabert	14	B	2	62	15 50	.....	15 00	0 50
255	M. Gabora	15	B	2	186	46 50	.....	39 25	7 25
256	John Furber	21	V	2	16	4 00	.....	1 00	3 00
257	Alfred M. Flower	18	E	2	19	4 75	.....	0 50	4 25
257	" (add. cheque)	18	E	2	31	7 75	.....	0 75	7 00
258	H. Turner	14	C	2	54	13 50	.....	11 75	1 75
259	H. T. Thorne	6	A	1	9	2 25	.....	1 75	0 50
260	W. M. Thompson	11	J	2	22	5 50	.....	5 00	0 50
261	Wm. F. Tait	4	B	2	54	13 50	.....	12 00	1 50
262	Hemming Suva	16	E	2	24	6 00	.....	2 00	4 00
263	James B. Swallow	13	C	2	15	3 75	.....	3 50	0 25
263	" (add. cheque)	13	C	2	27	6 75	.....	5 75	1 00
264	G. A. Sylte	6	P	2	1	0 25	.....	0 25	.....
264	" (add. cheque)	6	P	2	7	1 75	.....	1 00	0 75
265	F. X. Struely	19	R	2	20	5 00	.....	2 00	3 00
266	Horace Styne	6	R	2	26	6 50	.....	2 00	4 50
267	Ayton Safford	6	C	2	16	4 00	.....	3 50	0 50
269	S. W. Smith	20	R	4	17	4 25	2 75	.....	1 50
270	Thomas Smith	12	A	1	57	14 25	.....	10 50	3 75
271	R. R. Smith	15	C	2	10	2 50	.....	0 50	2 00
272	L. D. Sparling	7	P	2	4	1 00	.....	1 00	.. ...
274	W. C. Stewart	5	H	2	10	2 50	.....	2 50	.....
274	" (add. cheque)	5	H	2	11	2 75	.....	2 00	0 75
275	M. J. Stephenson	21	P	3	3	0 75	.....	.....	0 75
276	F. N. Spencer	12	J	2	3	0 75	.....	.....	0 75
277	James Russell	10	P	2	14	3 50	.....	3 00	0 50
278	A. L. Rowan	10	E	2	33	8 25	.....	8 25	.....
281	L. H. Reeves	16	N	2	7	1 75	.....	.....	1 75
283	Kenneth A. Price	7	B	1	31	7 75	.....	7 75	.....
284	W. H. Pearson	20	H	3	2	0 50	.....	.....	0 50
284	" (add. cheque)	20	H	3	15	3 75	.....	.....	3 75
287	George Nickel	22	B	3	1	0 25	.....	0 25	.....
288	Jno. W. Nelson	4	A	1	73	18 25	.....	17 50	0 75
289	John L. Munson	17	A	2	33	8 25	.....	2 25	6 00
290	P. J. Mullen	24	S	4	46	11 50	10 00	.....	1 50
291	D. Mitchell	21	J	3	5	1 25	.....	0 50	0 75
293	W. A. Mann	8	A	2	26	6 50	.....	6 00	0 50
294	Thos. W. Magrath	14	B	2	2	0 50	.....	0 50	.....
295	J. B. Lupton	7	D	2	74	18 50	.....	12 00	6 50
296	R. J. Latta	14	R	2	25	6 25	.....	1 50	4 75
296	" (add. cheque)	14	R	2	6	1 50	.....	0 25	1 25
297	A. R. Lecky	11	W	2	16	4 00	.....	0 50	3 50
298	J. B. Leightner	17	N	2	48	12 00	.....	1 00	11 00
300	R. H. Longmore	12	E	2	73	18 25	.....	10 75	7 50
301	Wm. McBrien	1	A	1	15	3 75	.....	3 75	.....
302	Allan McBurney	4	P	2	31	7 75	.....	.....	7 75
302	" (add. cheque)	4	P	2	1	0 25	.....	.....	0 25
303	O. K. McElhiney	15	B	3	14	3 50	.....	2 50	1 00
304	T. H. McGregor	2	A	1	13	3 25	.....	2 75	0 50
305	J. O. McGregor	18	W	2	7	1 75	.....	.....	1 75
307	John Zurowski	12	N	2	39	9 75	.....	3 75	6 00
308	P. Yemens	14	D	2	65	16 25	.....	12 75	3 50
308	" (add. cheque)	14	D	2	43	10 75	.....	6 50	4 25
309	George Wortley	15	P	2	25	6 25	.....	.....	6 25
310	J. T. Wright	3	H	2	28	7 00	.....	5 25	1 75
311	H. J. DeWinton	19	E	3	4	1 00	.....	0 25	0 75
312	J. W. Wilcox	15	D	2	25	6 25	.....	4 00	2 25
313	Geo. Wilson	17	R	2	98	24 50	.....	1 50	23 00
316	A. Westman	3	E	2	11	2 75	.....	2 75	.....
318	Thos. Waterfield	13	B	2	91	22 75	.....	20 75	2 00
319	Alex. Weinmeister	14	A	2	91	22 75	.....	15 75	7 00
343	A. Cowan	7	B	2	4	1 00	.....	1 00	.....

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STATEMENT No. 5.—STATEMENT of Fees paid to the Secretary Treasurers of the Local Improvement Districts, &c.—*Continued.*

No.	Name of Secretary Treasurer.	Local Improvement District.			Number of Applications.	Total Amount paid.	Chargeable to Alberta Government.	Chargeable to Saskatchewan Government.	Chargeable to Dominion Government.
						$ cts.	$ cts.	$ cts.	$ cts.
335	R. F. Blair	27	B	4	51	12 75		1 00	11 75
336	E. H. Malcolm	22	J	4	14	3 50	0 50		3 00
338	D. M. Northcott	16	F	2	13	3 25		0 25	3 00
341	Percy Alger	10	W	2	17	4 25		1 25	3 00
342	George A. Logan	10	T	2	21	5 25		2 75	2 50
343	F. W. Ferguson				47	11 75		10 50	1 25
352	John M. Belway	12	A	5	27	6 75	5 50		1 25
355	Martin Potter	19	B	5	16	4 00	2 50		1 50
356	A. E. Trussler	23	R	4	4	1 00	1 00		
357	H. G. Graham	22	H	3	7	1 75			1 75
357	" (add. cheque)	22	H	3	2	50			50
358	D. Sullivan	18	A	5	22	5 50	4 50		1 00
358	" (add. cheque)	18	A	5	22	5 50	3 50		2 00
359	Paul Brodessen	21	B	5	11	2 75	25		2 50
360	A. Sim	20	C	5	11	2 75			2 75
361	James Kinley	21	W	4	26	6 50	6 00		50
362	L. J. Rowe	19	J	4	6	1 50			1 50
363	George L. Rutherford	20	J	4	4	1 00			1 00
364	T. J. Davidson	19	A	5	61	16 00	13 25		2 75
364	" (add. cheque)	19	A	5	16	4 00	3 50		50
365	Archie Brown	21	H	4	6	1 50			1 50
366	Wm. Houston	17	B	5	10	2 50	1 25		1 25
369	M. L. Boyle	14	A	5	5	1 25	1 00		25
370	W. Caspell	9	W	4	15	3 75	2 25		1 50
371	G. B. Hunter	15	B	5	17	4 25	2 00		2 25
372	M. McLean	16	W	4	14	3 50	2 75		75
373	F. R. Pike	9	A	5	4	1 00	75		25
374	A. M. McNaughton	16	A	5	23	5 75	5 75		
375	John McAlpine	16	T	4	3	75			75
376	Colin Thompson	17	A	5	8	2 00	1 25		75
377	Walter B. Smith	16	B	5	16	4 00	3 25		75
378	Arthur Wheeler	15	T	4	7	1 75	75		1 00
381	G. H. M. Rumball	14	A	3	16	4 00		1 00	3 00
384	James T. Cooper	8	W	4	1	25			25
385	G. D. Fitzgerald	9	D	2	19	4 75		4 75	
386	J. C. Carritt	20	A	5	1	25	25		
387	Leeson Kidd	15	H	2	43	10 75		3 25	7 50
388	W. A. Day	4	T	4	1	25	25		
388	" (add. cheque)	4	T	4	2	50			50
389	Wm. Dakin	5	B	4	4	1 00	75		25
391	E. A. Hayes	10	Z	4	2	50	50		
392	C. H. Coyne	19	H	4	1	25			25
395	W. H. Johnson	21	P	4	3	75	75		
396	A. T. Carrland	21	P	4	2	50			50
397	H. McIntosh	5	T	4	2	50	25		25
398	John C. Ash	17	S	4	5	1 25			1 25
399	R. H. Burn	4	A	5	1	25	25		
400	M. P. Shantz	15	A	5	2	50	25		25
403	G. T. Dakes	18	T	4	3	75		75	
403	" (add. cheque)	18	T	4	3	75			75
404	H. Hill Wilson	10	W	4	3	75	75		
405	F. W. Woodward	22	M	3	10	2 50			2 50
406	A. Wilson	16	J	3	1	25			25
408	A. Lawrence	16	N	3	4	1 00			1 00
409	D. J. Haight	21	R	3	3	75			75
410	E. Hingley	21	D	3	14	3 50		1 75	1 75
411	J. F. Gamble	17	H	3	2	50			50
412	George Taylor, jr	22	S	2	16	4 00		1 00	3 00
413	Iver Nesham	23	R	2	7	1 75		0 75	1 00
414	Asa Lobb	22	P	2	9	2 25		1 50	0 75
417	J. S. Forsyth	22	R	2	4	1 00		1 00	
418	Dennis Duffy	24	A	3	1	0 25			0 25

STATEMENT No. 5.—STATEMENT of Fees paid to the Secretary Treasurers of the Local Improvement Districts, &c.—*Continued.*

Number.	Name of Secretary Treasurer.	Local Improvement Districts.	Number of Applications.	Total Amount paid.	Chargeable to Alberta Government.	Chargeable to Saskatchewan Government.	Chargeable to Dominion Government.
				$ cts.	$ cts.	$ cts.	$ cts.
420	R. B. Atkinson	24 R 2	2	0 50	.....	.....	0 50
421	H. E. Benjamin	7 T 4	5	1 25	0 50	.....	0 75
422	Edmund J. Riley	13 A 5	8	2 00	0 50	.....	1 50
423	T. H. Attewell	27 R 4	13	3 25	2 75	.....	0 50
423	" (add. cheque)	27 R 4	15	3 75	3 25	.....	0 50
424	F. R. Bowlby	22 M 4	15	3 75	2 00	.....	1 75
425	A. W. Fleming	23 P 4	36	9 00	8 25	.....	0 75
426	Wm. Garrison	30 T 4	8	2 00	1 25	.....	0 75
427	C. W. Ibsen	26 A 5	8	2 00	1 25	.....	0 75
428	J. C. Hennessy	25 J 4	3	0 75	0 25	.....	0 50
429	Thos. P. Hall	28 M 4	2	0 50	0 50	.....	.....
430	M. C. Hoffman	26 B 5	3	0 75	0 25	.....	0 50
431	John Kosure	29 N 4	10	2 50	2 25	.....	0 25
433	S. S. S. Stanswell	27 A 5	1	0 25	.....	.....	0 25
434	George Sutherland	26 T 4	6	1 50	1 50	.....	.....
435	W. A. Roseborough	25 D 4	17	4 25	0 25	.....	4 00
436	J. E. Williams	29 T 4	2	0 50	0 50	.....	.....
437	Geo. H. Whitson	26 D 4	5	1 25	.....	.....	1 25
438	L. Anderson	25 N 4	4	1 00	1 00	.....	.....
439	A. C. Bunney	23 A 5	4	1 00	0 25	.....	0 75
440	C. N. Brisbin	25 M 14	3	0 75	0 25	.....	0 50
441	J. E. Cunningham	28 J 4	3	0 75	.....	.....	0 75
442	J. L. Clarke	22 H 4	2	0 50	.....	.....	0 50
443	E. H. Wynn	27 J 4	5	1 25	.....	0 75	0 50
444	A. S. Shandro	29 M 1	24	6 00	3 75	.....	2 25
445	Wm. Thompson	25 P 4	2	0 50	0 50	.....	.....
446	J. G. Wilcher	22 R 4	26	6 50	5 75	.....	0 75
447	George Avery	6 A 2	2	0 50	.....	0 50	.....
448	Joseph Cope	8 B 2	27	6 75	.....	6 75	.....
450	J. J. Carson	9 A 2	5	1 25	.....	1 25	.....
451	D. Campbell	15 C 3	2	0 50	.....	0 50	.....
452	A. Graham	13 S 2	6	1 50	.....	0 75	0 75
453	M. Henderson	9 P 2	11	2 75	.....	2 75	.....
454	S. Caswell	18 E 2	3	0 75	.....	.....	0 75
454	" (add. cheque)	18 E 2	5	1 25	.....	0 50	0 75
455	E. C. Coupland	18 D 3	2	0 50	.....	0 50	.....
456	H. S. Keys	17 E 3	5	1 25	.....	0 75	0 50
457	J. C. Moore	8 P 2	10	2 50	.....	2 50	.....
457	" (add. cheque)	8 P 2	5	1 25	.....	1 25	.....
458	D. F. McMillan	7 A 2	4	1 00	.....	1 00	.....
459	A. H. McLean	8 N 2	3	0 75	.....	0 75	.....
460	W. J. Quinn	19 B 3	7	1 75	.....	0 25	1 50
461	F. E. Livingstone	17 E 3	24	6 00	.....	0 75	5 25
462	Jas. W. Smith	5 J 2	5	1 25	.....	0 75	0 50
463	J. D. Seney	17 D 3	11	2 75	.....	0 75	2 00
465	F. W. Taylor	19 A 3	4	1 00	.....	.....	1 00
467	M. A. Matheson	13 A 2	29	7 25	.....	4 50	2 75
468	R. Mitchell	17 C 2	91	22 75	.....	6 25	16 50
469	A. McLeod	13 A 2	34	8 50	.....	8 25	0 25
470	Thos. Moore	9 B 1	7	1 75	.....	1 50	0 25
472	J. G. Trover	16 B 2	97	24 25	.....	12 25	12 00
473	J. F. Odell	15 E 2	30	7 50	.....	3 75	3 75
475	W. E. Walter	17 H 2	10	2 50	.....	1 00	1 50
477	F. Whiteside	5 C 2	10	2 50	.....	1 75	0 75
478	J. H. Young	7 A 1	4	1 00	.....	0 75	0 25
479	William Staples	2 A 2	22	5 50	.....	5 50	.....
480	W. J. Maher	5 A 2	1	0 25	.....	0 25	.....
480	" (add cheque)	5 A 2	3	0 75	.....	0 75	.....
482	W. H. Hunter	4 D 2	108	27 00	.....	23 50	3 50
485	F. A. Hunter	4 H 2	5	1 25	.....	1 00	0 25
487	R. H. Stinson	3 I 2	15	3 75	.....	2 50	1 25
488	Alex. Wadell	4 J 2	5	1 25	.....	1 25	.....

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STATEMENT No. 5.—STATEMENT of Fees paid to the Secretary Treasurers of the Local Improvement Districts, &c.—*Continued.*

Number.	Name of Secretary Treasurer.	Local Improvement Districts.	Number of Applications.	Total Amount paid.	Chargeable to Alberta Government.	Chargeable to Saskatchewan Government.	Chargeable to Dominion Government.
				$ cts.	$ cts.	$ cts.	$ cts.
489	J. Lucas	4 M 2	3	0 75		0 75	
490	Jas. Smith	5 M 2	6	1 50		1 50	
491	A. H. Tuttle	5 R 2	9	2 25		0 50	1 75
493	Thos. H. Clay	6 S 2	13	3 25			3 25
496	W. H. Smith	9 T 2	9	2 25		2 25	
498	John Hodges	9 A 3	14	3 50		0 75	2 75
499	J. F. Sawatzsky	9 E 9	1	0 25		0 25	
500	C. H. Harvey	11 E 3	6	1 50			1 50
502	J. F. Heath	14 H 3	2	0 50			0 50
505	E. Androchowicz	21 Z 2	2	0 50		0 50	
506	F. M. Curtis	13 A 3	4	1 00		0 50	0 50
508	S. Cosooon	22 N 3	1	0 25			0 25
509	W. A. Wilson	4 E 2	2	0 50		0 50	
510	Wm. A. Pain	19 W 2	1	0 25			0 25
511	J. H. Flynn	18 T 2	52	13 00		0 75	12 25
513	John Leitch, Post Master, Canora		76	19 00		12 50	6 50
614	Frank Hamm	19 T 2	17	4 25		2 75	1 50
295	J. B. Lupton, (add cheque)	7 D 2	5	1 25		0 75	0 50
314	J. C. H. Willoughby	18 C 3	13	3 25		0 75	2 50
29	E. Covey, (add cheque postage and telegrams			3 02	3 02		
				2,952 02	378 27	1,292 25	1,281 50

8-9 EDWARD VII., A. 1909

STATEMENT No. 6.—Refunds on

Name.	—	WHEAT.								
		Bushels.	Grade		Rate.		Deduction		Net.	
					$	cts.	$	cts.	$	cts.
Western Canada Flour Mills Co		624 20	2	N.	1	08½	60	74	616	66
" "		1,046	3	N.	1	02½	117	11	955	04
" "		988 40	3	N.	1	03½	89	63	933	63
Ogilvie Flour Mills Co		430 50	2	N.	1	07	25	85	435	14
Western Canada Flour Mills Co		1,012 20	2	N.	1	11½	91	76	1,036	99
" "		1,016 30	1	N.	1	09	73	19	1,034	80
" "		1,118 10	2	N.	1	06	88	56	1,096	69
" "		2,030	3	N.	1	00½	225	67	1,814	48
" "		1,204 30	1	N.	1	09¾	94	60	1,227	34
Western Elevator Co		955 50	4	N.	0	88½	4	37	823	84
Norris Grain Co		1,037	1	N.	1	03½	1	03	1,072	27
Norris & Co		2,855 20	4	N.	0	88¼			2,519	83
British American Grain Co		991 40	1	N.	1	03¾	1	65	1,028	43
Winnipeg Elevator Co										
Lake of Woods Milling Co		966 40	3	N.	1	02⅝	60	65	931	39
Ogilvie Flour Mills Co										
Canadian Elevator Co		999	4	N.	0	92			919	08
R. D. Martin Co		1,133 20	4	N.	0	92	5	29	1,037	38
Western Canada Flour Mills Co	1 ct. per bush. correcting invoice Apr. 9.								6	39
Ogilvie Flour Mills Co	On account									
Zenith Grain Co		680	3	N.	1	07	2	95	724	65
"		370	3	N.	1	01¼			375	13
Richardson & Sons		627 10	1	N.	1	10¼			691	45
Norris & Co		724 50	4	N.	1	01⅝	3	14	731	65
Western Canada Flour Mills										
R. D. Martin & Co		940 40	2	N.	1	10¾			1,037	08
Griswold Milling Co										
Brackman-Ker Milling Co										
" "										
" "										
Canadian Elevator Co										
"										
"										
Jas. Carruthers & Co		3,686 20	4	N.	0	88½	3	78	2,727	62
International Elevator Co										
" "										
Winnipeg Elevator Co		2,699 10	1	N.	1	05			2,834	12
"		3,169 10	2	N.	1	02			3,232	55
Ogilvie Flour Mills Co										
" "										
International Elevator Co		6,278 10	3	N.	1	00			6,278	16
" "		311 10	3	N.	1	00¾			313	50
Anchor Elevator Co										
International Elevator Co		930	3	N.	0	95⅝			886	98
Winnipeg Elevator Co		919 50	2	N.	1	02			938	23
Jas. Richardson & Sons		996	1	11	1	01¼	0	66	1,007	79
Winnipeg Elevator Co		2,102 40	1	N.	1	05	0	97	2,206	83
"		2,797 40	2	N.	1	02			2,853	62
Ogilvie Flour Mills Co										
Brackman-Ker Milling Co										
Wilton Bros										
W. Carson										
"										
"										
"										
Anchor Elevator Co										
Carried forward										

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Account of Sales of Grain.

Oats.					Barley.					Amount
Bushels.	Grade	Rate.	Deduction.	Net.	Bush.	Grade	Rate.	Deduction.	Net.	
		$ cts.	$ cts.	$ cts.			$ cts.	$ cts.	$ cts.	$ cts.
1,785·20	2 W.	0 39	.....	696 37						
1,800·	2 W.	0 42	.....	756 00						
.....	2 W P.E.I	.....	.....	7,000 00						
3,006	2 W.	0 42½	.....	1,277 55						
35	Eng.	0 58	.....	20 30						
22,368	1 W.	0 42½	.....	9,506 40						
26,952	2 W.	0 41½	.....	11,185 10						
1,927	2 W.	0 38½	38 55	703 34						
7,139·14	1 W.	0 38	38 87	2,674 10						
4,201·06	1 W.	0 38	14 00	1,582 44						
10,107·02	2 W.	0 42½	8 29	4,287 22						
5,059·04	1 W.	0 42½	5 07	2,145 05						
15,386·26	2 W.	0 42½	34 41	6,504 96						
14,305·30	Eng.	0 42	.....	6,008 47						
2,157·12	Eng.	0 42	.....	906 09						
1,176·	Mix.	0 48	.....	564 48						
8,943·18	Eng.	0 42	.....	3,756 28						
1,899	1 W.	0 56	.....	1,063 44						
36,923·18	Eng.	0 43	.....	15,877 10						
2,076·16	Mix.	0 50	.....	1,038 23						
3,828	Mix.	0 39¾	.....	1,521 63						
1,594·04	Mix.	0 36¾	.....	585 84						
1,872	Mix.	0 29¾	.....	744 12						
7,365	Mix.	0 39	.....	2,871 55						
343·	Mix.	0 70	.....	240 10						
.....	.....	.....	.....	.....						.....

Sales of

Name.		Wheat				
		Bushels.	Grade	Rate.	Deduction	Net.
				$ cts.	$ cts.	$ cts.
Brought forward						
C. C. Castle						
E. Clarkson						
Ogilvie Flour Mills Co.	$7,000.00 already paid on this sale, leaving a balance of $1,109.81.					
" "	" "					
" "	" "					
Alberta Grain Co		1,516	N. 1	1 08		1,637 28
" "		1,802	N. 2	1 05		1,892 10
" "		10,064	3 N.	0 99½		9,996 91
" "		2,132	3 N.	0 99½		2,117 99
" "		1,280	4 N.	0 92⅔		1,181 87
J. Bruce Walker						
" "		10	3 N.	1 07		10 70
" "						
" "		10	3 N.	1 07	7 91	44 61
Geo. Hill						
Hon. David Laird	Shipped to J. O. Lewis					
J. Richardson & Sons						
Petty sales—C. C. Castle		6 30	1 N.	1 18		7 09
" "		28 45	2 N.	1 15		32 20
" "		841	3 N.	1 07		899 87
" "		55	3 N.	1 06		58 30
" "		150	4 N.	1 01		151 50
" "		1	Mix.	1 07		1 07
" R. E. A. Leach		4,580	1 N.			4,589 20
" "		5,046	2 N.			4,790 61
" "		17,636⅝	3 N.		0 44	16,740 66
" "		7,234½	4 N.			6,375 14
" "						
" "						
" "						
" "						
" "						
Sold by J. W. Martin	Credit Alberta Govt					
" "	" "					
" "	" "					
Lang Bros.	R. E. A. Leech sales acct					
Western Canada Flour Mills	" "					
Ogilvie Flour Mills Co.	" "					
" "	" "					
Carnifae Stock Food Co.	" "					
J. Elawse	" "					
Sold by J. W. Martin	" "					
" G. Hill to D. W. Campbell	" "					
" " "	" "					
Brackman-Ker Milling Co.	" "					
J. Richardson & Son	" "					
Manitoba Commission Co.	" "					
J. Richardson & Son	" "					
Manitoba Commission Co.	" "	77	2 N.	0 97½	0 49	74 59
Sold by J. W. Martin	" "					
" "	" "					
" Geo. Hill						
Ogilvie Flour Mills Co.						
" "						
" "						
Carried forward						

* This is difference between 250 bushels No. 3 wheat at $1.07 and 240 bushels No. 3 wheat retailed at 95c. per bushel.

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Grain—***Continued.***

Oats.					Barley.					Amount.
Bushels.	Grade	Rate.	Deductions.	Net.	Bush.	Grade	Rate.	Deductions.	Net.	
		$ cts.	$ cts.	$ cts.			$ cts.	$ cts.	$ cts.	$ cts.
23·18	R. A.	1 30		30 60						
76	Eng.	0 40		30 40						
10,303	P.E.I	0 42								
6,600·18	P.E.I	0 45								
1,397	P.E.I	0 45								
414·26	2 W.	0 45	3 00	1,109 81						
500	Eng.	0 85		425 00						
					50		1 13		56 50	
45	Mix.	0 40		18 00						
112	Eng.	0 85		95 20						
2,885·30	2 W.	0 21½	26 92	1,170 72						147,662 59
498	2 W.	0 70		348 60	36	No. 2	1 13		40 70	
702	2 W.	0 75		526 50						
60	Eng.	0 88		52 80						
12,222·32	Eng.	0 85		10,388 65						
190·9	Mix	0 85	5 95	155 30						
9	2 W.	0 70		6 30	4		1 13		4 52	12,673 40
45	1 Spl.			38 70	627	No. 2			708 51	
75	2 Spl.			63 75	139	No. 3			157 07	
324	1 W.			230 04	108	Ont.		22 22	99 82	
3,886½	2 W.			2,634 67						
140	3 W.			93 80						
150	B. C.			129 00						
10,728·3	Eng.		3,402 20	5,378 99						
70	Ont.			60 20						
1,577½	P.E.I			1,319 91						43,410
301	G.	1 30	0 50	390 80						
1,983	Mix.	0 36½		723 80						
1,200	"	0 40		516 00						
1,500	"	0 36½		545 71						2,176 31
1,092 17	Eng.	0 43	14 93	454 85						
					80		1 00		80 00	
2,770·30	Mix.	0 42		1,163 77						
3,801·06	"	0 35		1,330 41						
1,569·06	"	0 43		674 75						
					150		0 60		90 00	
3,847	Mix.	0 40	2 15	1,536 65	1,216		0 50		608 00	
2,165	"	0 45	5 25	969 00						
101	"	0 45	0 10	45 35						
					382		0 48		183 36	
386·16	W. 2	0 41½	2 70	157 69						
1,966·16	2 W.	0 38½	244 94	512 15						
3,496·16	Mix.	0 41½	371 80	1,079 24						
1,015·26	2 W.	0 33½	158 58	181 69						
1,974·24	P.E.I	86 p.ton	0 20	201 22						
2,514	Mix.	0 40		1,005 60						
1,098	"	0 36½	1 41	399 36						
70·10	Dam.	0 25		17 57						
2,011	Eng.	0 42		844 62						
823·18	"	0 42		345 88						
4,569·40	"	0 42		1,919 04						

SALES OF

NAME.		Wheat.				
		Bushels.	Grade.	Rate.	Deductions.	Net.
				$ cts.	$ cts.	$ cts.
Manitoba Commission Co	R. E. A. Leech, sales account					
Ogilvie Flour Mills Co.	" "					
" "	" "					
Canadian Malting Co.	" "					
Manitoba Commission Co.	" "					
P. Broadfoot	Dockage on cars					84 30
Young Grain Co.	Corrected invoice					110 00
Canadian Pacific Ry. Co.	Shortage, No. 3 wheat				1 30	20 93
Wilton Bros.	Office samples					
Overpayment, car No. 42684	1 p.c. dockage not deducted					11 08
J. P. Graves	Claim account					
Canadian Pacific Ry. Co.	Shortage, oats shipped from Picton					
Northern Elevator Co.	Refund freight charges 2 w. oats, March, '08.					
Saskatchewan Elevator Co	Account option					135 00
International "						1,150 00
Imperial Elev'r and Lumber Co.						62 50
Western Elevator Co						1,456 25
Northern "						750 00
Winnipeg "					20 00	5 00
Northern "						1,518 75
Parrish & Lindsay						388 12
North Star Grain Co.						743 75
Imperial Elev'r and Lumber Co.						506 25
Canadian Elevator Co.						181 25
" "						287 50
" "						925 00
LESS—Cheque to Winnipeg Elevator Co. to balance purchase and sale July wheat	$ 904 10					
J. Nesham, account sales	3 40					
Storage	127 91					
Switching	10 00					
Freight and handling	260 59					
Commission on sales	22 88	97,493 15			981 74	103,266 11

SESSIONAL PAPER No. 25c

GRAIN—*Concluded.*

Oats.					Barley.					
Bushels.	Grade	Rate.	Deductions.	Net.	Bushels.	Grade	Rate.	Deductions.	Net.	Amount.
		$ cts.	$ cts.	$ cts.			$ cts.	$ cts.	$ cts.	$ cts.
6,879 24	2 w..	0 40	45 63	2,706 25						
8,864 24	Eng .	0 42		3,723 17						
1,657 12	" ..	0 42		696 09						
					1,885		0 50		942 50	
1,952 2	Mix..	0 39	201 39	560 03						
				2 00						
			4 37	250 79						
				780 19						
				124 04						1,383 33
294,988 15			4,593 60	131,680 84	4,577			22 22	2,970 98	237,917 93
										1,328 88
										236,589 05

Name.			Wheat. Bushels.	Grade.	Rate.	Deductions.	Net.
					$ cts.	$ cts.	$ cts.
Manitoba Commission Co.	Screenings		5,743		0 31 1/2		1,783 20
" " "	"		3,280		0 26 1/2		854 44
" " "	"		2,158		0 31 1/2		670 06
International Elevator Co.	"		2,805		0 30		841 50
" "	"						
Northern Elevator Co.	"						
Anchor Elevator Co	"						
Manitoba Commission Co	"						
Donald McLean	"		875		0 26 3/8		230 50
Herriott & Milne	"	(slump offer)	757 83/60				325 00
Sold by McTavish, authority R. E. A. Leach	"	(light and chaffy)					
Brackman, Kerr Milling Co.	"						
" " "	"						
Alberta Grain Co	"		65 58		*5 00		9 89
Northern Elevator Co.	"						
" "	"						
Anchor Elevator Co.	"						
" "	"						
Western Canada Flour Mills Co	"						
Anchor Elevator Co	"						
Brackman, Kerr Milling Co.	"						
Western Milling Co.	"		177 53		*5 00		26 68
Calgary Milling Co.	"		87 57		*5 00		13 19
Western Milling Co	"						
Northern Elevator Co.	"						
Canada Malting Co.	"						
			15,950 20/60				4,754 46

* Per ton.

SESSIONAL PAPER No. 25c

Screenings.

Oats.					Barley.					Amount.
Bushels.	Grade	Rate.	Deductions.	Net.	Bush.	Grade	Rate.	Deductions.	Net.	
		$ cts.	$ cts.	$ cts.			$ cts.	$ cts.	$ cts.	$ cts.
911 3/4		*14 75		228 50						
16,000		0 31		4,960 00						
8,500		0 28		2,380 00						
1,163		0 22½		261 68						
534·33			15	39 85						
1,117		*5 00		94 94						
					171 27		0 36		61 76	
116·13		*5 00		9 89						
3,947·02		0 31		1,223 57						
920·09		0 40		368 10						
651·15		0 40		260 53						
162·06		0 28		45 41						
2,819·32		0 05		141 00						
2,580·20		0 28		722 57						
1,845·4		*3 00		94 05						
555·3		*5 00		47 19						
516·9		*5 00		43 82						
					488 49		0 40	7 87	187 68	
					1323 41		*14 50		460 70	
42,340·18				10,921 10	1984 14				710 14	16,385 70

*Per ton.

Sales of Surplus Sacks and Miscellaneous Refunds.

Name.	Sacks.			
	Quantity.	Rate.	Deduction.	Net Amount.
		$ cts.	$ cts.	$ cts.
Western Can. Flour Mills	1,002	per M. 78 00		78 15
A. McNab	182	0 09		16 38
McEwan, Douglas & West	50	0 14		7 00
Alberta Grain Co.	12,174	0 10		1,217 40
Brackman, Kerr Milling Co.	3,820	0 08		305 60
International Elevator Co	2,859	0 06½		185 84
Western Can. Flour Mills	6	0 10		60
Alberta Pacific Elevator Co	1,000	per M. 68 00		68 00
" "	646	0 11⅜		73 48
Erb & Anderson	5,000	per M. 68 60		343 00
Western Milling Co.	2,000	0 07	0 50	139 50
" "	2,160	0 07		151 20
Erb & Anderson	660	0 09		59 40
Brackman, Kerr	447	0 09		40 23
W. R. Brock	280	0 07		19 60
M. J. Bastard	6,500	0 06½	0 50	422 00
Simpson Bros.	500	0 10		50 00
Anchor Elevator Co.	1,000	0 09		90 00
" "	6,000	0 03½		210 00
" "	8,000	0 06		480 00
" "	2,400	0 03		72 00
" "	9,000	0 06		540 00
" "	18,280	0 03½		639 80
" "	3,635	0 01	15 00	21 35
Sundry Bags	350	0 05		17 50
W. Stead	20	0 09		1 80
F. F. Burney	20	0 05		1 00
J. Richardson & Sons	506	0 07		35 42
Anchor Elevator Co.	8,000	0 06		480 00
" "	4,500	0 04	97 20	1,702 80
" "	120 lbs. twine	0 20		24 00
" "	2,500	0 06		150 00
" "	19,500	0 05		975 00
" "	14,500	0 06		870 00
" "	130,500	0 06		7,830 00
" "	907	0 00		20 00
	268,904 120 lbs. twine.			17,333 05

SESSIONAL PAPER No. 25c

Miscellaneous Refunds.

Name.	—	Sundries.	Insurance.	Freight.	Administration.	
					Deduction.	Net.
		$ cts.	$ cts.	$ cts.	$ cts.	$ cts.
Geo. D. Pope	Acct. travelling expenses					115 00
E. F. Craig	E. Boyer, acct. travelling expenses	2 49				
Miss B. Steadman	Salary cheque—unused					47 58
R. E. A. Leech	Acct. contingencies					2,720 19
D. J. McCarthy	Salary cheque—unused					61 75
City of Regina	Cheque not used					10 55
Regina Seed Grain Office	Unexpended balance					166 28
W. C. Cowell	Acct. travelling expenses					3 50
G. E. Wilson	" "					7 75
W. E. Gladstone	Acct. duplicate payment					20 80
Adam Link	" travelling expenses					25 30
R. E. A. Leech	Amt. advanced to pay Sec. Treas. fees					4,000 00
Saskatchewan Govt	Furniture purchase, Seed Grain office, Regina					445 04
C. H. Beddoe	Acct. travelling expenses					15 80
J. A. McTavish	Duplicate payment					68 40
Post Office, Winnipeg	Rebate post office key					1 00
A. H. Pulford	Office furniture, Winnipeg				4 10	36 25
A. D. Chisholm	Freight rebate			45 90		
C. C. Castle	Freight overpaid car No. 14024			4 10		
C. P. Ry. Co.	" " " 42366			30 20		
"	Rebate car No. 15732 Moosejaw to Pense			9 05		
Allan, Lang & Killam.	Rebate insurance premium		182 62			
Ryan Agency Ltd.	" "		1,801 82			
Allan, Lang & Killam.	" "		232 59			
Ryan Agency Ltd.	" "		373 69			
"	" "		49 14			
Allan, Lang & Killam.	" "		420 54			
Ryan Agency Ltd.	" "		33 12			
"	" "		101 95			
Cheque issued James Richardson & Sons		2 49	3,195 47	89 25	4 10	7,745 19
	Less acct. freight			9 40		
		2 49	3,195 47	79 85	4 10	7,745 19

No. 7.—Statement of Liens executed in favour of the Minister of the Interior, Ottawa, Province of Alberta, by Land Agencies, in connection with Seed Grain advanced in 1908.

WHEAT.

Agency.		No. 1 Northern.	Value.	No. 2 Northern.	Value.	No. 3 Northern.	Value.	No. 4.	Value.	Total.	Total Value.
		Bush.	$ cts.	Bush.	$ cts.	Bush.	$ cts.	Bush.	$ cts.	Bush.	$ cts.
Calgary	Liens.	285	336 30	225	258 75	346	370 22	.....	.....	856	965 27
Edmonton	"	2,687	3,170 66	430	491 50	6,122	6,871 54	1,048	1,058 48	10,587	11,595 18
Lethbridge	"	1,059	1,249 62	378	434 70	.....	.....	.....	.....	1,437	1,684 32
Red Deer	"	20	23 60	234	269 10	684	731 88	.....	.....	938	1,024 58
Total		4,051	4,780 18	1,267	1,457 05	7,452	7,973 64	1,048	1,058 48	13,818	15,269 35

OATS.

Agency.		No. 1 Western White.	Value.	No. 2 Western White.	Value.	No. 3 Western White.	Value.	Western White, Special.	Value.	English.	Value.	Ontario.	Value.	P. E. Island.	Value.	Total.	Total Value.
		Bush.	$ cts.	Bush.	$ cts.	Bush.	$ cts.	Bush.	$ cts.	Bush.	$ cts.	Bush.	$ cts.	Bush.	$ cts.	Bush.	$ cts.
Calgary	Liens.	303	215 13	6,892	4,824 40	.....	.....	.....	.....	3,207	2,725 95	605	514 25	1,584	1,346 40	12,591	9,626 13
Edmonton	"	794	563 74	6,200	4,340 00	5,021	3,364 07	7,014	5,964 39	20,879	17,747 15	.....	.....	1,361	1,156 85	41,269	33,136 20
Lethbridge	"	66	46 86	2,747	1,922 90	.....	.....	.....	.....	815	692 75	.....	.....	.....	.....	3,628	2,662 51
Red Deer	"	.....	.....	5,381	3,766 70	39	26 13	.....	.....	398	330 65	478	406 30	2,383	2,025 55	8,670	6,555 33
Total		1,163	825 73	21,220	14,854 00	5,060	3,390 20	7,014	5,964 39	25,290	21,496 50	1,083	920 55	5,328	4,528 80	66,158	51,980 17

BARLEY.

Agency.		No. 2.	Value.	No. 3 Extra.	Value.	No. 3.	Value.	Total.	Total Value.
		Bush.	$ cts.	Bush.	$ cts.	Bush.	$ cts.	Bush.	$ cts.
Calgary	Liens	718	811 34	38	42 94			756	854 28
Edmonton	"	4,921	5,560 73	30	33 90			4,951	5,594 63
Lethbridge									
Red Deer	"	1,147	1,296 11	102	115 26			1,249	1,411 37
Totals		6,786	7,668 18	170	192 10			6,956	7,860 28

ALBERTA LIENS—SUMMARY.

	Bushels.	Value.
Wheat	13,818	$15,269 35
Oats	66,158	51,980 17
Barley	6,956	7,860 28
	86,932	$75,109 80

STATEMENT of Mortgages executed in favour of the Deputy Minister of Agriculture, Province of Alberta, by Land Agencies, in connection with Seed Grain advanced in 1908.

WHEAT.

Agency.		No. 1. Northern.	Value.	No. 2. Northern.	Value.	No. 3. Northern.	Value.	No. 4.	Value.	Total.	Total Value.
		Bush.	$ cts.	Bush	$ cts.	Bush.	$ cts.	Bush.	$ cts.	Bush.	$ cts.
Calgary	Mortgages	228	269 04	260	299 00	533	570 31			1,021	1,138 35
Edmonton	"	1,919	2,264 42	1,923	2,211 45	3,637	3,891 59	255	257 55	7,734	8,625 01
Lethbridge	"	460	542 80	500	575 00					960	1,117 80
Red Deer	"	10	11 80	1,011	1,162 65	805	861 35			1,826	2,035 80
Totals		2,617	3,088 06	3,694	4,248 10	4,975	5,323 25	255	257 55	11,541	12,916 96

OATS.

Agency.		No. 1 Western White.	Value.	No. 2 Western White.	Value.	No. 3 Western White.	Value.	Western White Special.	Value.	English.	Value.	Ontario.	Value.	P. E. Island.	Value.	Total.	Total Value.
		Bush.	$ cts.	Bush.	$ cts.	Bush.	Value.	Bush.	$ cts.	Bush.	$ cts.	Bush.	$ cts.	Bush.	$ cts.	Bush.	$ cts.
Calgary Mortgages		306	217 26	12,621	8,834 70			198	170 28	6,490½	5,516 94	450	382 50	2,850	2,422 50	22,915½	17,544 18
Edmonton	"	1,785	1,267 35	12,978	9,107 10	4,847	3,247 49	17,762	15,174 52	33,024$\frac{11}{11}$	28,070 68					70,396$\frac{11}{11}$	56,867 14
Lethbridge	"	60	42 60	999	699 30					290	246 50					1,349	988 40
Red Deer	"	...		15,203	10,642 10	1,381	925 27	222	188 70	1,685½	1,432 68	1,378	1,171 30	960	816 00	20,829½	15,176 05
		2,151	1,527 21	41,801	29,283 20	6,228	4,172 76	18,182	15,533 50	41,490$\frac{11}{11}$	35,266 80	1,828	1,553 80	3,810	3,238 50	115 490$\frac{11}{11}$	90,575 77

BARLEY.

Agency.	No. 2.	Value.	No. 3 Extra.	Value.	No. 3.	Value.	Total.	Total Value.
	Bush.	$ cts.	Bush.	$ cts.	Bush.	$ cts.	Bush.	$ cts.
Calgary Mortgages	1,571	1,775 23	288	325 44			1,859	2,100 67
Edmonton "	7,969	9,004 97	336	379 68			8,305	9,384 65
Lethbridge "								
Red Deer "	3,410	3,853 30	420	474 60			3,830	1,327 90
Tot	12,950	14,633 50	1,044	1,179 72			13,994	15,813 22

ALBERTA MORTGAGES

Summary.

	Bushels.	Value.
Wheat	11,541	$12,916 96
Oats	115,490¼	90,575 77
Barley	13,994	15,813 22
	141,025¼	119,305 95

STATEMENT of Liens executed in favour of the Minister of the Interior, Ottawa. Province of Saskatchewan, by Land Agencies, in connection with the Seed Grain advanced in 1908.

WHEAT.

Agency.		No. 1 Northern.	Value.	No. 2 Northern.	Value.	No. 3 Northern.	Value.	No. 4.	Value.	Total.	Total Value.
		Bush.	$ cts.	Bush.	$ cts.	Bush.	$ cts.	Bush.	$ cts.	Bush.	$ cts.
Battleford	Liens.	1,197	1,412 46	2,978	3,42 70	7089	7,585 23	2,182	2,203 82	13,446	14,626 21
Brandon	"	715	843 70	475	546 25	1,922	2,056 54	450	454 50	3,562	3,900 99
Estevan	"	1,155	1,362 90	1,536	1,766 40	8,285	8,864 95	1,695	1,711 95	12,671	13,706 20
Humboldt	"	6,426	7,582 68	4,685	5,387 75	19,710	21,089 70	2,978	3,007 78	33,799	37,067 91
Moosejaw	"	2,739	3,232 02	4,072	4,682 80	10,888	11,650 41	2,124	2,145 24	19,823	21,710 47
Prince Albert	"	438	516 84	240	276 00	2,332	2,495 24	205	207 05	3,215	3,495 13
Regina	"	5,564	6,565 52	4,798	5,517 70	18,320	19,602 40	7,880	7,958 80	36,562	39,644 42
Yorkton	"	3,139	3,704 02	4,309	4,955 35	7,327	7,839 89	1,764	1,781 64	16,539	18,280 90
		21,373	25,220 14	23,093	26,556 95	75,873	81,184 36	19,278	19,470 78	139,617	152,432 23

OATS.

Agency.		No. 1 Western White.	Value.	No. 2 Western White.	Value.	No. 3 Western White.	Value.	Western White Special.	Value.	English.	Value.	Ontario.	Value.	P.E.I.	Value.	Total	Total.
		Bush.	$ cts.	Bush.	$ cts	Bush.	$ cts.	Bush.	$ cts.	Bush.	$ cts.	Bush.	$ cts.	Bush.	$ cts.	Bush.	$ cts.
Battleford	Liens.			8,347	5,842 90					10,908	9,271 80			896	761 60	20,151	15,876 30
Brandon	"			886	620 20					1,242	1,055 70			1,295	1,100 75	3,423	2,776 65
Estevan	"			4,194	2,935 80					1,861	1,581 85	840	714 00	1,669	1,418 65	8,564	6,650 30
Humboldt	"	761	540 31	13,224	9,256 80			50	42 50	25,972	22,076 20	2,631	2,236 35	2,510	2,133 50	45,148	36,285 66
Moose Jaw	"			14,590	10,213 00	200	134 00			8,643 13/34	7,347 00			7,147½	6,075 39	30,581 1/34	23,769 39
Prince Albert	"			250	175 00					6,403	5,442 55			538	457 30	7,191	6,074 85
Regina	"	1,204	854 84	8,057	5,639 90	856	573 52			11,397 3/34	9,687 56	1,239	1,053 15	4,443	3,776 55	27,196 4/34	21,585 52
Yorkton	"	515	365 65	14,710	10,297 00			65	55 25	44,052½	37,444 62	2,525	2,146 25	2,622	2,228 70	64,489	52,537 47
Totals		2,480	1,760 80	64,258	44,980 60	1,056	707 52	115	97 75	110,479 5/34	93,907 28	7,235	6,149 75	21,120½	17,952 44	206,743 17/34	165,556 14

BARLEY.

Agency.	No. 2.	Value.	No. 3 Extra.	Value.	No. 3.	Value.	Total.	Total amount.
	Bush.	$ cts.	Bush.	$ cts.	Bush.	$ cts.	Bush.	$ cts.
Battleford ..... Lieus	1,296	1,464 48					1,296	1,464 84
Brandon ..... "	25	28 25	20	22 60			45	50 85
Estevan ..... "	90	101 70	192	216 96			282	318 66
Humboldt ..... "	2,157	2,437 41					2,157	2,437 41
Moosejaw ..... "	145	163 85	567	640 71	320	361 60	1,032	1,166 16
Prince Albert ..... "								
Regina ..... "	495	559 35	123	138 99			618	698 34
Yorkton ..... "	2,113	2,387 69					2,113	2,387 69
Totals	6,321	7,142 73	902	1,019 26	320	361 60	7,543	8,523 59

SASKATCHEWAN LIENS—SUMMARY.

	Bushels.	Value.
Wheat	139,617	$152,432 23
Oats	206,743 22/24	165,556 14
Barley	7,543	8,523 59
	353,903 22/24	326,511 96

STATEMENT of Mortgages executed in favour of the Commissioner of Agriculture Province of Saskatchewan, by Land Agencies, in connection with Seed Grain, advanced in 1908.

WHEAT.

Agency.		No. 1 Northern.	Value.	No. 2 Northern.	Value.	No. 3 Northern.	Value.	No. 4.	Value.	Total.	Total Value.
		Bush.	$ cts.	Bush.	$ cts.	Bush.	$ cts.	Bush.	$ cts.	Bush.	$ cts.
Battleford	Mortgages.	325	383 50	315	362 25	1,747	1,869 29	1,598	1,613 98	3,985	4,229 02
Brandon	"	4,920	5,805 60	3,815	4,387 25	16,869	18,049 83	5,870	5,928 70	31,474	31,171 38
Estevan	"	15,120	17,854 70	13,787	15,855 05	49,350	52,804 50	20,037	20,237 37	98,294	106,748 62
Humboldt	"	1,647	1,943 46	1,720	1,978 00	5,879	6,290 53	520	525 20	9,766	10,737 19
Moose Jaw	"	1,450	1,711 00	1,055	1,213 25	3,414	3,652 98	1,208	1,220 08	7,127	7,797 31
Prince Albert	"	1,698	2,003 64	338	388 70	2,339	2,502 73	125	126 25	4,500	5,021 32
Regina	"	10,944	12,913 92	14,974	17,220 10	53,062	56,776 34	19,624	19,820 24	98,604	106,730 60
Yorkton	"	4,681	5,523 58	12,304	14,149 60	17,682	18,919 74	9,693	9,789 93	44,360	48,382 85
		40,785	48,136 40	48,308	55,554 20	150,342	160,865 94	58,675	59,261 75	298,110	323,818 29

OATS.

Agency.		No. 1 Western White.	Value.	No. 2 Western White.	Value.	English.	Value.	Ontario.	Value.	P. E. I.	Value.	Total.	Total Value.
		Bush.	$ cts.	Bush.	$ cts.	Bush.	$ cts.	Bush.	$ cts.	Bush.	$ cts.	Bush.	$ cts.
Battleford	Mortgages.			1,427	998 90	3,669	3,118 65			115	97 75	5,211	4,215 30
Brandon	"			10,601	7,420 70	3,487	2,963 95			5,737	4,876 45	19,825	15,261 10
Estevan	"	330	234 30	20,800	14,560 00	8,646	7,349 10	1,746	1,484 10	5,692	4,838 20	37,214	28,465 70
Humboldt	"			3,863	2,704 10	6,493	5,519 05	1,346	1,144 10	811	689 35	12,513	10,056 60
Moose Jaw	"			2,097	1,467 90	1,792	1,523 20			1,883	1,600 55	5,772	4,591 60
Prince Albert	"			1,540	1,078 00	5,158	4,384 30			455	386 75	7,153	5,849 00
Regina	"	245	173 95	21,580	15,106 00	14,934¾	12,694 12	5,671	4,820 35	13,314	11,316 90	55,744¾	44,111 30
Yorkton	"	760	539 60	64,653	45,257 10	72,226	61,392 10	3,010	2,558 50	4,646	3,949 10	145,295	113,696 40
		1,335	947 85	126,561	88,592 70	116,405¾	98,944 47	11,773	10,007 05	32,653	27,755 05	288,727¾	226,247 12

BARLEY.

Agency.		No. 2.	Value.	No. 3 Extra.	Value.	No. 3.	Value.	Total	Total Amount.
		Bush.	$ cts.	Bush.	$ cts.	Bush.	$ cts.	Bush.	$ cts.
Battleford	Mortgages.	630	711 90					630	711 90
Brandon	"	924	1,044 12	335	378 55	40	45 20	1,299	1,467 87
Estevan	"	1,066	1,204 58	362	409 06			1,428	1,613 64
Humboldt	"	777	878 01					777	878 01
Moosejaw	"	100	113 00	128	144 64			228	257 64
Prince Albert	"								
Regina	"	2,072	2,341 36	2,481	2,803 53			4,553	5,144 89
Yorktown	"	5,203	5,870 39					5,203	5,879 39
Total		10,772	12,172 36	3,306	3,735 78	40	45 20	14,118	15,953 34

SASKATCHEWAN MORTGAGES—SUMMARY.

	Bushels.	Value.
Wheat	298,110	$ 323,818 29
Oats	288,727 3/4	226,247 12
Barley	14,118	15,953 34
	600,955 3/4	$ 566,018 75

STATEMENT No. 8.—Statement showing cost of distribution of Seed Grain, 1908, chargeable to the Dominion Government and the Provinces of Alberta and Saskatchewan.

Particulars.	Amount.	Total.
	$ cts.	$ cts.
Province of Alberta—Mortgages—		
Wheat	12,916 96	
Oats	90,575 77	
Barley	15,813 22	
	119,305 95	
Share of cost	31,230 08	
Fees paid to Secretary Treasurers	378 27	
		150,914 30
Province of Saskatchewan—Mortgages—		
Wheat	323,818 29	
Oats	226,247 12	
Barley	15,953 34	
	566,018 75	
Share of cost	147,633 09	
Fees paid to Secretary Treasurers	1,292 25	
		714,944 09
Dominion Government—Alberta Liens—		
Wheat	15,269 35	
Oats	51,980 17	
Barley	7,860 28	
	75,109 80	
Saskatchewan Lines—		
Wheat	152,432 23	
Oats	165,556 14	
Barley	8,523 59	
	326,511 96	
Share of cost	105,046 62	
Fees paid to Secretary Treasurers	1,281 50	
		507,949 88
Net expenditure		1,373,808 27
Refunds		281,335 80
Gross expenditure		1,655,144 07
Share of Cost—		
Alberta	31,230 08	
Saskatchewan	147,633 09	
Dominion	105,046 62	
	283,909 79	

STATEMENT No. 9.—STATEMENT showing Grain and Sacks Purchased, Distributed and Sold in connection with the Seed Account of 1908.

Gain and Sacks	Purchases.		Distribution.		Sales Including Screenings.		Shrinkage.
	Bushels.	Amount.	Bushels.	Amount.	Bushels.	Amount.	Bushels.
		$ cts.		$ cts.		$ cts.	
Wheat	577,364 28	547,550 79	463,086	504,436 83	113,443 41	108,020 57	834 47
Oats	1,024,861 04	671,169 18	677,119	534,359 20	339,493 21	141,273 06	8,248 17
Barley	50,807 34	16,302 63	42,611	48,150 43	6,561 14	3,681 12	1,635 20
		1,285,022 60		1,086,946 46		252,974 75	

Memo:

Purecased by Alberta Government—
1,000 Bushels Garton Regenerated Abundance Oats ..... $ 1,291 03
Cr. Cash on account 391 30
Balance due ..... $ 930 73

Purchased by Saskatchewan Government—
1442·04 Bushels Garton Regenerated Abundance Oats ..... $ 1,889 55

STATEMENT No. 10.—STATEMENT of Freight Paid in connection with Seed Grain Distribution, of 1908.

	Canadian Pacific.	Canadian Northern.	Total.
	$ cts.	$ cts.	$ cts.
General Freight	65,028 89	27,690 15	
Freight on English Oats	40,243 36		
Fright on Oats from Ontario	472 94		
Freight on Garton Oats	345 83		
	106,091 02	27,690 15	
Less refund Canadian Racific Railway	79 85		
	106,011 17	27,690 15	133,701 32

STATEMENT No. 11.—STATEMENT of Expenditure for Handling, Sacking and Cleaning Grain in connection with Seed Grain Distribution of 1908.

Particulars.	Amount.
	$ cts
Alberta Grain Co	224 75
Anchor Elevator Co.	8,879 81
C. E. Barnhart	25 00
Brackman-Ker Milling Co	2,806 65
Calgary Milling Co	1,337 99
Canada Malting Co	771 58
Canadian Pacific Railway Co.	2,205 41
George Hill	16 25
International Elevator Co.	3,724 22
A. E. McKenzie & Co.	2,108 95
D. McLean	384 39
C. Nairn	444 37
Northern Elevator Co	16,753 44
Ogilvie Flour Mills Co	2,091 32
Ernest Parker	6 63
Western Canada Flour Mills Co	3,948 72
Winnipeg Elevator Co	979 41
Western Milling Co	1,010 59
Grand Total	47,719 48

SESSIONAL PAPER No. 25c

No. 12.—STATEMENT of Duty paid in Connection with Seed Grain Distibution of 1908.

	Duty on Eng. Oats.	Duty on Barley.	Duty on Sacks.	Customs Brokerage.	Commission.	Grand total.
	$ c.	$ c.	$ c.	$ c.	$ c.	$ c.
Per S.S. Empress of Ireland (1st)	2,552 97					
" Lake Champlain	2,443 21					
" Empress of Britain	4,039 21					
" Victorian	1,215 20					
" Athenia	666 82					
" Sardinian	1,904 77					
" Lake Erie	3,712 10					
" Salacia	579 67					
" Corsican	1,157 52					
" Empress of Ireland (2nd)	3,183 11					
" Montrose	2,275 56					
" Shenandoah	2,968 00					
" Montreal	3,332 56					
" Virginian	172 90					
" Hestia	1,074 08					
Brackman-Ker Milling Co.—Duty on American Barley		1,493 06				
Collector of Customs—Duty on English oat sacks			328 80			
Collector of Customs—Duty on English oat sacks			1,042 78			
W. G. Bell & Co.				5 00		
J. R. Wells				33 00		
W. G. Bell & Co.				6 50		
" "				111 00		
Anchor Elevator Co.					11 76	
" "					8 73	
W. Carson					1,106 76	
	31,277 68	1,493 06	1,371 58	155 50	1,127 25	35,425 07

No. 13.—Statement Showing Expenditure for Insurance, Inspection, Weighing, &c., Seed Grain Advances, 1908.

—	Amount.	Total.
	$ cts.	$ cts.
Insurance —		
Ryan Agency Co.	4,083 40	
Allan, Lang, Killam & McKay	1,390 00	
		5,473 40
Weighing and Inspection—		
W. W. Cumming, Grain Inspector	1,126 57	
J. A. McTavish, "	627 35	
Chief Grain Inspector, Government inspection fees	217 85	
C. S. Langille, Grain Inspector	212 00	
F. E. Endersby "	147 90	
Jas. Birch "	135 00	
F. E. Gibbs	39 00	
H. Labelle	22 02	
G. McDougall	12 80	
R. D. Prettie	2 25	
J. D. Fraser	97 10	
Canadian Bank of Commerce acct. Inspector, Picton	70 00	
J. A. Black	75 00	
A. L. Hastings	100 00	
W. Anderson	60 00	
Canadian Northern Ry	91 20	
Canadian Pacific Ry	24 15	
Anchor Elevator Co	47 50	
Ogilvie Flour Mills Co	16 50	
Calgary Milling Co	8 00	
Canada Malting Co	6 75	
International Elevetor Co	4 25	
		3,123 19
Premiums on Grain—		
Herriott & Milne	598 00	
Imperial Elevator Co	150 00	
		748 00
Storage—		
Winnipeg Elevator Co	107 64	
North Star Grain Co	106 52	
British American Elevator Co	103 24	
		317 40
Superintending Shipments of English Oats at St. John		532 62
		10,194 61
Less Refunds		3,197 96
		6,996 65