



JOSEPH BOUCHETTE,
Surveyor-General of Lower Canada and Lieut.-Col. C. M.

PROCEEDINGS
OF THE
ASSOCIATION
OF
ONTARIO LAND SURVEYORS

At its Third Annual Meeting, since Incorporation,

HELD AT

TORONTO, FEBRUARY 26TH, 27TH AND 28TH,

1895

Being the Tenth Annual Meeting of the Association of Provincial Land Surveyors of Ontario.

The Fourth Annual Meeting (Eleventh Annual Meeting of the Association of Provincial Land Surveyors of Ontario) will be held in Toronto, commencing on Tuesday, 25th of February, 1896.

PRINTED FOR THE ASSOCIATION
BY
C. BLACKETT ROBINSON, 5 JORDAN STREET,
TORONTO.

PATRONIZE OUR ADVERTISERS.

NOTICES.

The attention of the members is called to the list of Standing and Special Committees as given on page 6. Each member should assist the Committees as much as possible.

Members and others can be supplied with copies of the Proceedings for 1886, 1887, 1888, 1889, 1891, 1892, 1893, or 1894 by remitting fifty cents to the Secretary.

Copies of the Ontario Land Surveyors' Act and By-Laws of the Association will be sent upon receipt of three-cent stamp.

The thanks of the Association are due to the Faculty and Alumni Society of the School of Practical Science for the very interesting and instructive entertainment tendered to the members in attendance at the annual meeting of 1895.

Published annually by the Association of Ontario Land Surveyors.

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PATRONIZE OUR ADVERTISERS.

PREFACE.

To the Members of the Association of Ontario Land Surveyors :

The Proceedings of the Association at its Third Annual Meeting since incorporation are herewith presented.

Appended will be found By-Laws passed by the Council since the date of the meeting.

It will be seen that the Committees have been active and earnest in the promotion of the interests of their several departments, and it is hoped that they will be even more energetic this year.

Each member of the Association, whether a member of a committee or in the ranks, is requested to lend his aid for the advancement of the profession.

Respectfully submitted on behalf of the Council,

A. J. VANNOSTRAND,

Secretary.

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ASSOCIATION OF
ONTARIO LAND SURVEYORS

(Incorporated 1892).

ORGANIZED 23RD FEBRUARY, 1886.

Officers for 1895-96.

PRESIDENT.

M. Gaviller, O L.S., Collingwood.

VICE-PRESIDENT.

Willis Chipman, O L.S., Toronto.

CHAIRMAN OF COUNCIL.

Villiers Sankey, O.L.S., Toronto.

SECRETARY-TREASURER.

A. J. VanNostrand, O.L.S, Toronto.

COUNCILLORS

Hon. A. S. Hardy, Commissioner of Crown Lands.

P. S. Gibson, Willowdale } For 3 years.
F. L. Foster, Toronto }

Villiers Sankey, Toronto } For 2 years.
H. J. Bowman, Berlin }

G. B. Kirkpatrick, Toronto } For 1 year
Alex. Niven, Haliburton. }

AUDITORS.

H. B. Proudfoot, Toronto.

A. P. Walker, Toronto.

BANKERS.

Imperial Bank of Canada (Yonge Street Branch, Toronto).

BOARD OF EXAMINERS.

Villiers Sankey, Toronto (Chairman).
 M. J. Butler, Napanee } Appointed by Lieut.-Gov.
 G. B. Kirkpatrick, Toronto } in Council.
 P. S. Gibson, Willowdale } For 3 years, appointed by
 A. Niven, Haliburton } Council.
 M. Gaviller, Collingwood } For 2 years, appointed by
 R. Coad, Glencoe } Council.

STANDING COMMITTEES FOR 1895-6.

LAND SURVEYING.—T. B. Speight (Chairman), James Dickson, F. L. Foster, H. H. Gibson, J. L. Morris, A. Niven, C. Unwin, J. F. Whitson.

DRAINAGE.—Geo. Ross (Chairman), R. Coad, W. M. Davis, Owen McKay, J. M. Tiernan, T. H. Wiggins.

ENGINEERING.—H. J. Bowman (Chairman), G. B. Abrey, M. J. Butler, J. DeGursé, Jas. Hutcheon, T. Harry Jones, Jas. Robertson, A. P. Walker.

ENTERTAINMENT.—H. D. Ellis (Chairman), F. L. Foster, W. E. McMullen, C. J. Murphy, T. B. Speight, A. P. Walker.

PUBLICATION.—K. Gamble (Chairman), H. J. Browne, Willis Chipman, H. L. Esten, F. L. Foster, J. McAree, C. J. Murphy, H. W. Selby.

TOPOGRAPHICAL SURVEYING.—Willis Chipman (Chairman), M. J. Butler, T. Fawcett, K. Gamble, Otto J. Klotz, J. McAree, V. Sankey, E. Stewart, L. B. Stewart.

SPECIAL COMMITTEES.

POLAR RESEARCH.—Willis Chipman (Chairman), C. J. Murphy, A. Niven, W. Ogilvie, J. A. Paterson, L. B. Stewart, J. W. Tyrrell.

STANDARD MEASURES OF LENGTH.—M. J. Butler (Chairman), G. B. Abrey, W. Chipman, H. D. Ellis, M. W. Hopkins, J. McAree, H. W. Selby.

BIOGRAPHY.—G. B. Kirkpatrick (Chairman), W. R. Aylsworth, Jas. Dickson, H. L. Esten and all exempted members.

PROGRAMME OF THE
Association of Ontario Land Surveyors

(INCORPORATED)

AT ITS THIRD ANNUAL MEETING HELD IN TORONTO,
FEBRUARY 26TH, 27TH AND 28TH, 1895.

PROGRAMME.

Tuesday, February 26th—Morning at 10 o'clock.

Meeting of Council.
Meeting of Standing Committees.

Afternoon at 2 o'clock.

Reading of Minutes of previous meeting.
Reading of Correspondence.
Report of Council of Management (including Reports of Board of Examiners and Secretary-Treasurer). V. Sankey, O. L. S., Chairman, Toronto.
Report of Committee on Publication. K. Gamble, O. L. S., Chairman, Toronto.
Report of Committee on Biography. G. B. Kirkpatrick, O. L. S., Chairman, Toronto.
President's Address.
Paper—"Indexing Office Information." D. D. James, O. L. S., C. E., Toronto.
Paper—"Flood Prevention Work at Brantford." C. C. Fairchild, O. L. S., Brantford.
Paper—"Rainy River District." J. F. Whitson, O. L. S., Toronto.

Evening at 8 o'clock.

Report of Committee on Polar Research. Willis Chipman, O. L. S., C. E., Chairman, Toronto.
Paper—"The Eightieth Meridian." Willis Chipman, O. L. S., C. E., Toronto.
Paper—"The Objects of Arctic Exploration." L. B. Stewart, O. L. S., D. T. S., Toronto.
Paper—"The Dawson Route." W. A. Browne, O. L. S., Toronto.

Wednesday, February 27th—Morning at 10 o'clock.

Report of Committee on Drainage, with "Question Drawer."
Geo. Ross, O. L. S., C. E., Chairman, Welland.

Paper—"Drain Gradient Instrument." A. R. Davis, O. L. S.,
C. E., Napanee.

Report of Committee on Topographical Surveying. Willis Chip-
man, O. L. S., C. E., Chairman, Toronto.

Paper—"Aneroids." Otto J. Klotz, O. L. S., D. T. S., Ottawa.

Paper—"Triangulation Work on Topographical Surveys." H. K.
Wicksteed, O. L. S., C. E., Cobourg.

Afternoon at 2 o'clock.

Report of Committee on Land Surveying. T. B. Speight, O. L. S.,
Chairman, Toronto.

Paper—"Co-efficient of Refraction." Otto J. Klotz, O. L. S.,
D. T. S., Ottawa.

Paper—"Provincial Boundaries." A. Niven, O. L. S., Hali-
burton.

Paper—"The Cradle Theodolite." J. M. O. Cromwell, O. L. S.,
Perth.

Evening at 8 o'clock.

ANNUAL DINNER.

F. L. Foster, O. L. S., Chairman of Committee on Entertainment.

Thursday, February 28th—Morning at 10 o'clock.

Report of Auditors.

Report of Committee on Standard Measures, G. B. Abrey, O. L.
S., C. E., Chairman, Toronto Junction.

Report of Committee on Engineering—T. Harry Jones, O. L. S.,
C. E., Chairman, Brantford.

Paper—"Highway Bridges" P. S. Gibson, O. L. S., C. E.,
Willowdale.

Paper—"Good Streets." H. J. Bowman, O. L. S., C. E., Berlin.

Paper—"Mining." J. D. Evans, O. L. S., C. E., Trenton.

Afternoon at 2 o'clock.

Report of Committee on Entertainment. F. L. Foster, O. L. S.,
Chairman.

Ratification of New By-laws.

Unfinished Business.

New Business.

Nomination of Officers (President, Vice-President, two Members
of Council, Secretary-Treasurer and Auditors).

Appointment of Scrutineers.

Adjournment.

ASSOCIATION OF
ONTARIO LAND SURVEYORS
(INCORPORATED).

MINUTES OF THE THIRD ANNUAL MEETING

(Tenth Annual Meeting of Provincial Land Surveyors of Ontario),

FEBRUARY 26th, 27th and 28th, 1895.

The meeting was called to order at 2 p.m. on Tuesday, the 26th of February, in the lecture room of the Canadian Institute, 58 Richmond Street East, Toronto.

The President, Mr. M. J. Butler, in the chair.

Moved by Mr. Van Nostrand, and seconded by Mr. Niven, that the minutes of last meeting of the Association of Ontario Land Surveyors, as printed in the Proceedings, be confirmed as read. Carried.

The Secretary read a letter from the Editor of "The Surveyor and Municipal County Engineer," of London, England, thanking the Association for the report of last meeting which was sent him, and inviting Ontario Land Surveyors to contribute articles for "The Surveyor"; also one from the President of the Illinois Society of Engineers and Surveyors, regretting that it was impossible to have a representative of that Society at our annual meeting.

Mr. Sankey, on behalf of the Council of Management, asked to be allowed to defer the presentation of their report for the present. He presented the Secretary-Treasurer's report and financial statement which was referred to the auditors.

Captain Gamble presented the report of the Committee on Publication, and moved, seconded by Mr. Selby, that it be adopted. Carried.

Mr. Kirkpatrick, chairman of the Committee on Biography, presented a verbal report, stating that, in answer to the letters sent out

to the different surveyors, he had received some thirty-five or forty replies, which contain a great deal of valuable information concerning the surveyors in the early history of this Province. He suggested that the Committee be instructed to correspond with the descendants of some of these old surveyors with a view of obtaining all the information possible regarding them. On the suggestion of Mr. Chipman he read a few of the replies received.

Mr. W. F. King, D.T.S., being present, the President extended the courtesies of the Association to him, asking him to take part in the proceedings.

The President then read his annual address.

On motion of Mr. Sankey, seconded by Mr. Dickson, a vote of thanks was tendered the President for his address.

Mr. D. D. James read a paper on "Indexing Office Information."

In the absence of Mr. C. C. Fairchild, his paper on "Flood Prevention Work at Brantford" was read by Mr. T. Harry Jones.

In the absence of Mr. Otto J. Klotz, his paper on "Aneroids" was read by Mr. T. Fawcett.

The President announced that on Thursday evening the Alumni Association of the School of Practical Science proposed holding a stereopticon entertainment in that building for the Association of Ontario Land Surveyors if enough members would signify their intention of being present.

The meeting then adjourned at 4.45 p.m.

TUESDAY EVENING SESSION, 8 P.M.

The President in the chair.

Mr. J. F. Whitson read a paper on "The Rainy River District."

Moved by Mr. T. B. Speight, seconded by Mr. Jas. Dickson, that a vote of thanks be given Mr. Whitson for his very able paper. Carried.

The Report of the Committee on Polar Research was read by Mr. Willis Chipman, chairman of the Committee.

On motion of Mr. Chipman, seconded by Mr. Dickson, the report was adopted.

Mr. Chipman read a paper on "The Eightieth Meridian."

On motion of Mr. C. F. Aylesworth, seconded by Mr. J. W. Tyrrell, a vote of thanks was given Mr. Chipman for his valuable and interesting paper.

Mr. W. A. Browne read a paper on "The Dawson Route"

The meeting then adjourned, 10.15 p.m.

WEDNESDAY MORNING SESSION, 10 A.M.

The President in the chair.

The report of the Committee on Drainage was read by Mr. Geo. Ross, chairman of the Committee, and was discussed at length.

Mr. A. R. Davis read a paper on "Drain Gradient Instrument," in connection with which he also exhibited a model of his instrument.

The report of the Committee on Topographical Surveying was read by Mr. Chipman, chairman of the Committee.

After considerable discussion, on motion of Mr. Chipman, seconded by Mr. Dickson, the report was adopted.

The meeting then adjourned, 12.45 p.m.

WEDNESDAY AFTERNOON SESSION, 2 P.M.

The Vice-President, Mr. M. Gaviller, in the chair.

In the absence of Mr. H. K. Wicksteed, his paper on "Triangulation Work on Topographical Surveys" was read by Mr. H. H. Gibson.

In the absence of Mr. Otto J. Klotz, his paper on "Co-efficient of Refraction" was read by Mr. H. H. Gibson.

On motion of Mr. Dickson, seconded by Mr. Davis, a vote of thanks was tendered Mr. Klotz for his interesting paper.

The report of the Council of Management was then read by Mr. Villiers Sankey.

By laws Nos. 36, 37, 38, 39 and 40, as enacted by the Council, were then ratified by the Association.

On motion of Mr. Sankey, seconded by Mr. Dickson, the report of the Council of Management was adopted.

The report of the Committee on Land Surveying was read by Mr. Speight, chairman of the Committee, and the questions submitted were discussed.

In the absence of Mr. J. M. O. Cromwell, his paper on "The Cradle Theodolite" was read by Mr. H. H. Gibson.

The meeting then adjourned, 5.45.

The Annual Dinner was held in the evening.

THURSDAY MORNING SESSION, 10 A.M.

The President in the chair.

Mr. T. Harry Jones, chairman of the Committee on Engineering, said that his Committee had concluded to follow the precedent set

in other years and submit no written report. The members, living as they do in various parts of the country, had not been called together during the year. However, some of the papers which have been read before the Society had been procured or given by members of the Committee.

Mr. P. S. Gibson then read a paper on "Highway Bridges."

Mr. J. D. Evans read a paper on "Mining."

Mr. F. L. Foster presented the report of the Auditors, which on motion was adopted.

Mr. H. J. Bowman read a paper on "Good Streets" which was discussed at considerable length.

The meeting then adjourned, 12.30 p.m.

THURSDAY AFTERNOON SESSION, 2 P.M.

The President in the chair.

Moved by Mr. F. L. Foster, seconded by Mr. A. J. Van Nostrand, that the report of the Committee on Entertainment be taken as read and printed in the proceedings. Carried.

Moved by Mr. T. B. Speight, seconded by Mr. M. Gaviller, that any omissions or clerical errors in the records of the proceedings of this meeting, now in the hands of the Stenographer and the Secretary, be corrected by the Committee on Publication before being printed. Carried.

Moved by Mr. Willis Chipman, seconded by Mr. A. Niven, that the Secretary prepare a list of candidates who have passed the Preliminary and Final examinations for Land Surveyors of Ontario since incorporation, this list to give the date of passing and last reported address, and that it be printed in the Proceedings. Carried.

Moved by Mr. G. B. Kirkpatrick, seconded by Mr. F. L. Foster, that the Secretary-Treasurer be granted the sum of one hundred and twenty dollars for his services during the past year. Carried.

Moved by Mr. Chipman, seconded by Mr. C. F. Miles, that the Council be and are hereby instructed to fit up the room in the Parliament Buildings granted the Association by the Crown Lands Department in a proper manner for the reception of books, plans, photographs, portraits, documents, instruments, etc., the expenditure for such purpose not to exceed thirty dollars. Carried.

The following were suggested as subjects for papers for next meeting:—

By Mr. P. S. Gibson: "The Survey Act as it stands at present," more particularly with reference to "Sectional Surveys—Double Fronts and Single Fronts." (Suggested by Mr. Dickson.)

By Mr. Niven: "The Eastern Boundary of this Province." (Suggested by Mr. Chipman.)

Mr. Niven explained that he had started to write a paper on "Provincial Boundaries," but found it impossible to finish it in time. He, however, promised to prepare a paper on that subject for next year.

Mr. Gaviller suggested that Mr. H. L. Esten give some information regarding cases which have been decided in the Courts, of interest to the profession, as he had at one time commenced to make a compilation of them. This Mr. Esten said he would be very happy to do.

Mr. Chipman suggested a paper on "The Surveys that were made before 1790 in Ontario."

Mr. Niven suggested that Mr. Dickson give a paper on something in the line of Crown Surveys.

Mr. Speight suggested that Mr. H. D. Lumsden prepare a paper on Railway Work.

Mr. Sankey said he thought it would be well to have an index made of the information contained in the Exchanges and the Reports of the Association and have it printed and sent to each member.

Mr. Chipman thought that this should be done every five years.

Mr. Chipman suggested a paper on "Statute Labor."

Mr. Sankey suggested a paper on "The Areas in Ontario that may be Reclaimed by Drainage."

Moved by Mr. Sankey, seconded by Mr. P. S. Gibson, that the Secretary-Treasurer issue a circular as soon as possible to all members, active and retired, requesting contributions for the repository of any books, plans, pamphlets, field notes, diaries, etc., and any other documents pertaining to the early surveys in Canada, also of old instruments, or other curios of interest to the profession. Each member is also to be requested to forward a photograph of himself, with brief biographical sketch, name and address. Carried.

Moved by Mr. G. B. Kirkpatrick, seconded by Mr. P. S. Gibson, that we have learned with regret of the death, since our last meeting, of Mr. William Robinson, P.L.S., London, Ontario, and we desire to convey to his relatives this expression of sympathy with them in their bereavement. Carried.

Moved by Mr. Chipman, seconded by Mr. Sankey, that the meeting do now adjourn for ten minutes. Carried.

After the adjournment, the nomination of officers was proceeded with.

The President—Last year I suggested that the office of President be for one year only, and that for the future there would be no feeling on the part of any person that he had been cut off summarily. There are many members of the Society who are well fitted for the office of

President, but, in the ordinary course of affairs, it is impossible that it reach all that deserve to be there; therefore, I made that suggestion, and I think we had better bear that in mind now before making any nominations, that it be understood from this date that the President's term be for one year.

Mr. Jas. Dickson moved, seconded by Mr. W. A. Browne, that Mr. Maurice Gaviller be President for the ensuing year.

There being no other nominations, Mr. Gaviller was declared elected.

Moved by Mr. P. S. Gibson, seconded by Mr. Niven, that Mr. Willis Chipman be Vice-President for the ensuing year.

There being no other nominations, Mr. Chipman was declared elected.

As Mr. Gibson and Mr. Chipman were the retiring members of the Council, the following nominations were made to take their places:

Mr. P. S. Gibson, nominated by Mr. Kirkpatrick, seconded by Mr. Niven.

Mr. James Dickson, nominated by Mr. W. A. Browne, seconded by Mr. Speight.

Mr. Thos. B. Speight, nominated by Mr. Sankey, seconded by Mr. Bowman.

Mr. George Ross, nominated by Mr. Van Nostrand, seconded by Mr. Esten.

Mr. J. D. Evans, nominated by Mr. Gaviller, seconded by Mr. Foster.

Mr. W. M. Davis, nominated by Mr. Bowman, seconded by Captain Gamble.

Mr. Harry J. Browne, nominated by Mr. Gibson, seconded by Mr. Speight.

Mr. T. Harry Jones, nominated by Mr. Kirkpatrick, seconded by Mr. W. A. Browne.

Mr. F. L. Foster, nominated by Mr. Chipman, seconded by Mr. Niven.

AUDITORS.

Mr. Jas. Dickson moved, seconded by Mr. M. Gaviller, that the retiring Auditors be re-nominated.

As Mr. F. L. Foster was nominated for the Council, he asked to have his name withdrawn from the nominations for Auditors, and Mr. Gaviller nominated Mr. A. P. Walker in his place as one of the Auditors. There being no other nominations, Messrs. Proudfoot and Walker were declared elected.

Mr. Sankey moved, seconded by Mr. P. S. Gibson, that Mr. Van Nostrand be nominated as Secretary-Treasurer for the ensuing year.

There being no further nominations, Mr. Van Nostrand was declared elected.

The President then appointed Captain Gamble and Mr. W. A. Browne as scrutineers.

On motion of Mr. Sankey, the President then left the chair and Mr. Dickson took it *pro tem*.

Mr. V. Sankey, seconded by Mr. A. Niven, then moved a cordial vote of thanks to the retiring President, Mr. M. J. Butler, for his services as President, and for the trouble he had taken and the valuable assistance he had rendered to the Association, from its commencement to the present time, which was carried unanimously, and to which the retiring President made the following reply :

Mr. Chairman and Gentlemen,—I am sure I thank you very much indeed for the kind manner in which you have received this vote of thanks to me. I appreciate it very much indeed. As suggested by one of our members, I did assist at the birth of this Association, and I attended it through its early infancy, but it has now reached the age of ten years and ought to be able to walk alone pretty strongly. It is getting to be a pretty full grown boy now, and I think our sphere ought to keep on enlarging and broadening until, as suggested by Mr. Bowman, our surveyors will be, without exception, engineers. Then the reflection that was cast upon surveyors in times past, "Oh, yes, that is the fellow with the Jacob's staff and two or three hundred link chain," will not be hinted at in regard to any member of the Ontario Land Surveyors' Association. I thank you indeed for your appreciation of the services I was able to render to the Association, little as they were, during the past year. (Applause.)

On motion of Mr. Dickson, seconded by Mr. Foster, the meeting then adjourned, 4 p m.

MEMBERS IN ATTENDANCE AT THE THIRD ANNUAL MEETING.

Abrey, G. B.	Foster, F. L.	O'Hara, W. F.
Aylsworth, C. F., jr.	Gamble, K.	Proudfoot, H. B.
Beatty, W.	Gaviller, M.	Robertson, Jas.
Bowman, C. D.	Gibson, H. H.	Ross, G.
Bowman, H. J.	Gibson, P. S.	Selby, H. W.
Browne, H. J.	Hutcheon, Jas.	Sankey, V.
Browne, W. A.	James, D. D.	Sewell, H. DeQ.
Butler, M. J.	Johnson, R. T.	Silvester, G. E.
Chipman, W.	Jones, T.	Speight, T. B.
Davis, A. R.	Kirkpatrick, G. B.	Stewart, L. B.
Davis, J.	Laird, R.	Spry, W.
DeGurse, J.	Lumsden, H. D.	Tyrrell, J. W.
Dickson, J.	McFarlen, G. W.	Unwin, C.
Ellis, H. D.	McMullen, W. E.	VanNostrand, A. J.
Esten, H. L.	Miles, C. F.	Walker, A. P.
Evans, J. D.	Murphy, C. J.	Wheeler, C. R.
Fawcett, T.	Niven, A.	Whitson, J. F.

RESULT OF ELECTIONS.

President M. Gaviller (by acclamation).
Vice-President Willis Chipman (by acclamation).
Secretary-Treasurer A. J. VanNostrand (by acclamation).

Councillors elected for ensuing three years.

P. S. Gibson, F. L. Foster.

Auditors for ensuing year (by acclamation).

H. B. Proudfoot, A. P. Walker.

I hereby declare the above-named Councillors and Auditors elected.

A. J. VANNOSTRAND,
Secretary-Treasurer.

Certified correct.

KILLALY GAMBLE,
 W. A. BROWNE,
Scrutineers of Ballots.

REPORT OF THE COUNCIL.

The Council met in April and November.

At the April meeting, By-Laws Nos. 36, 37, 38 and 39 were passed, under the authority of By-Law No. 33, and at the November meeting By-Law No. 40 was passed under the same authority, and are now reported to the Association for ratification or otherwise. At the meeting of the new Council in April Mr. Sankey was elected chairman, and Messrs. Gaviller and Coad were appointed as members of the Board of Examiners. The several Standing Committees were appointed, as provided in By-Law No 5. (See Report 1894, p. 6). It was also resolved by the Council to print the examination papers, as far as practicable, of November, '93, in the report. This has been done at a cost of about \$20, and the Council hopes that the Association will concur in this practice being continued in future for the following reasons: 1. The publishing of these papers gives intending candidates opportunity of preparing themselves properly for the Examinations. 2. It shews to the members of the Association the manner in which the Board of Examiners is carrying out its duties, and gives opportunity to suggest improvements in the style and scope of the Examinations. 3. The enhanced value of the Report which has been already favourably commented on, and also the evidence these papers bear, that to become an Ontario Land Surveyor a candidate must be well grounded in the several subjects required. It may be here stated that an oral examination is required as well in each subject.

The Council, knowing that a large amount of information of interest to the profession is scattered throughout the Province, and that the first move in order to collect it was to secure a convenient repository for the same, an application was therefore made to the Hon. the Commissioner of Crown Lands for the use of some room in the New Parliament Buildings, the result being that he has most kindly placed a suitable room, fitted up with shelves, tables and chairs, at our disposal. We are now in a position to keep an index, plans, maps, books, instruments, etc., and the members of the Association are earnestly requested to further the enterprise by securing for this repository donations of such information, instruments, etc., as they may think of interest. The use of the room and benefit of the information will be always at the disposal of all our members.

With regard to the election of the several officers the Council would suggest that the Association will consider the advisability of permitting members, who are unable to attend the annual meeting, to send in their nominations in writing. This would tend to increase the interest of members from all parts of the Province. As there may, however, be reasons why this plan will not work, the Council hopes the matter may be fully discussed before being adopted.

The plan of printing some of our papers before the Annual Meeting has been tried this session.

It is recommended that in future all papers for the annual meeting of the Association be sent to the Secretary by February 1st, in order that they may be printed and mailed to the members at least a week before the annual meeting, and that discussions be written out and sent in by the members, or personally read by them after the reading of the paper.

In response to Circular No 16, the Secretary has received many replies which shew that in some places unlicensed men are now practising. The Council has decided to enquire into these cases, and to prosecute in all cases where the evidence will warrant such action. Any member able to assist in giving information, or the names of persons from whom such information may be had, will please communicate at once with the Secretary.

The Reports of the Board of Examiners and of the Secretary-Treasurer are herewith presented, having been adopted by the Council. The Council has again to record the high appreciation of the energy and ability with which the Secretary-Treasurer discharges his many and, in some cases, onerous duties.

Respectfully submitted.

VILLIERS SANKEY,

Chairman of Council.

NEW BY-LAWS.

By-Law No. 36. "The following Surveyors having duly registered, and having proved to the satisfaction of the Council that they had been respectively, in actual practice as duly authorized and qualified Land Surveyors for Ontario for a period of not less than 35 years prior to July 1st, 1892, are hereby placed on the list of registered Surveyors for Ontario, and are exempt from the payment of further dues under the authority of sub-section 4 of section 10, Chapter 34, Ontario Statutes, 1892, viz., Thomas Coltrin Keefer, Nathaniel Edward Low, Thomas Cheesman, James McCallum and Thomas W Walsh." Passed by Council of Management, 4th April, 1894.

By-Law No. 37. "Whereas it has been proven to the satisfaction of the Council that Royal Wilkinson Hermon was granted a certificate as Provincial Land Surveyor, dated 13th July, 1857, and had therefore been a duly qualified Land Surveyor for 35 years, less 12 days, prior to the first day of July, 1892; it is therefore enacted that the said Royal Wilkinson Hermon is hereby granted exemption from dues under the authority of sub-section 4 of Section 10, Chapter 34, Ontario Statutes, 1892." Passed by Council of Management, 4th April, 1894.

By-Law No. 38. "Whereas it has been recommended by the Board of Examiners that the minimum marks in the subject of levelling be reduced from 40 to 35, it is therefore hereby enacted that the

minimum number of marks required to be taken by each successful candidate in the subject of levelling shall be 35 instead of 40 as set forth in By-Law No 29." Passed by Council of Management, 4th April, 1894.

By-Law No. 39. "Whereas any registered surveyor desiring to give up practice can have his name removed from the registered list of practitioners at any time, upon giving written notice of such desire, and whereas it is desirable that such surveyors may contribute papers and secure the reports of the transactions of this Association and exchanges, therefore this Council hereby enacts that such surveyors shall have the aforesaid privileges upon the payment of an annual fee of two dollars, and their names shall be printed in the list of members in the annual report of the Association and properly marked." Passed by Council of Management, 7th April, 1894.

By-Law No. 40. "The following surveyors having duly registered and having proved to the satisfaction of the Council that they had been respectively in actual practice as duly authorized and qualified land surveyors for Ontario for a period of not less than thirty-five years prior to July 1st, 1892, are hereby placed on the list of registered surveyors for Ontario and are exempt from the payment of further dues under the authority of sub-section 4, of section 10, chapter 34, Ontario Statutes, 1892, viz., Tom S. Rubidge and James A. Gibson." Passed by Council of Management, 6th November, 1894.

REPORT OF THE BOARD OF EXAMINERS.

The Board of Examiners met in April and November, when the following candidates passed, the finals being sworn in, and the following bonds were approved and filed with the Provincial Registrar. (See lists below.)

One candidate failed in April, and two others were required to take a supplemental examination in two subjects each.

A list is also presented showing the names of the various students who have filed articles and with whom they are now serving. This will bring the list, which was published in the Report of 1893, pages 154-5, up to date.

The Board, in order to reduce the cost of the examinations, decided that \$5 00 per day would be the fee payable to the members for the April meeting, and that attendance of the examiners should be so regulated that just a sufficient quorum might be in attendance. This has reduced the cost, and was found to be workable when there were not a great many candidates.

Respectfully submitted,

VILLIERS SANKEY,

Chairman of Board.

LIST OF ARTICLED PUPILS.

NAME OF PUPIL.	NAME OF SURVEYOR.	RESIDENCE.	DATE OF ARTICLES	TERM
Heaman, John Andrew	Moore & Henry	London	9th November, 1893.	Three years.
Chalmers, William James	Rorke, Louis Valentine	Sudbury	31st March, 1894	One year.
Ardagh, James Arthur Gowaf	Bowman, Herbert Joseph	Berlin	10th May, 1894	One year.
Mitchell, Charles Hamilton	Tyrrell, James Williams	Hamilton	17th May, 1894	One year.
Bergey, Aaron E.	Bowman, Herbert Joseph	Berlin	4th June, 1894	One year.
Chalmers, John	Burke, William Robert	Ingersoll	1st July, 1894	One year.
MacLean, William Arthur	Campbell, Archibald William	St. Thomas	4th April, 1894	Three years.
Ford, William Butterton	Davis, William Mahlon	Woodstock	4th April, 1894	Three years.
Gillon, Douglas John	McCaullum, James	Rat Portage	16th June 1894	One year.
Squire, Richard Herbert	Jones, Thomas Henry	Brantford	20th July, 1894	One year.
Newman, John James	Newman, William	Windsor	4th April, 1894	Three years.
Ward, Archeson Thomas	Speight & VanNostrand	Toronto	4th April, 1894	Three years.
Fairbairn, John M. R.	Wilkins, Frederick William	Peterborough	4th June, 1894	One year.
Gibson, Wilbert Silas	Gibson, Peter Silas	Willowdale	4th June, 1894	One year.
McNaughton, Finlay Donald	Brown, David Rose	Cornwall	5th April, 1894	Three years.
Mackenzie, William	Baird, Alexander	Leamington	5th April, 1894	Three years.
Brown, George Laing	Brown, David Rose	Leamington	23rd January, 1894	One year.
McPherson, Archibald John	McCulloch, Andrew Lake	Cornwall	2nd April, 1894	One year.
Johnson, Sydney Munnings	VanBuskirk, William Fraser	Galt	28th March, 1894	One year.
Smith, Angus	Scane, Thomas	Stratford	24th October, 1894	One year.
		Ridgeway	18th December, 1894	One year.

APRIL EXAMINATION.

Preliminary.

Bow, James Alexander	Orillia.
Gibson, Wilbert Silas	Willowdale.
MacLean, William Arthur	St. Thomas.
McNaughton, Finlay Donald	Cornwall.
Ford, William Butterton	London.
Ward, Archeson Thomas	Toronto.
Newman, John James	Windsor.

Final.

Fairchild, Charles Court	Brantford.
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NOVEMBER EXAMINATION.

Preliminary.

No candidate.

Final.

ALLAN, JOHN RICHARD (Supplemental).

BONDS—APRIL, 1894.

HARVEY, THOMAS ALEXANDER.

MCLENNAN MURDOCH JOHN.

HOPKINS, MARSHAL L. WILLARD.

NOVEMBER, 1894.

FAIRCHILD, CHARLES COURT.

REPORT OF THE SECRETARY-TREASURER.

MR. CHAIRMAN,—In compliance with the By-laws, I beg to present the following report of the official proceedings of the Association, as transacted by my department between February 26th, 1894, and February 25th, 1895:—

The following circulars have been issued:

No. 14. Ballot for 1894-5	225 copies
“ 15. Explanation of Ballot	225 “
“ 16. <i>Re</i> Court Decisions, etc	225 “
“ 17. <i>Re</i> Biographical Sketches	40 “
“ 18. Announcement of Annual Meeting, 1895	250 “
“ 19. Programme for “ “ “	325 “

Letters and Accounts sent from Secretary's office	709
Postal Cards “ “ “	50
Letters, Postal Cards and Biographical Sketches received	479

The Register stands as follows:

Active members, subject to dues	197
“ “ exempted from dues	16
Withdrawn from practice	43
Dead	2

Total number of registrations

258

The following table shows the present location of both "active" and "withdrawn" members:—

<i>County or District.</i>	<i>Active Members.</i>	<i>Withdrawn Members.</i>
Algoma	2	
Brant	3	
British Columbia		10
Bruce	4	
Carleton	11	5
Dufferin	2	
Durham	1	
Dundas	1	
Elgin	4	
Essex	7	
Frontenac	4	
Grey	3	
Grenville	1	
Glengarry	1	
Haliburton	1	
Halton	2	
Hastings	4	
Haldimand	2	
Huron	2	
Kent	8	
Lambton	5	
Lanark	4	
Leeds	3	
Lennox	4	
Lincoln	1	1
Middlesex	10	
Manitoba	1	6
Manitoulin	1	
Muskoka	4	
Nipissing	4	
Norfolk	2	
North-West Territories		6
Northumberland	4	
Ontario	3	
Oxford	4	
Parry Sound	1	
Peel	1	
Perth	7	
Peterboro'	4	2
Prince Edward	1	
Quebec		3
Renfrew	5	
Russell	1	
Rainy River	4	
Simcoe	7	1
Stormont	2	
Thunder Bay	4	
Victoria	3	
Waterloo	4	1
Welland	1	
Wellington	5	
Wentworth	7	1
York	35	6
United States	5	4
Number of Candidates passed Final Examination		2
" " " Preliminary Examination		7
" Pupils filing Articles		19

The demand for our Annual Reports having increased, it was deemed advisable to enlarge the issue to 1,150, 1,046 of which were sent to exchanges, members, advertisers, libraries, newspapers, etc., and 104 remain on hand.

Single copies have been sent by request to the following institutions, viz. :—

Public Library, Toronto.
 Canadian Society of Civil Engineers, Montreal.
 Library of Parliament, Ottawa.
 Meteorological Office, Toronto.
 Ontario Department of Crown Lands, Toronto.
 Ontario Bureau of Mines, Toronto.
 Ontario Department of Agriculture, Toronto.
 City Engineer, Toronto.
 Association of Provincial Land Surveyors of British Columbia,
 Victoria, B.C.
 Engineers' Society of Western Pennsylvania, Allegheny, Pa.
 Cornell University, Ithaca, N.Y.
 Massachusetts Institute of Technology, Boston, Mass.
 State Normal and Training School, Cortland, N.Y.
 University of Minnesota, Minneapolis, Minn.
 Thayer School of Engineering, Hanover, New Hampshire.
 Correspondence School of Mechanics, Scranton, Pa., and

The Surveyor, London, England, and in nearly every instance at least one volume has been received in exchange. The Editor of *The Surveyor* has kindly continued the name of our Association on the weekly mailing list in exchange for a single copy of our report. It is hoped that in exchange for this courtesy some of our "sanitary" members will contribute, as requested in the letter of the Editor, to the sanitary columns of that valuable publication.

In addition to the single exchanges mentioned above, our library has been further enriched through the generosity of Mr. Chipman by 56 bound and unbound volumes, a catalogue of which has been made.

Another member of the Council of Management has also kindly donated a set of charts from the United States Hydrographers' Department, showing the St. Lawrence River from its mouth to Ile de Grace.

Now that we have secured a safe repository for our library, and other properties, in the Crown Lands Department, it is hoped that others will contribute in the form of books, maps, old instruments, or curios, of interest to the profession.

Accompanying this report is a statement of the receipts and expenditures for the association during the past year, which, when duly audited, will be presented

All of which is respectfully submitted.

A. J. VANNOSTRAND,

Secretary-Treasurer.

Toronto, 25th February, 1895.

DISCUSSION.

Mr. Dickson—I think that idea of having the papers sent in several weeks before the meeting of the Association and printed is a capital one. It is a very difficult thing for any member who has never heard about a certain subject to get up and discuss it intelligently. In this way he can get his remarks ready beforehand, and either deliver them orally or read them out before the meeting. The only danger is that some of us might make it too long. I am afraid I would be inclined to do that myself. But I think if we made it just as short as we possibly could and made it sufficiently plain it would be a good thing.

Mr. Gaviller—I quite agree with what has been said. It would put the discussion in better shape and make it more intelligible.

Mr. Sankey—The principal object in making the suggestion was that we find as a rule the discussion is limited to the front benches; the men sitting in the back part of the hall are all more or less of a retiring and timid nature and they don't like to speak. Then there is another class of men; they are the ones who know most about the subject probably, but don't like to make a statement that may hereafter be brought up against them. It may not be known that men of the legal profession look over our reports, and it may sometime be said:

Well, you made such and such a statement in the Surveyors' meeting; are you prepared to go back on that?" You know we are not just merely a "little" meeting now-a-days; we have some weight in the country. We don't want to check discussion at all, but we want to give an opportunity of having a sensible and really business-like discussion on the various papers brought before us.

About the room we have secured in the Parliament Buildings, I think it is well to add that it is a very convenient room. The key will be in Mr. Kirkpatrick's office. We hope to make a collection of books of all kinds. We also wish to make a collection of maps and plans of all parts of the Province, or other countries. People sometimes want to get a look at a map that is not found in Canada. I know we can get maps from the various departments in Ottawa and Ontario that are useful for surveyors to have a look at; also old instruments, etc. We have already had a donation in that line. I would like to ask some of you to go up and look at the room.

Mr. Gaviller—There is a point I would like to draw attention to, that is as to members who find it impossible to attend the meeting sending in nominations in writing. They feel as it is that they are cut out entirely from taking any part in the nominations until the ballot is sent in, and then they find somebody perhaps whom they would like to see a candidate is not mentioned at all. I would like to hear the sense of the Association on that, because you all may be affected by it some day.

Mr. Sankey—I was in hopes that this matter would be discussed. In many cases members fail to send in their ballot papers marked for any one. They say simply: "We don't know any of the gentlemen proposed, and so we don't care to vote for them particularly," and I think in that way interest is to a certain degree lost in some sections

of the Province. If these nominations could be received by the Secretary before the annual meeting, he could read them out when the ordinary nominations are being made. There is just one point, I think, we ought to take into consideration in managing an Association of this kind where the members are so very much separated. A certain amount of concentration is undoubtedly necessary. We must be within reach of a certain quorum of our Council as the governing body of the Association. It is just possible that these nominations may have the effect of distributing the Council so far apart that practically the whole business of the Association would have to be done by letter writing. Of course, a great deal can be done in that way, but you can all understand it is very advisable to be able at times to discuss matters that will probably have to be discussed at two or three different meetings before anything arises out of them.

Mr. Speight—Do you know if that method of nominating candidates is adopted by any other Association ?

Mr. Sankey—I can't answer that question ; I don't know positively. But you know that our election is by post, so that, arguing from that backward, there is no reason why the nomination should not be by letter. We are not interfering with the electing powers of the Association at all, but we thought it advisable to bring this up for discussion.

Mr. Dickson—Supposing I should send in a nomination that was not seconded ?

Mr. Sankey—Up to the present we have received nominations for the Council without a seconder. As a rule, our President and Vice-President have been elected by acclamation by standing vote in the room. Well, somebody might put in a name in a letter, and that would prevent the nomination being unanimous. As a rule, the Vice-President has been made President, and we have found it works very well so far. There is just a little feeling in some parts of the Province that they have not a chance of nominating men that they would like to vote for, but that could easily be done by writing to some member of the Association and asking him to propose so and so.

Mr. Dickson—I think there has always been a very fair representation here, and I have never heard anything said in the way of complaint at not having had a share in the nomination. Parties might send in a nomination and cause a great deal of trouble. I think those who take the trouble to come here, some a considerable distance—and I am sorry that more don't come—I think they should certainly have the privilege of nominating officers when all the members of the Association are equally asked to record their votes.

Mr. Sewell—I think the best thing is to leave well alone. Our nominations should be made here in the room. I think it is far the better way.

Mr. Gaviller—The Council are not going to act in haste in this matter, and that is one reason why Mr. Sankey and the Council are anxious to hear your opinion on it.

The report of the Council was then adopted.

REPORT OF PUBLICATION COMMITTEE.

MR. PRESIDENT,—This Committee has had but little to occupy it save the usual routine of business.

Eleven hundred and fifty copies of the Report of the Proceedings were printed by the Presbyterian Printing and Publishing Company at a cost of \$290.60, being rather more than in former years, as the illustrations were more expensive, and the examination papers were added to the Report.

We continue to exchange our reports with other societies as in the past.

Members sending in "Papers" for publication are requested to have the accompanying diagrams accurately drawn on a scale suitable for insertion in the Report.

It is most desirable that all members of our Association would endeavour to forward the interests of our advertisers in every way in their power.

EXCHANGES, SENT TO

Iowa Civil Engineers and Surveyors' Society	55 copies.
Illinois Society of Engineers and Surveyors	100 "
Michigan Engineers' Society	140 "
Ohio Society of Surveyors and Civil Engineers	130 "
Indiana Engineering Society	130 "
School of Practical Science Engineering Society	200 "

Respectfully submitted,

KILLALY GAMBLE,

Chairman.

REPORT OF COMMITTEE ON BIOGRAPHY.

(Verbal Report. See Minutes).

REPORT OF COMMITTEE ON POLAR RESEARCH.

MR. PRESIDENT,—At the last meeting of this Association a committee of seven was appointed for specific purposes mentioned in the resolution which will be found on page 13 of the 1894 Report of Proceedings.

The purposes for which this Committee was appointed have not been interpreted literally by the Committee, but in a broader spirit.

This Committee has been an active one, all the members taking a keen interest in the problem.

We are of opinion that the Canadian Land Surveyors are better fitted for Arctic research than any other class of people on the globe, accustomed as they are to low temperatures, the use of toboggans, snowshoes and dog teams—fertile in resources, patient under adversities.

Your Committee would strongly urge upon the members of this Association to acquaint themselves fully with the history and geography of "Arctic Canada" and to give moral support to the promoters of Canadian expeditions.

Your Committee presents herewith letters from Professor Angelo Heilprin, President of the Geographical Club of Philadelphia, who relieved Lieutenant Peary in 1893, respecting the organization of an expedition to relieve him in the summer of 1895.

From this correspondence it will be seen that the Association of Ontario Land Surveyors can send a representative in this expedition by contributing \$1,000 towards the cost. While we believe that it would be foolish to send an expedition composed of inexperienced men north of latitude 80°, we do not think the Association can at present afford to contribute the large amount required to gain a summer's experience. We hope that there will arise from among our members some few who will volunteer to spend a year in North Greenland or Grinnel Land to gain the experience necessary before attempting exploring north of latitude 83°, and that the Association will contribute something towards the cost of outfit.

We are of opinion that our Governments, Federal and Provincial, will not consent to expend any large amount upon any exploring scheme that promises so little in return as a polar expedition. We must stimulate the patriotism of some of our wealthy men, upon whose liberality we must rely for the necessary funds, but we cannot appeal to them until we can prove the fitness of our men for the work. The men selected must have spent at least one year within the Arctic Circle in America before assuming to lead an expedition. Volunteers for this work must be physically and mentally robust, possessed of indomitable will power, and must be prepared to sacrifice two or three years at least in a life of hardship.

The party should not be large—say 12 men all told—supplied with three years' provisions, sledges, boats, dogs, snowshoes, etc., etc. The cost of such an expedition should not exceed \$50,000 (possibly half this would do), a large part of which must go towards chartering a vessel to take the party and all supplies as far north, *via* Smith Sound, as possible.

For the present the Association can do nothing, but the individual members can awaken public interest in Arctic Canada, and arouse enthusiasm by recounting the adventures of the many noble men who have explored the north coast of America and the archipelago of islands to the north of it.

With the hard-fisted utilitarian we cannot afford time to argue. We can only refer them to the long list of talented, educated and brave men who spent years in Arctic research.

Frobisher, Hudson and Baffin were representative of the seventeenth century. In the next hundred years Behring discovered the strait between Asia and America, Wrangell the land named after him, while Hearn and Mackenzie explored the central part of British America.

In our own century we have Scoresby, Ross, Parry, Franklin, Back, Dease, Simpson, Richardson, Rae, McClure, Collinson, Penny, Austen, Belcher, Osborn, Kellatt, McClintock, De Haven, Dr. Kane, Hall, Koldeway, Nordenskiöld, Payer, Weyprecht, Smith, Nares, Markham, Schwatka, De Long, Greely, Lockwood, Nansen, Peary.

This list is not a complete one, but we cannot read the history of the lives of those men without a feeling of pride to know that the great majority are of the Anglo-Saxon race, whose example we should not hesitate to follow. We should not rest until British North America has been fully explored and mapped. This large region probably contains the largest area of unmapped territory in the world, not excepting Central Africa, the Sahara, or North-western Australia.

WILLIS CHIPMAN,
Chairman.

REPORT OF COMMITTEE ON DRAINAGE.

MR. PRESIDENT,—Your Committee on Drainage beg to report as follows:

For the past few years the whole drainage question in this Province has been most carefully investigated in all its bearings with the object of having the laws respecting the same drawn up so as to meet any case that might arise, in a manner that would do justice to all parties, and clearly indicate on what lands and in what proportion the cost of constructing and maintaining drainage works should be levied without draining the pockets of the owners of the lands instead of their lands by unnecessary litigation. As a result of all this painstaking research, The Ditches and the Watercourses Act, of 1894, became the law of this Province on the fifth day of May last, and an Act to consolidate and amend the Drainage Laws, received the royal assent at the same time, and came into operation on the first of June. Drafts of these Acts were sent out in 1893 to "councils, surveyors, public officers, etc., etc., with a view to the expression of public opinion thereon," and at the Annual Meeting of this Association a year ago the Drainage Committee only suggested a few comparatively unimportant changes, but these, with one solitary exception, met an untimely fate. However, several important amendments were made in the bills before finally becoming law in 1894, among which may be mentioned the changes in Sections 59 and 60 of the Drainage Act, when work is extended into another municipality. The Act of 1894 provides for the initiating municipality to complete the whole work, instead of having each municipality extend the drain beyond its limits as was proposed in the draft of 1893.

A corresponding change was not made in Sections 69 and 70 as to maintenance of a drain continued into or through more than one municipality but each municipality is to maintain the portion in such municipality at the expense of the lands and roads in any way assessed for the construction thereof and in the proportion determined by the engineer, or surveyor, in his report and assessment for the

original construction. This may seem simple enough but in actual practice there is reason for careful enquiry. Suppose a case where the drain is continued into three municipalities, and any one township repairs the portion therein, should the lands in all three townships be assessed for the work done in any one? This would be perfectly fair only when the repairs are undertaken in all three municipalities about the same time.

In the Ditches and Watercourses Act an important change was made in Sec. 5 of the 1893 draft, as to the limit of the work which enables a drain to be extended without a petition into seven instead of five original township lots, and considerably increases the "one man's power" of which so much is heard at meetings under this Act, where there is opposition to the proposed work.

Some cases have already come up before the referee, where assessments have been made under Sub-Secs. 3 and 4 of Sec. 3 of the Drainage Act of 1894, but we do not know of any where the decision has yet been given. It has been found very difficult to distinguish between "outlet liability" and "injuring liability." Sub-Sec. 5 of Sec. 3 specifies that the assessment for injuring liability and for outlet liability shall have regard to the speed of the water artificially caused to flow upon the injured lands or into the drainage work. Does this mean the speed with which the drainage work carries off the water from the lands or roads liable for such assessments? The principles that guide the relative amount of assessment for "benefit" and outlet seems as elusive as ever and will probably be fought over and over again in the courts.

Sub-Sec. 4 of Sec. 3 provides for assessing the lands and roads of any municipality, company or individual using any drainage work as an outlet, either directly or through the medium of any other drainage work, or a swale, ravine, creek or watercourse. The interpretation of this has already been argued before the referee. Does this in any case cover the cost of works constructed before the Act came into force? Can uplands, draining through a large swale, with no perceptible current, be assessed? From the decisions that may be given, these questions may be answered a year from now. In the meantime your Committee would ask all members to send full notes on all decided cases of any importance to the Chairman of the Drainage Committee; otherwise many interesting points of much value may not become known to the majority of the members. Owing to the changes made in the Drainage Act, the decisions in several cases that have been tried during the last year or two, are not of so much value as they would otherwise be, but they all shed a certain amount of light on the miry path and a list of several is hereto appended with some notes or extracts from the digest in the law reports.

On the whole about an average amount of drainage work was undertaken during the past season, and the new Acts are considered to be a decided improvement on the former drainage laws and when better understood will no doubt prove very satisfactory.

All of which is respectfully submitted,

GEO. ROSS,
Chairman.

22 Ont. Reports, p. 664.

Re Suskey and the Corporation of the Township of Romney. Argued Nov. 22, 1892, before Boyd, C.

A by-law amending a drainage by-law under Sec. 573 of the Consolidated Municipal Act, 1892, "in order fully to carry out the intention thereof" where sufficient funds have not been authorized by the original by-law, is one which provides for the completion of the work, so as to make it efficient, although there may be some deviations and variations, or even additions to the work as originally planned.

During the construction of the drain it was found that stone portals were needed for the work, and that the outlet to the lake had to be deepened, and certain other extra work and necessities were recommended by the engineer. *Held* that the by-law providing for them was an amending by-law under Sec. 573 of the Consolidated Municipal Act, 1892, and that the township council had power to pass it under that Section.

23 Ont. Reports, p. 651.

Queen's Bench Division, *Williams v. Richards et al.*

WATERS AND WATERCOURSES.

That cannot be called a defined channel or watercourse which has no visible banks within which the water can be confined, and an occupant or owner of land has no right to drain into his neighbour's land the surface water from his own land, not flowing in a defined channel.

The rule of the civil law that the lower of two joining estates owes servitude to the upper to receive all the natural drainage, has not been adopted in this Province.

Judgment by Robertson J. at Chatham Spring Sittings, 1893, confirmed by Divisional Court, June 10, 1893.

23 Ont. Reports, p. 99.

COMMON PLEAS DIVISION.

Close et al. v. the Corporation of the Town of Woodstock. Tried before Falconbridge J., 12 March, 1891.

A Municipal Corporation having constructed a drain without by-law for a particular portion passing through private property whereby noxious matter was brought down and deposited thereon, was held liable for damages sustained thereby, notwithstanding that there were excavations on the land but for which the noxious matter might have passed off; the owner not having been bound to leave his land in a state of nature; nor was it answer that the drain was used for similar purposes by others as well as the corporation. In such a case the remedy is by action and not by submission to arbitration.

24 Ont. Reports, p. 12.

QUEEN'S BENCH DIVISION.

York *et al.* v. Township of Osgoode *et al.*, Ditches and Watercourses Act.

Where the engineer of a Municipal Corporation purports to make an award under the Ditches and Watercourses Act, with respect to the making of a drain, the affirmance of such award by the County Court Judge does not preclude the High Court from entertaining the objection that the engineer had no jurisdiction to make the award, nor is such an objection one for the County Court Judge.

The decision by the County Court Judge as to matters over which the engineer has jurisdiction cannot be reviewed by the Court; and whether the plaintiffs were benefited by the proposed work was a matter to be determined by the engineer and subject of appeal to the County Judge.

Judgment by Falconbridge J., 12th May, 1893. Confirmed by Divisional Court, June 10, 1893.

In this case a majority of the owners were required under the Act of 1883, and it was held that "owners" were persons assessed as such.

21 Ont. Appeal Reports, p. 163.

At the Court of Appeal, April 16, 1894, it was decided that "owners" were actual, not assessed owners. This reversed the decision of the lower court, but the term "owner" is now defined in the Act of 1894.

25 Ont. Reports, p. 399.

CHANCERY DIVISION.

Re Jenkins and the Corporation of the Township of Enniskillen.

A township council, finding that a government drain in the township did not carry off the water by reason of the natural flow being in another direction, accepted a report made by their engineer, and passed a by-law adopting a scheme for a new drain, leading from the middle of the government drain into an adjoining township, where it was to find an outlet:—

Held, that the proposed drain properly came within the description of a new outlet, although not at the end of the government drain, and although the former outlet remained to serve to carry off a part of the water; and so long as the proposed drain was designed merely as an outlet for the water from the government drain, it might, under Sec. 585 of the Municipal Act, of 1892, be provided for without any petition under Sec. 569, even although it should incidentally benefit the locality through which it ran, nothing being included in the plan beyond what was reasonably requisite for the purpose intended.

Although a township council is not powerless with regard to the drainage report of its engineer, it is contrary to the spirit and

meaning of the Act that two adjoining councils should agree upon a drainage scheme and upon the proportion of its cost to be borne by each, and that the engineer of one of them should be instructed to make a report to carry out the scheme and charging each municipality with the sums agreed on; for such a course would interfere with the independent judgment of the engineer, and pledge each township in advance not to appeal against the share of cost imposed upon it, to the possible detriment of the property owners assessed for the portion of that share.

And where such a course was pursued, a by-law of one of the councils, adopting the engineer's report, was quashed.

In describing lands for assessment "the north east part," even with the addition of the acreage, is an ambiguous description; and *quære* as to the effect upon the validity of a by-law.

Judgment by Street J., July 21, 1894.

25 Ont Reports, p. 465.

COMMON PLEAS DIVISION.

The Canadian Pacific Railway *v* the Corporation of the Township of Chatham.

Cost of culvert built by railway under agreement with defendants at a cost of a little over \$200. Agreement held to be ultra vires and not coming under Sec. 573.

Judgment by Street J., June 15, 1893, and affirmed by Divisional Court, Rose J., dissenting.

30 Law Journal.

P. 105, Dagenais *v* Corporation of Trenton; p. 687, Stephens and the Township of Moore; p. 730, Harwich and Raleigh.

20 Ont. Appeal Reports, p. 225.

Hiles *v*. Ellice, Crooks *v*. Ellice.

23 Supreme Court of Canada, p. 429.

Upon reference of an action under the Drainage Trials Act of Ontario (54 v. c. 51) whether, under Sec. 11, or Sec. 19, the Referee has full power to deal with the case as he sees fit and to make of his own motion all necessary amendments to enable him to decide according to the very right and justice of the case and may convert the claim for damages under Sec. 11 into a claim for damages arising under Sec. 591 of the Municipal Act.

The referee has no jurisdiction to adjudicate as to the propriety of the route selected by the engineer and adopted by by-law, the only remedy, if any, being by appeal against the project proposed by the by-law.

A municipality constructing a drain cannot let water loose just inside or anywhere within an adjoining municipality, without being liable for injury, caused thereby in lands in such adjoining municipality.

21 Ont. Appeal Reports, p. 504.

Gibson *v.* Township of North Easthope.

Judgment 30 June, 1894, reversing decision of Queen's Bench Division. Withdrawal from petition.

Township of Rochester *v.* Townships of Mersea and Gosfield.

This was a case in which the Township of Rochester undertook to repair that portion of the Ruscom drain in their township which was constructed originally under a by-law of the County of Essex, and under which certain lands in Mersea and Gosfield were assessed, as well as the lands in Rochester, certain work at that time having been performed in Mersea and Gosfield.

The points raised were that the referee had no jurisdiction, and that if he had, the work was legal under the old Act, and upon the facts the appeal should be dismissed, in this the referee held that he had jurisdiction, and dismissed the case upon the facts, Rochester from this decision of the referee, appealed to the Court of Appeal, in which the referee was upheld as far as the facts were concerned but did not decide as to his jurisdiction, virtually disallowing Rochester's appeal.

Decided by Court of Appeal, 1895.

The municipal law requires considerable modelling to meet the ever-changing necessities, but frequently attempts to better it have proved the reverse, yet there is one case in which, in our opinion, a change is necessary and desirable. More particularly is this the case in this part of Ontario where drainage assessments form one of the principal burdens of the farmer. No one is secure from such an assessment and any legislation that can lighten the burden ought to meet the approval of a majority of the legislature, which is composed very largely of farmers or men interested in farming lands. We have now a direct case in point. Some time ago parties who live near the mouth of Sturgeon Creek, applied for relief to the municipal council of Mersea, claiming that their lands were flooded by waters brought down the creek and that they would hold the council responsible unless relief was granted. The lands in dispute are about 35 acres, which are liable to be flooded at any time that a freshet occurs. The council, it appears, has no option in the matter if the petition and demand is in accord with the statute. In accordance with the appeal, they appointed an engineer to examine into the matter and make a report. This was done, the report accepted, and the engineer instructed to make an assessment, which he did, no doubt to the best

of his ability, and in doing so, assessed the Township of Gosfield \$136 for injuring liability. That township appealed and the case came before His Lordship Justice Britton who, after hearing all the evidence, reserved decision. The cost of repairing the drain or enlarging it, so as to prevent the flooding complained of, was about \$1,000 and the costs of reference will be in the neighborhood of \$500 or about \$43 an acre for the lands occasionally submerged. The same trouble is likely to occur again and again, and under the present law there is no redress. The municipality must make the survey and assessment. Were the law so amended that the municipality interested could acquire such land by right of purchase, assessing parties for payment who would be liable were a drain constructed, it would settle the matter for all time, and prevent any demands being made for damages. United action should be taken by the municipalities in Kent and Essex and strong appeals be presented to the Government for redress.—*Leamington Post, February 14th, 1895.*

DISCUSSION.

Mr. Gibson—I had a case last fall in which the party through whose land the ditch would be made (where there was no ditch before) objected to the whole proceeding, on the ground that there was no provision made apparently under the Ditches and Watercourses Act for being recouped for the damage that the ditch would do, and asserted that if I went on and made my award, as is generally done under the Ditches and Watercourses Act, he would enter an action for damages—that it would undoubtedly be a damage to the land. Now, the question is this: Under the Drainage Act of 1894 there is an injuring liability and outlet liability and benefit liability, but under our Ditches and Watercourses Act there is no provision made apparently for a person being recouped for any injury that may be done him over and above the benefit. I have a case in the Township of Vaughan where the party claims that if I go on and make my award that it will be a very great damage to him. Now, does the Ditches and Watercourses Act provide for injury, or is it necessary to appeal to the courts on common law principles for damages? Of course, at the same time I advised the parties that I would make my award in such a way as to do as little damage as possible, and that afterwards, when they got over their temper, they could probably dig the ditch and nobody would say anything about it.

The President—I have learnt that there is a good deal of difficulty in the interpretation of Sub-sec. 5 of Sec. 3 of the Drainage Act in the construction of drainage work. "The assessment for injuring liability and outlet liability provided for in the two next preceding sub-sections shall be based upon the volume, and shall also have regard to the speed of the water artificially caused to flow upon the injured lands or into the drainage work from the lands and roads liable for such assessments." That question, I believe, has been up two or three times before the Drainage Commissioner, and there has

not yet been an engineer who has been able to answer it. What does it mean? An expression of opinion from this Association would be a help to the members who have to work at it, and would without doubt assist the Drainage Commissioner very often in coming to a decision. Does that mean that the engineer is to take that water in flood time and calculate its velocity, or in the normal flow of the channel, or under what conditions?

Mr. Gibson—He would have to consider the difference in the volume before the ditch was made and after.

Mr. Bowman—You may remember, gentlemen, that our Drainage Report last year touched on this point, adjusting between “injuring liability” and “outlet liability,” and our recommendation was that that method of assessment be left optional with the engineer. From what we could tell at the last meeting, very few drainage engineers understood what was meant, and it seems to me that we are not called upon to advise the Drainage Referee how to carry out this Act. They enacted against our wishes, and if they have got into a muddle they had better get out, or repeal it and leave it optional, as we suggested.

The President—If it is something that is unworkable, let us point it out.

Mr. Gibson—What right have they to refer in the Act to the volume of water? They should just let it alone.

The President—Who put that there?

Mr. Ross—The Drainage Commission.

Mr. Gibson—That is hampering the engineer; they should not have put it in at all. He should be allowed to judge between “injuring liability” and “outlet liability.”

The President—Would it not be advisable for the Drainage Committee to formulate an explanation, showing that this on the face of it is something that is ambiguous and absurd, and lay it before the Commissioner of Crown Lands and ask him to have it remedied?

Mr. Ross—The opinion of the Drainage Committee was that we had better not ask or suggest any changes just now; that probably we would understand this Act a little better in a few years. We did not know exactly what some of it meant, and some of these cases I have referred to in my report may be decided, so we thought it better to make no suggestions at present. In the discussion last year there was not a member here who could say why “injuring liability” should be different from “outlet liability,” and we recommended that “outlet liability” would cover the whole case. When drainage work is constructed I don't think any lands should be injured. It should be constructed large enough so that no lands would be injured, and I think that is the intention of the Act. That case I read from Mersea covers “injuring liability” very clearly. Of course, it is the lands that are assessed for outlet that pour water down on these lands that

are assessed for "injuring liability," but it is practically the same as "outlet liability" as far as I can see.

Mr. Gibson—For instance, in making half a mile or a mile of a ditch you make a large cut that separates one portion of a man's land from another; that is a direct damage or injury to that land, and he might appeal to the court as a matter of common law for redress.

Mr. Ross—Under the Drainage Act, you can provide for such things, construction of bridges and the disposal of the material excavated

Mr. Gibson—That is provided for under "outlet" and under the ditch itself, but my land might be damaged materially by putting a wide, deep ditch through it, and I say that is injury.

Mr. Ross—That does not come under "injuring liability."

Mr. Gibson—But I say it is common sense. If the ditch does me a damage I ought to be recouped for it. It should be put in that way.

Mr. Robertson—I think amongst surveyors up west it is very much as it is in other places: there is considerable difference of opinion with regard to assessing for "injuring liability" and "outlet liability." At the same time probably there is some reason for assessing for both and having them assessed separately. I think the intention of the persons who constructed the Act is this, that when you can describe an area that is injured by water being carried down by the construction of drains in higher land then you would assess for "injuring liability." For "outlet liability" you can go up stream on a natural water course for the construction of a ditch that carries water in that direction, as far as you like, even although there may be a certain amount of land along each side of that water course that might be injured more or less. I think the assessment would not come under the head of "injuring liability"; that would be "outlet liability" right to the head of the drain, with the exception of what you would assess for benefit. With regard to the section referring to the volume and flow of water, I think the intention is this: that if there is one water course that carries water from higher land into the drain you are constructing and assessing for with greater rapidity than another one that might come in in another direction through lower land with less velocity, the water that comes from the higher area will get down into the lower land in a greater volume in the same time than the same area draining in from another direction with smaller fall. In that case they should probably pay more.

Mr. Bowman—Have there been any cases under the new Act yet before the Referee?

Mr. Robertson—Yes, there are several cases. There was a case in the Township of Sarnia and Township of Plympton. The Township of Sarnia constructed a drain, some 27 or 28 feet fall, to

the town line, and I think one of the grounds of appeal was that the Township of Plympton should have been assessed for "injuring liability," while they were only assessed for "outlet liability." The Referee held that "outlet liability" was all right, and it was not necessary to assess them for "injuring liability."

Mr. Ross—Was the decision of the Referee that "outlet liability" covered both?

Mr. Robertson—No, but that it was only necessary to assess the lands under the head of "outlet liability." There was no assessment for "injuring liability."

Mr. Ross—I think myself that is the easiest way to get out of it, and I think your definition there is probably the right one. That is the only way I can see it myself; but, of course, all the waters that come down from higher lands above would tend to injure the lower lands as well as water that comes down quickly from adjacent lands. Suppose you had a large area of marsh and 1,000 acres, say, bordering that marsh. There is, say, half a mile where the slope is pretty rapid, perhaps 15 or 20 feet in half a mile, and then up above that there is a gradual rise, would you assess the lands on this slope for "injuring liability" and the upper lands for "outlet liability."

Mr. Robertson—No; I would certainly assess them for both in that case. In my opinion the assessment should certainly be both for "injuring liability" and "outlet liability" where there was a lower level that was injured by it; that is, a defined area that could be described.

Mr. Ross—And this marsh would all be assessed for benefit?

Mr. Robertson—Yes; you would, of course, try to define your limit of benefit. As I understand it, drains are constructed from this higher land to the marsh, thus injuring it. It is necessary for the improvement of this marsh land, or land that is injured, to relieve it from the injury and to improve it; it is necessary to construct a drain. The construction of that drain will benefit this low land; assess this low land for benefit and outlet. Up here we come to where there is no benefit by the construction of that drain, but still those lands pour their water down on this land. Then, what I maintain is this: that all this area should be assessed under two heads, for "outlet" and "injuring liability."

Mr. Aylsworth—What do you call "injuring liability"?

Mr. Robertson—For relieving this place of the water that they pour upon it; they have a right to help to carry it off.

The President—The only question is how to distinguish the "outlet" from "injuring liability."

Mr. Robertson—That is a matter of judgment.

Mr. Ross—You take a case, an acre of land in that marsh and assess it so much for benefit, say \$5; how much would you assess it for outlet?

Mr. Robertson—Well, the “outlet liability” is generally in proportion to the distance the water has to be carried through the drainage work, and cost of that.

Mr. Ross—In that case there is a main drain made across that marsh to the upper side of it.

Mr. Robertson—It is a pretty difficult matter to put it in figures.

Mr. Ross—In what relative proportion would you make that assessment for “injury” and for “outlet.”

Mr. Robertson—Well, of course, the proportion for benefit would have to be determined entirely upon the amount of benefit that was going to be received; and then all the land probably should not be assessed very differently from the same rate per acre if it is all using the same length of outlet.

Mr. Aylsworth—Supposing that upper plateau had not been drained at all—they just depended on the furrows in plowing and it naturally drained itself; could you then assess for “injuring liability”?

Mr. Robertson—I think probably then it would hardly be right to assess for “injuring liability.”

Mr. Gibson—If the upper lands join in the petition for it, then they are in for it.

Mr. Ross—Here is another case from Mr. Baird: “At the reference it seemed to be difficult to draw the line between ‘injuring liability’ and ‘outlet liability,’ in which, in fact, I cannot see very clearly where the line could be drawn. It also seemed to be held that when a man was assessed for benefit that it should be equal to the value of the land when placed in a state of cultivation, which to me seems erroneous, and should only be to the extent that it would cost these lands to construct a sufficient drain.” Can you explain that?

Mr. Robertson—My opinion is this: Supposing these upper lands were in a state of nature; if these lower people wanted to drain their lands, they should construct and pay for a sufficient drain themselves. But as soon as those people begin to pour their water down by artificial drainage, changing it from a state of nature, I think that they should contribute.

REPORT OF COMMITTEE ON TOPOGRAPHICAL SURVEYING.

MR. PRESIDENT,—Owing to the fact that the members of this Committee reside at such widely separated points, it was found impossible to secure a quorum for the transaction of business, except on the first day of this Annual Meeting.

An informal meeting of surveyors interested in this work was held, on the invitation of the Chairman, in Toronto on December 31st,

1894, to discuss the preliminary steps of procedure, at which the following surveyors were present :—

W. F. King, D.T.S., Chief Astronomer, Department of the Interior, Ottawa.
 G. B. Kirkpatrick, O.L.S., Director Crown Land Surveys (Ontario), Toronto.
 John Galbraith, M.A., Professor Engineering School of Practical Science, Toronto.
 L. B. Stewart, O.L.S., Professor Surveying School of Practical Science, Toronto.
 A. J. VanNostrand, O.L.S., Secretary Association O.L.S., Toronto
 V. Sankey, O.L.S., President of Council O.L.S., Toronto.
 F. L. Foster, O.L.S. (of Unwin, Foster, Murphy & Esten), Toronto.

At this meeting, after several hours of earnest discussion, it was decided to ask each member of the Committee to communicate with some country where geodetic and topographic surveys have been made, and ascertain officially the *commercial* advantages that may be expected to follow, especially pointing out the benefit the agriculturist will reap therefrom.

On January 10th, 1895, a circular letter was sent out by the Chairman advising each member of the informal meeting and the conclusion arrived at, and each was requested to communicate with the country set opposite his name, as follows :—

Casgrain, J. P. B.....	Montreal	France
Cozens, Jos.....	Sault Ste. Marie.....	U. S. Lake Survey
Chipman, Willis.....	Toronto	U.S. Coast and Geodetic Surveys
Dickson, Jas.....	Fenelon Falls	Great Britain (Scotland)
Fawcett, Thomas.....	Ottawa	Sweden and Norway
Klotz, Otto J.....	“	Germany
Ogilvie, William.....	(absent in Alaska)	
Russell, A. L.....	Port Arthur.....	Spain and Portugal
Sankey, Villiers.....	Toronto	Great Britain (England and Ireland)
Stewart, Elihu.....	Collingwood	Russia
Tyrrell, J. W.....	Hamilton	Austria

With few exceptions the members assumed the responsibility of seeking the information asked for, but to date replies have been received from the United States only. No doubt, full replies will be received from all shortly.

Your Committee recommends that the Association empower it to consult with the Ontario Government when convenient respecting the action to be taken after the data is received from foreign countries.

WILLIS CHIPMAN,
Chairman.

DISCUSSION.

Mr. Bowman—It seems to be recommended that the Committee immediately upon receiving this information interview the Government. It seems to me that would be a little premature; it would be better if the information were laid before the Association and the members thus informed as to the great advantages to be derived from a topographical survey, so that when the representatives begin to inquire throughout the province we will have a united opinion upon the matter.

The President—It seems to be pretty well settled amongst surveyors that they will unite. The thing is not to postpone it too long ; it takes years to get the slightest movement in these cases.

Mr. Gibson—I think they have gone about this matter in a very excellent way, getting the data that is required. The Government wants facts before they take it up at all.

Mr. Dickson—I think the intention is to get all the data they can and then get together and formulate a report, and at some convenient season interview the Government. I don't think there is a single individual member of this Association but will heartily endorse the scheme, and if it is a feasible scheme it should be carried out. I think it should be adopted in Canada with the least possible delay.

Mr. Sankey—I would suggest that Mr. Chipman just give a short outline of the probable benefits to be derived from it. In that way I think the objection taken by Mr. Bownan, which I think is a good one, that the members of the Association should have as much knowledge regarding it as possible, could be met and the ground covered sufficiently at present.

Mr. Chipman—I might say, Mr. President, that the question of cost is well understood by all engineers and surveyors. It would depend upon the accuracy of the work and the amount of detail work done. The first thing to be done of course is the primary triangulation work, and it appears to be the opinion of the Committee that this work can be best done by the Dominion Government, and possibly the secondary triangles, but that the topographical work, all the detail work, must be done by the Provincial Government and by the municipalities. In the circular sent to the members, requesting them to communicate with the different foreign countries, it was specially stated that we did not wish any information respecting the cost or the benefits to be derived from a military standpoint or the advantages to be derived by navigation. We all know that it is patent to any one that this is not a military country, it is an agricultural country chiefly. The reply I have received from the United States Coast Geodetic Survey may be of some interest to you. (Reads letter in reply to letter of January 15th.)

I regret to say that is the only communication we have received, as stated in the report, but I have not the least doubt but that others will be received very shortly.

As to the remarks made by Mr. Bowman, the Committee concluded that it would be better to take the Government into our confidence at once. We believe that the members of the Government may require considerable enlightening on this subject, and it will take at least one year to enlighten them even up to our present plane of knowledge on this matter. It will take some time, but I believe if we once get them interested in it that we will have no difficulty in getting the work started. The primary triangulation of course must be done first, and if the Ontario Government would urge the necessity of it upon the Dominion Government it would probably be commenced, but we cannot ask the Ontario Government to go on with any work until the primary triangulation work has been commenced, that

is out of the question. We, therefore, decided to first interest the Ontario Government in the proposed work. We must not forget that the Commissioner of Crown Lands is one of the officers of our Association, and I think he should be consulted in this matter.

Mr. Dickson—I do not anticipate that when we go to the Government to ask them to do this that they will do it. It will take some time to work it up, and every member of the Association, and I think farmers as well, might be interested in its behalf. I think we might naturally expect even the Patrons to fall in with it. But I think it will be some time before we get either Government sufficiently interested to say that they will do it, so that we have got to keep at it until we get some substantial progress made.

Mr. Bowman—The explanation given by Mr. Chipman, I think covers what was wanting, and that is that the Ontario Government is not at present asked to make any outlay, only to communicate with the Dominion Government in regard to the advisability of commencing the primary triangles, and I think we can trust to the Dominion Land Surveyors at Ottawa to supply the necessary information there.

Mr. Aylsworth—I think that this survey is going to be a grand thing, even for the farmers themselves, and I think they are the ones we might start with first and educate them. If I understand this topographical survey scheme, it is a large topographical plan just the same as you get up for a sewer system in a city, shows the grades of streets, heights, etc., and it is going to show the water courses and all the depressions and elevations.

Mr. King—It seems to me that the main thing is to get in the information that Mr. Chipman has mentioned, and the Committee is already acting in that line to get information from all countries that have made such surveys as to what actual commercial benefits, etc., might be received from it. If you can get strong evidence in that line it would greatly strengthen the case in this country. As to the cost of triangulation or topographical survey, of course it all depends upon how much detail you put in. I believe a good survey can be made for \$20 to \$30 per square mile, that will be sufficient for general purposes in this country; including plans and everything. I know you can spend a great deal more money on it if you please. The United States Coast Survey made a very full and complete survey of the part of the District of Columbia around the City of Washington which cost \$1,500 a square mile. That goes down to very minute, detail, though; gives contour lines of four or five feet. They made a little model of it and exhibited it at the World's Fair, and it gives a bird's eye view; as it were, of the district. That cost is of course apart from the cost of primary triangulation. In most surveys there are three triangulations, the primary triangulation which covers sides of thirty or forty miles long perhaps. Those are done with the great-

est accuracy. Then the secondary triangulation, which divides the area into smaller triangles of six to ten mile sides, and then the tertiary triangulation, which is a part of the topographical work, but the cost of that is included. When we say that topographical work costs so much per mile, that includes the primary and tertiary triangulation. The greater part of Ontario being flat, the sides of the primary triangles would be short, ten or twelve miles, and the topographical triangulation would be tied on them so that the survey would not be as expensive as the usual topographical and geodetic survey.

REPORT OF THE LAND SURVEYING COMMITTEE.

Your Committee beg to report as follows :—

Several questions on surveying have been sent to your Committee, which questions and the answers to them are annexed hereto. We would suggest that members in submitting questions as to surveys in townships would state the name of township, as this would enable us to examine instructions, plans and field notes under which such surveys were made, and would assist us very materially in arriving at correct solutions. It is to be regretted that more of our members do not take advantage of the "Question Drawer" as a means of throwing light upon the many knotty problems met with in practice. An expression of opinion or interchange of ideas must be beneficial to all concerned.

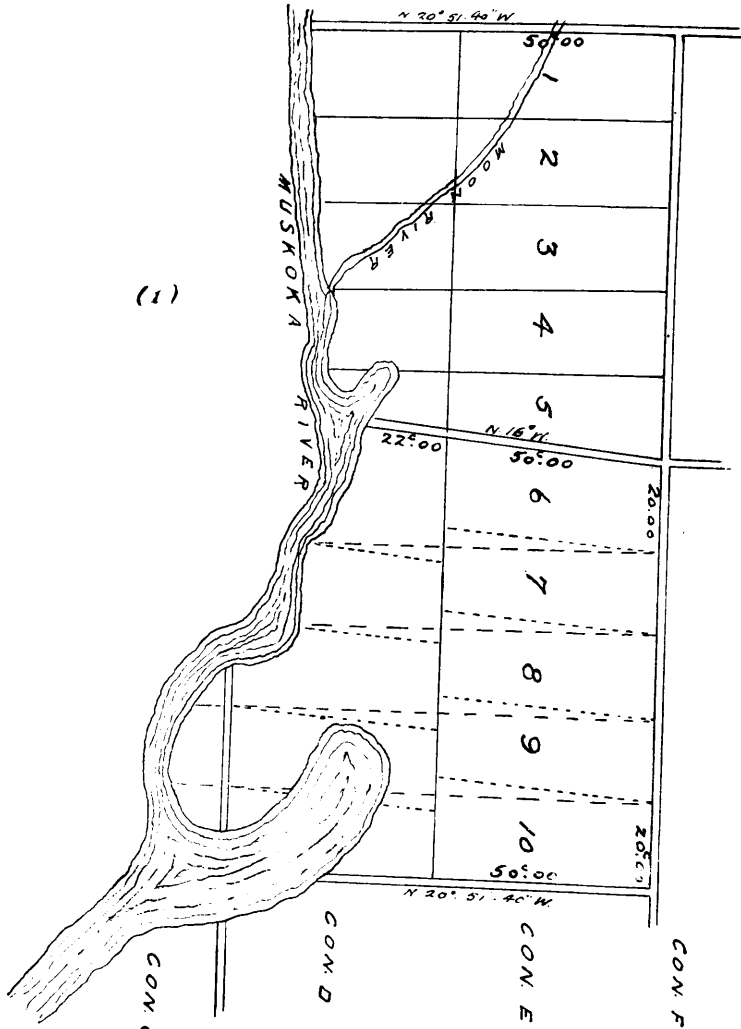
Your Committee would be glad to receive any court decisions of importance met with during the year; also any suggested amendments or additions to the "Survey Act" of 1887, so that they may be laid before our Association at the next annual meeting, and be ready, if necessary, for the next revision of the Ontario Statutes.

All of which is respectfully submitted.

T. B. SPEIGHT,
Chairman.

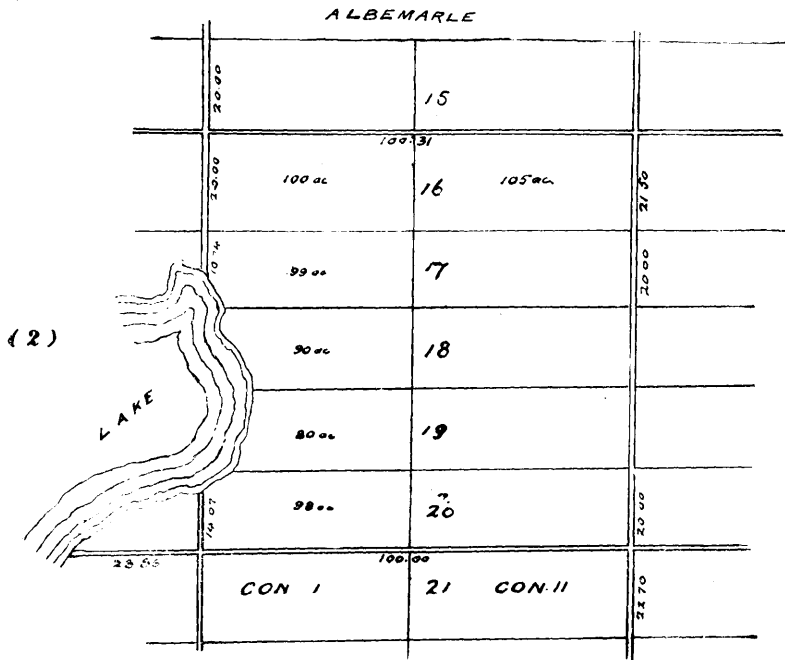
QUESTION DRAWER.

MEDORA



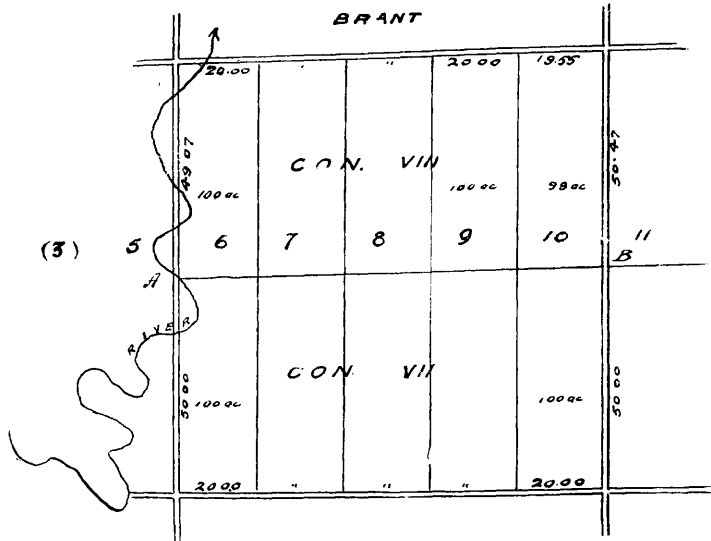
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Question 1.— On which course should side lines of lots 6 to 10 be run?
 Original plan shows bearings of all side lines to be N. 20° 51' 40" W. Asty. Bearing of side line 5 and 6 as run in original survey is N. 16° W. Ast. This side road is plainly marked on the ground. The river is the south boundary of the township.
Answer.— On same course as line between Lots 5 and 6.— (Sec. 59).



Question 2.—In that block, including lots 16 to 20, Cons. I. and II., East Bury Road, there is a part of a lake on the fronts of lots 17, 18, 19 and 20, Con. I., as shown on the sketch. How would you run the lines between these lots, as there were no posts planted at the fronts, being in the lake?

Answer.—Divide widths of broken fronted lots proportionately by measuring along blind line.—(Sec. 54).

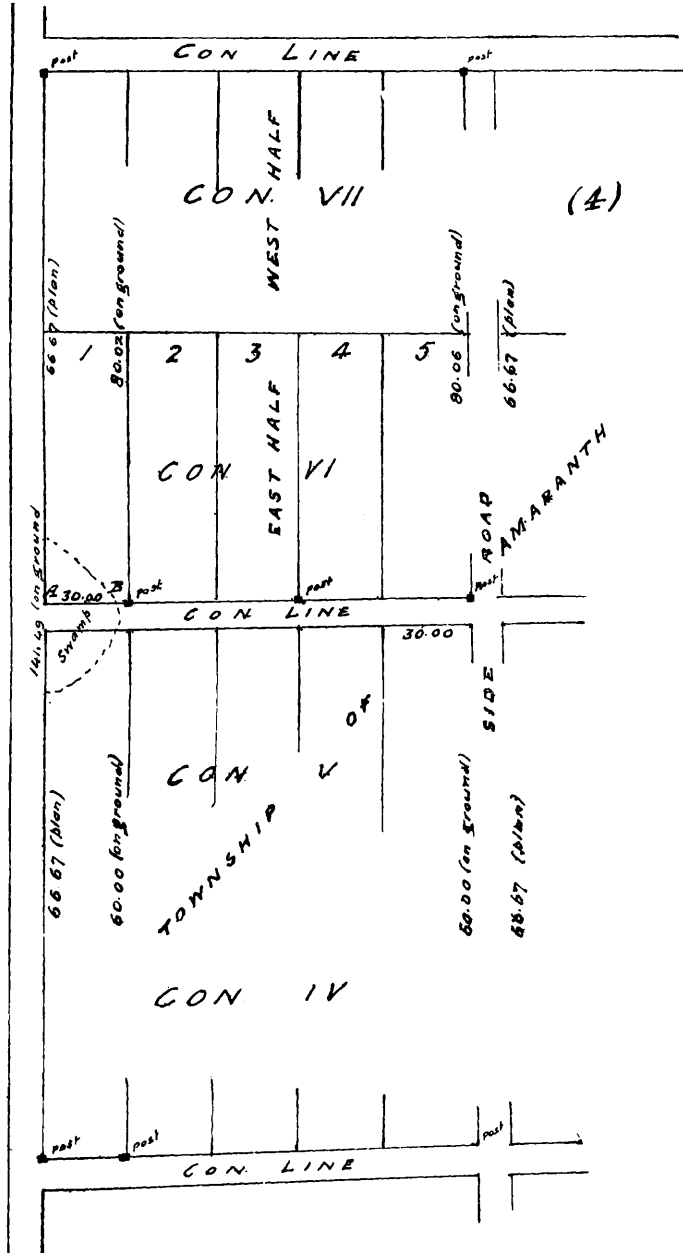


Question 3.—In the block including lots 5 to 10, Cons. VII. and VIII., the post at A is lost, but the field notes give the distance across Con. VII. as 50c. and Con. VIII. as 49c. 07l. on the side road, lots 5 and 6; and on the side road at lot 10, Con. VII., is 50c., and Con. VIII. 50.47. There is a post at B. All the lots except 10, Con. VIII., are deeded as 100 acres. How would you run the blind line in this block? or across lots 5, 6, 7, 8, 9? The concession lines are parallel, though the field notes show different widths.

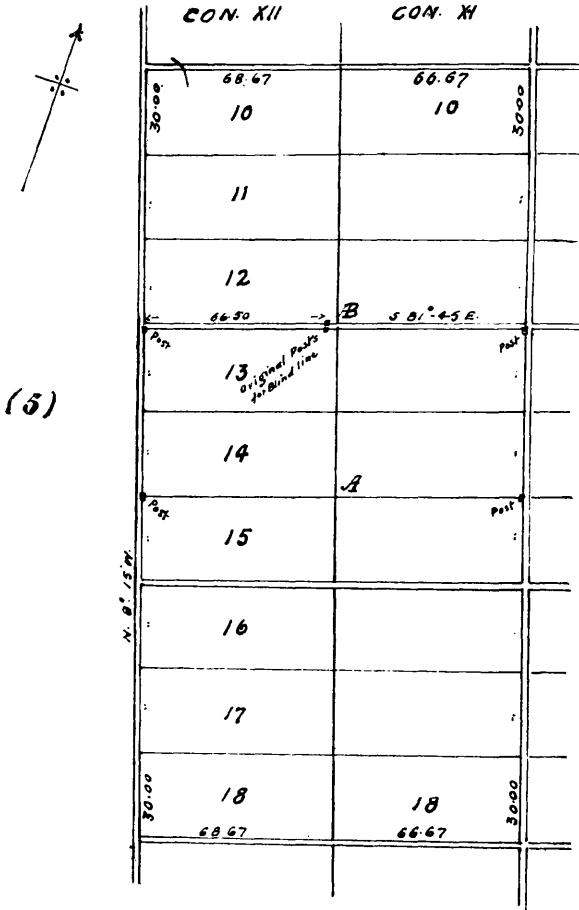
Copy of part of instructions to A. P. Brough, P.L.S., 7th of May, 1850, to survey part of the Township of Brant: "You will proceed to subdivide the residue of the Township of Brant into farm lots of 100 acres each, in conformity with the accompanying projected plan, tracing all concession and side road lines in the centre of the road allowances, which are to be one chain in width, and planting the posts, duly inscribed with a marking-iron, at the distance of 50 lks. from your lines. The lots are to be 20 chs. in breadth by 50 in depth, with road allowances between each alternate concession and every fifth lot."

Original field-notes show blind line posts.

Answer.—For theoretical depths of Lots in Con. VIII, proportion plan depths on side roads. Use depths thus obtained in proportioning for blind line. (See Sec. 57 Survey Act; also pages 96 and 97 of 1888 Report Association, P. L. S.). Accept post at B, if evidence satisfactory.



Question 4.—How to establish A B?
 Concession line between V. and VI. has been opened and travelled on for the last fifteen years, statute labor being done on same during that period. Nothing on ground from A to B to fix line. Township surveyed in 1822.
Answer.—Fix point at A by dividing the four concessions proportionately between undisputed corners.—
 (See Sec. 60). Join A and B.

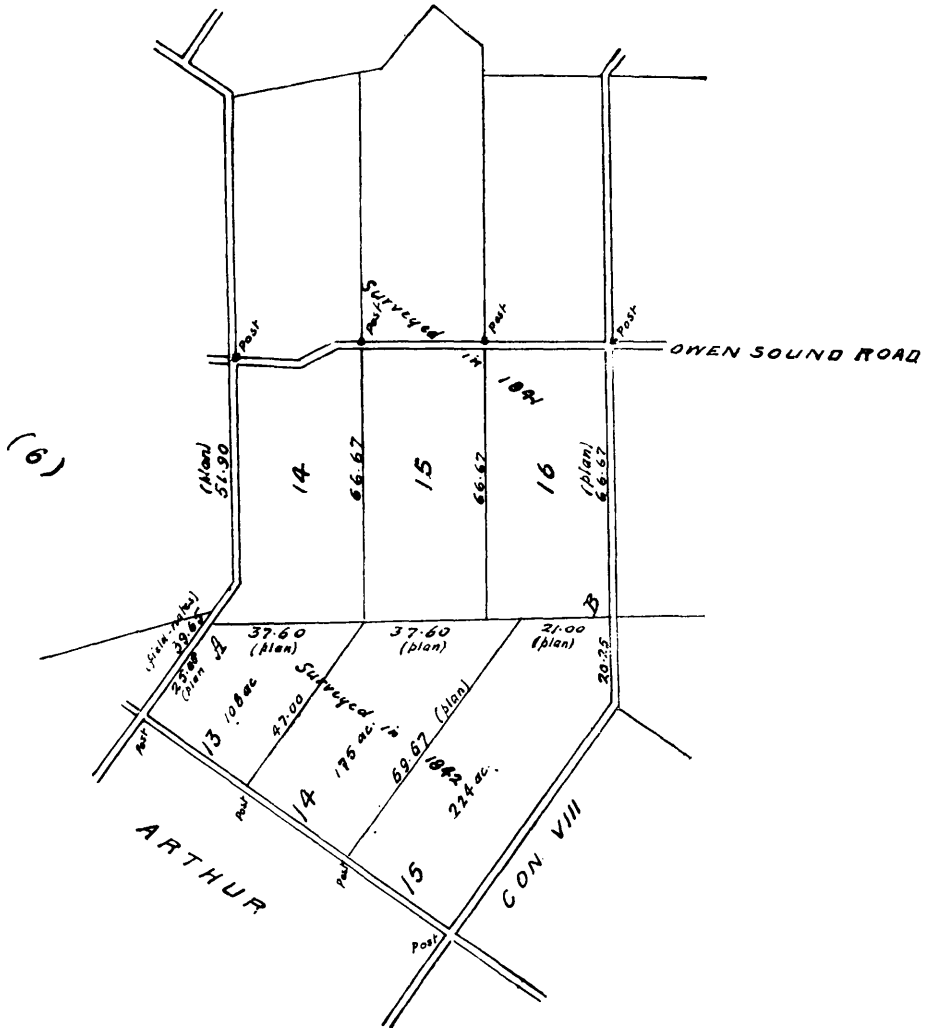


ARTHUR

Question 5.—How to establish blind line A B?

Side roads run originally parallel to north boundary, and lots number from same place. Every second side road run. Concession lines parallel to east boundary of township. In instructions surveyor was not told to plant blind line posts. In report or field notes there is no mention of said posts. Surveyed in 1842 by John McDonald.

Answer.—Disregarded blind line posts as not planted under authority.—(See Sec. 41).



Question 6.—How to establish A B?

Portion to west of A B surveyed in 1842; portion to east of A B surveyed in 1841, by John McDonald, P.L.S. Roads colored as laid out originally. In the instructions he was told to make his survey of 1842 fit with that of 1841.

Answer.—Proportion to fix points at A and B.—(See Sec. 57). No statute to cover the intermediate lot corners. For equitable survey join A B.

Question 2.

Mr. Dickson—I think the law is clear upon it.

Mr. Kirkpatrick—Under the old Act the clauses were so indefinite that when the Act of 1887 was brought in we had a good deal of manœuvring to find the word that would exactly suit. Some would say, just measure it out across, or some were inclined to get into the next concession, but you see there is no clause in the Act to go into the next concession, and it was often found in practice that if you ran from the second concession through—in one case there was a difference of 5 or 10 chains of a jog, and it was going to make quite an insurrection in that particular concession, and it was thought that that was the best way because it was the closest approach to what was intended in the original survey.

Mr. Dickson—I think it is well because it does away with any ambiguity that might arise.

Question 3.

Mr. Gaviller—You would divide it proportionally ?

Mr. Speight—Yes.

Mr. Aylsworth—How do you divide it at A ?

Mr. Speight—Divide it proportionally.

Mr. Sankey—In other words, the field notes as returned govern.

Mr. Aylsworth—Would you divide up for the blind line between lots 10 in concessions 7 and 8 ?

Mr. Speight—Certainly.

Mr. Gaviller—Take between 8 and 9, how would that be divided ?

Mr. Niven—Take the mean of 49.07 and 50.55, that will give the depth at 8 and 9.

Mr. Bowman—It would not do to take the mean.

Mr. Sankey—Well, take the proportion:

Mr. Johnston—How about the original blind line post ?

Mr. Gaviller—In this case I understood Mr. Speight to say that that original stake is not only on the ground but in the field notes in the Department.

Mr. Johnston—Sometimes you will find the stakes on the ground and not shown in the field notes.

Mr. Gaviller—I think in that case they are repudiated by the Crown Lands Department. I have known a case where a surveyor actually posted the line between the concessions and the posts were there to be found.

Mr. Dickson—Taking surveys like this the surveyors are especially instructed not to post the blind line.

Mr. Gaviller—That gives trouble, they put in posts when there were no instructions.

Mr. Chipman—Now as to the line from A to B.

Mr. Sankey—Isn't it possible from that drawing, to put the proportion on between 9 and 10, whatever it comes out ; then you measure up on the ground between 9 and 10 in both concessions and divide proportionally.

Mr. Bowman—But that point is fixed by the stake B, and these measurements while shown there really don't govern as I understood.

Mr. Sankey—They don't govern on the line itself but they certainly govern the rest of the block.

Mr. Gibson—What is the length the line between 9 and 10 was intended to be in the original survey in the 8th concession ?

Mr. Speight—As a matter of fact it does not show it.

Mr. Gibson—What were the instructions ?

Mr. Speight—50 chains.

Mr. Gibson—Then if you want to find the line between lots 9 and 10 the Statute says you must give the proportion of that intended in the original survey. They were intended to be equal. Chain through then and take half and plant your stake. If you do the way you are proposing you might as well draw a straight line across between them. The law requires you to divide the concessions proportionally to what they were intended.

Mr. Speight - But if they were returned to the Department differently and accepted by the Department ? That was shown on the original survey as 50.47.

Mr. Aylsworth—How would you divide up between 5 and 6, Mr. Gibson ?

Mr. Gibson—I would chain through and give the north concession the proportion of the depth to what is shown in the original notes. It was intended to be 50 chains, but the notes show what they are on the ground exactly.

Mr. Gaviller—But Mr. Gibson has before stated what has been the rule of the Committee in former years, that is that they should be divided proportionally as intended in the original survey, half and half, and skewed in to the other point.

Mr. Sankey—You are making a difference between the original survey and instructions ; it is correct according to the instructions but not according to the original survey.

Mr. Speight—When the Returns are accepted by the Department they are *ipso facto* in accordance with the instructions.

A Member—My impression at first was that it should be divided up proportionally, in the way you speak of ; but I believe now, after hearing the matter discussed, that where we find the field notes and on the plan, as in the case at A, 50 and 49.07, then we should divide in

accordance with those figures, but where there are no figures on the plan as between 6 and 7 and the other lots, the instructions say that they are 50 chains, and it seems to me that we should divide on that basis.

Mr. Jones—Do you know what the chainage was on the ground for the east limit of lot 10?

Mr. Speight—I don't know what that was.

Mr. Jones—Because the question would come up again, while the instructions might have been 50 chains each the original survey might have been returned as 50.47, and then the question might come up, when it was chained on the ground it might be only 50 chains or 49½.

Mr. Chipman—What is the actual chainage from B to that concession line?

Mr. Speight—These figures are taken from the plan returned by the surveyor. On the ground the stake at B is midway between the fronts of concession 7 and 8. He says both sides are parallel.

Mr. Aylesworth—I think that between 5 and 6 ought to be divided up in the proportion between 50 and 49.07.

Mr. Jones—He may mean by saying they are parallel that they are simply returned with the same bearings and intended to be parallel.

Mr. Sankey—You can't discard the post at B no matter where it is.

Mr. Gibson—Is that a double front concession?

Mr. Chipman—I understand that Mr. Gibson would run the line between 8 and 9, and make the line in the 7th concession the same length exactly as the one in the 8th when the original field notes show that the lines in the one concession are not the same as the other.

Mr. Miles—I ran a blind line like that in the County of Bruce and I made the length of the lots 7, 8 and 9 all equal.

Mr. Sankey—What is the proportion in depth intended in the original survey?

Mr. Gibson—If you take up the patents you will find it is 50 chains.

Mr. Gaviller—The question is, do the plan and field notes on record over-ride the instructions? I think there is no doubt about it. The surveyor was not instructed in the first place to make these broken distances.

Mr. Gibson—In the first place the instructions are that in laying out a section like this no blind line stakes should be planted at all, but they were planted by surveyors; I know when I was a boy we put down mere pickets. And in this case the surveyor is expected to go back and he divides up the proportion. The point B stays where it is because it is the original boundary passed by the Crown Lands.

Mr. Sankey—On the same principle you have got to adopt what the Crown Lands adopted in receiving that plan with various widths ; one governs as much as the other.

Mr. Gibson—If you look up the patents you will find they are 50 chains each.

Mr. Speight—Suppose these lots are all shown 20 chains in breadth, except lot 10, 20.50 chains, how would you do ?

Mr. Gibson—I would give that lot the proportion of the whole breadth ; if there was a surplus on it I would give it a greater width, and the others proportionally.

Mr. Kirkpatrick—Supposing you are asked to describe this without going on the ground at all ; you take that block or section and there are the distances. Now you are asked to supply distances. Could you commence at the north-west angle, we will say, on No. 6, thence due east 20 chains, thence due south 50 chains, thence due west 20 chains to the sideroad, thence due north 49.07 chains ? Is that the way you would describe that ? Would you not calculate it in proportion ? Take that 49.07 and 50.47 and supply on the paper on each sideline there the calculated distance. If you plotted that, it could not be 50 chains and a straight line because there is 49.07 at one end and 50.47 at the other. Now enlarge that to a very large scale and it won't be 50 between 6 and 7. I think you would put on the proportion as it is on the plan and field notes, then go on the ground and lay off the depths in that proportion.

Mr. Gibson—How do you know the concession lines are straight ?

Mr. Kirkpatrick—I am saying without going on the ground at all. You are writing a description from the data that is there ; would you make 50 chains there ?

Mr. H. H. Gibson—There are none shown on the plan ; why not just describe it without the dimensions at all, just describe it due south to the rear of that lot ?

Mr. Chipman—I think if I were a surveyor and called upon to give a description I would begin at the north-west angle, thence along the front of the lot, then south to the rear of the lot so many chains more or less.

Mr. Sankey—By not giving distances you are just putting off the evil day.

Mr. Davis—What we want to know is how to run between 8 and 9 ?

Mr. Sankey—Is there any difficulty at all in calculating from the plan in the Crown Lands Department the lengths of the sidelines in concession 8 ? Is there any difficulty in getting the proportion of the length of each sideline between the east of 6 and the west of 10, as shown on the plan on record in the Department ?

Mr. Davis—No.

Mr. Sankey—I would submit that the first thing a surveyor would have to do would be to supply these distances on the plan, then go on the ground and measure through on the sideline across 7 and across 8 and divide the distances you find on the ground in the same proportion as that plan gives. You are doing it equitably; you are doing it as it was intended in the original survey and making all allowance for incorrectness in the lines between 7 and 8. It may not be correct, but you are giving the man the proper proportion he is entitled to.

Mr. Gibson—I have been speaking of the patent, what the intention was.

Mr. Kirkpatrick—You are giving one man 50 chains and giving him his 100 acres and you are not giving the other man his.

Mr. Gibson—If that is a double-fronted concession you would have to divide it on the principle of half and half anyway; then you would take half the depth.

Mr. Davis—I see no reason why we should take the measurements at the east side of 10. It strikes me we must deal with that line by itself. If no distances are given in the plan or field notes, then we must take those that should have been there, or intended to be there. It is a question that comes up in nearly every surveyor's practice several times a year; it is one of the most common occurrences in surveying. The way I have been doing it is this: I have chained through on the line between 8 and 9 without any reference to the other ends of the lot. That concession line might be crooked; both of them might be crooked.

Mr. Sankey—Does not the Act say you shall divide them equally if so intended, and if not, then the proportion as intended. Does not that show that it was not intended, and was not in fact equal?

Mr. Davis—No, it does not. That plan merely shows that the line between 10 and 11 is not equal; that plan shows that the line between 8 and 9 is equal in the 7th and 8th concessions.

Mr. H. H. Gibson—The plan shows it was never a complete survey; it is only just an outline survey.

A Member—I have a survey down in Ontario where I was instructed to put in these posts in that blind line, and I put them in under instructions.

Mr. Gaviller—Was that a re-survey?

A Member—No, an original survey.

Mr. Gaviller—I think the Act has some extra wording in it so as to endeavor to make it plain. It says—"That is to the centre of the space contained between such alternate concession lines, if the concessions were intended in the original survey to be of an equal depth, or if they were not so intended, then to the proportionate depth intended in the original survey, as shown on the plan and field notes." Now the intention there would be the instructions issued to the surveyor, not what his field notes showed at all. I

don't think you can go outside of the instructions as far as intention is concerned. Then whatever these field notes show, the way we have ruled before is that that simply had reference to the side of the lot next the sideroad, and then divide according to instructions, that is the intention, and that is to the centre of the block for the interior lots. Chain it through and divide it equally, that is, between 6 and 7, 7 and 8, 8 and 9.

Mr. Sankey—How about between 5 and 6 ?

Mr. Gaviller—That is actually on record.

Mr. Dickson—I understood that he was instructed to plant that concession post.

Mr. Speight—No, there were no instructions given.

Mr. Dickson—Well, I would discard it altogether.

Mr. Gaviller—It is shown in the field notes.

Mr. Dickson—It is just one of these things that could be very easily overlooked, and I would discard it altogether if I found that he was instructed not to plant these posts.

Mr. Gibson—I would require an awful lot of swearing to prove that that stake was the correct one. I would not believe that was the stake unless I found the distances correspond exactly with it.

Mr. Dickson—Do the deeds show equal area ?

Mr. Gaviller—They are described as 200 acres.

Mr. Dickson—I assume that all the lots are 20 chains wide, east to west. On the plan do they all show it ?

Mr. Speight—Yes, they are all deeded 100 acres.

Mr. Chipman—How many here present would run the line between 8 and 9 and then divide equally between the two concession lines, or how many would do it in some other way ?

Mr. Gaviller—Suppose we confine it to the question of how the line between 8 and 9 shall be defined.

Mr. Dickson—I will move that the blind line at the point between 8 and 9 in the 7th and 8 and 9 in the 8th concession be located by ascertaining the distance between the two concession lines on the ground, and then dividing that equally.

Mr. Jones—I will second that.

Mr. Niven—I cannot vote on that motion until I know whether the surveyor was instructed to plant posts at B and A.

Mr. Speight—I have read the instructions and there is no mention in the instructions about planting a post any place in the whole township. (Reads instructions).

(The motion was then put—In favor of motion, 15 ; against, 11.)

Mr. Aylsworth—Now I would like to make a motion whether that post B would be accepted or not. I move that the post is not accepted.

Mr. Bowman—Before putting that motion I would like to speak in regard to the instructions. If I remember Mr. Speight's reading of them they were that the surveyor was to run this line in the middle of the road allowance and to plant his posts, properly marked, 50 links from this line. It does not say what post; it covers that post at B as well as those on the front of the concession. His instructions plainly cover the planting of that post. Then that certainly would govern.

Mr. Sankey—I would move that the instructions do cover the planting of that post, and that that post at B was planted under instructions.

Mr. Bowman—I will second that.

Mr. Aylsworth—I say it should not be accepted. I claim these are general instructions and the practice has always been not to plant a post there.

Mr. Gibson—But they were approved of by the Government and handed in.

Mr. Kirkpatrick—As a matter of fact those posts were found to be there on the ground; it was found in practice that those conflicted and the change was made. They were told expressly not to plant those posts, because there would be the place between one end of the section and the other, the center spot? If a man chains off 50 chains and puts down a post, ten to one when he gets to the upper end he is not 50 chains from it. Therefore that conflicted, and my impression is that the idea was that instructions were changed or made more perfect by saying, "Do not plant those posts."

Mr. Aylsworth—If that is the case I will change my motion, if there has been two sets of instructions made. I thought there was only one general line of instructions.

Mr. Dickson—I am inclined, after hearing the instructions read over again, to think that it was certainly planted under instructions.

Mr. Sankey—The instructions as read by Mr. Speight would authorize the surveyor to plant that stake at B, and as far as that stake governs and that the surveyor is satisfied by information on the ground that that is the original stake, he will be bound to give it whatever consideration any post planted under those instructions is entitled to.

(Mr. Sankey's motion was then put—in favor of motion, 16; against, 2.)

Mr. Chipman—I think we should re-consider that; at least leave it over till next year.

Mr. Aylsworth—I think that is a good idea, I would like to have those two sets of instructions Mr. Kirkpatrick talks about.

Question 4.

Mr. Davis—I would produce the line.

Mr. Chipman—To my mind it would be perfectly absurd to join those two points along the town-line and divide it proportionally.

Mr. Gibson—Suppose there was only one stake there at the north-east corner of 5 in 6; the problem is to fix the south-east corner of lot 1.

Mr. Dickson—I had a case exactly similar to that. I was running out a concession line under instructions from the Crown Lands Department, and I found the post between 30 and 31, which should be about 46 chains. I remember the one concession was exactly the size and the other was some trifle over 80 chains; and I made an equal division of the property and skewed it across the last lot, and the accuracy of my survey was never questioned. It was confirmed in the Department, and the parties themselves concluded they would leave it where it was before; settled it by taking the old road where it was, and allowed each man to keep what land he had.

A Member—I had a case similar to that where the parties agreed to produce the line down to the boundary the same as it would be there between A and B.

Mr. Kirkpatrick—When I was serving my time we were making a re-survey of a whole township under instructions from the Department, and we found a post identical with the one mentioned there, B, and we found none on the south boundary, and my recollection is that we cut it off at an angle of 45°, and that road allowance is there to the present day. The surveyor I was with divided it up equally because the concessions were shown equal in the original survey.

Mr. Gibson—I can assure you that there are any number of cases which have been reported to the Crown Lands Department and approved on this principle, that if there has been an old established road between concessions 5 and 6, traveled and used and fenced, and if you can find the points, 1, 2 and 3, and C, B, and D, you have three points in the line and it is assumed that the line is not lost, when you have three points or two points. Again, the statute provides that the best evidence must be taken, and I would accept a straight line by production in a case like that. The best evidence is that there has been an established road there, and the presumption is in favor of the straight line. That is the practice of the Crown Lands Department; but if that is bush land I think the township council should close up the original and open a new one.

Mr. Speight—I will just read that clause about “the best evidence the case admits of.” (Reads).

Mr. Gibson—The statute says that if “the whole concession line is lost,” then you should chain through and divide proportionally. If two points can be found you join them, but if, as in this case, there is the end only of the concession line lost you will have to be very careful. In this case, the general practice in old settled sections is to produce the line.

Mr. Sankey—Has any gentleman ever had experience of a gold mine being on that little piece?

Mr. Gibson—Then you will have litigation decidedly.

Mr. Dickson—I would like to draw attention to the matter of how posts are now marked in Government Surveys. They used to be marked with a marking iron, but last summer, when inspecting Crown surveys, I found only one township where 12 posts were marked with a marking iron, the posts in the others being done with a pocket knife. Now I think they look very ugly: and in examining old posts I have heard the question asked, Is it marked with a marking iron? If it is, it is the original post; but if it is marked with a pocket knife, then discard it altogether. The instructions require it to be marked with a marking iron, but it is simply disregarded.

Mr. Niven—It is very difficult to get a decent marking iron; I have never come across a really good one. Somebody ought to invent one.

REPORT OF ENTERTAINMENT COMMITTEE.

MR. PRESIDENT,—Your Committee on Entertainment for this year have to report as follows:—

In view of the satisfaction expressed by members of our Association regarding the suitability of the rooms in the Canadian Institute occupied by us during the sessions of the last two years, they were re-engaged at the same rental for this meeting.

In answer to the usual queries regarding the annual dinner, replies to the number of thirty-four were received. Twenty of these were from members regretting their inability to attend, and but fourteen from those who accepted. In spite of this disparity of numbers, the Committee decided to hold the dinner as usual, as the acceptance of others not heard from could be counted on as usual.

We were not disappointed in this assumption, and at the time appointed for the dinner—8 o'clock p.m. on the 27th February—it was found necessary to provide for 40 people, instead of the smaller number that our replies led us to expect.

This number included six invited guests: Walter Beatty, Esq., O.L.S., and M.L.A. for Leeds; Mr. Aubrey White, Assistant Commissioner of Crown Lands; Mr. E. H. Keating, City Engineer of Toronto; Mr. Sims, representing the Engineering Society of the School of Practical Science; Mr. Wright, vocalist, and his accompanist.

Letters regretting inability to attend were received from Hon. A. S. Hardy, Commissioner of Crown Lands of Ontario, and from Capt. E. Deville, Surveyor-General of Dominion Lands. We were also disappointed at the absence of another invited guest, W. F. King, Esq., D.T.S., Astronomer of the Department of the Interior, who, though present at our meeting, was obliged to leave for Ottawa the day of the dinner.

After showing a due appreciation of the excellent menu provided by our host, the usual patriotic and other toasts of "The Queen," "Canada," "Ontario Legislature," "Engineering Societies," "Our Association" and "The Ladies" were honoured with the usual enthusiasm. Appropriate volunteer toasts were then proposed and happily responded to.

The excellent character songs given by Mr. Wright were well received and heartily encored. The list would have been longer had not the accompanist been suddenly called away by a message announcing serious illness in his family.

Several songs were afterwards volunteered between the toasts by members, which, though not comparable to our professional guest's brilliant efforts, were, no doubt, duly appreciated.

I have to acknowledge the able assistance of my fellow-committee-men, and beg to suggest the placing of the chairmanship in other hands, as a change in this respect would, no doubt, be beneficial.

An account, showing the receipts and disbursements of the Committee, will be placed in the hands of the Secretary of the Association, which can be examined by any member.

Respectfully submitted in behalf of the Committee,

FRED. L. FOSTER,

Chairman.

PRESIDENT'S ADDRESS.

GENTLEMEN OF THE ASSOCIATION OF ONTARIO LAND SURVEYORS :

I have much pleasure in welcoming you to this, the Tenth Annual Meeting, the third since our incorporation.

We have lost by death one of our older members, during the past year, Mr. William Robinson, of London, who died on the 11th of October, at the advanced age of 82 years. He was a bachelor.

I learn with pleasure that our various Committees have had a considerable degree of success in the various duties assigned them. Our Biographical Committee has secured a lot of valuable data relating to our early Surveyors—data which would have been lost forever, had it not been for their efforts.

Our Polar Exploration Committee are bringing our Association before the geographical and exploration congresses of the world.

It may not be an unprofitable task if we glance backwards, and consider on this the anniversary of our first decennial period, what has been accomplished during our existence.

Our old Surveyors lacked *esprit du corps*. When two by chance met, usually on opposite sides in court, it was some such meeting as the emissaries of hostile camps, each regarded the other jealously and suspiciously. Thanks to the good feelings, brought about by our Association, in these meetings, we now meet each other as professional gentlemen.

During the past nine years we have furnished nine volumes of Proceedings of our own Association besides thirty-six volumes of the Proceedings of the various State Associations in the United States. Scattered in these forty-five volumes is a vast deal of extremely valuable data, such as cannot be elsewhere found, It is useless to search the text books, for they are written to enforce general principle. The paper usually has an exact case which helps us out of the hole we were in. Our Act was in a chaotic state ; we have had it very much improved. The Ditches and Water-course Act and The Municipal Drainage Act were also in a deplorable state. It is to this Association the credit is due of inaugurating a remedy for the defects and by the aid of its members has helped to place upon the Statute Book Bills which, while they may not accomplish all we hoped for, are at least a marked advance on what preceded them. We may hope for more drains as the result, and better drainage means a healthier and more prosperous community.

And when we consider the changes being brought about with bicycle, electric motive power, and improved systems of transportation we see where the farmer's market for his horses, hay and oats have

gone to. Our Dairy interests to-day supply the Ontario farmer with ready cash for his various wants. But in the transitional stage from the old to the new, the country as a whole has suffered and it would be unreasonable on our part to expect that we alone should be exempt from the general dullness of business.

We shall have to study economy closely in any work which it falls to our lot to carry on. Do not spend one dollar that can be saved. In this way our public works may hope to earn a reasonable return on the capital invested in them.

In union there is strength—united we stand, divided we fall. These are troublous times in the commercial world, and it behoves us to do our part to protect ourselves and to seek to hold what we have gained. At the annual meeting of the Canadian Society of Civil Engineers this year, generous tribute was paid to the fact that the Ontario Association of Land Surveyors was a strong united and aggressive body, incorporated by Statute and therefore occupying a point of advantage they hope to reach.

We have yet much to do. Our Topographical Committee should submit a project to begin a Topographical Survey of the Province. Our various Committees are at present consulting Surveyors for the profession. More may be done towards assisting the younger members. Our Legislation Committee should have in mind improvements to our Act. Our examinations should be made broader so as to include Mechanics, Hydraulics, etc., working up gradually to the standard exacted for a Borough Surveyor in England.

In conclusion, gentlemen, I trust that the same spirit and harmony of good fellowship will be found in this meeting that has characterized those in the past.

PAPERS.

[*This Association is not responsible as a body for any opinions expressed in its Papers by Members.*]

A HANDY METHOD OF INDEXING OFFICE INFORMATION.

By D. D. JAMES,
O.L.S., C.E., Toronto.

THIS paper is presented with a consciousness of the fact that there are and have been many excellent methods of indexing office information all more or less peculiarly adapted to the circumstances under which they have been created. The author believes that the success of any system of indexing depends on its being adapted by its users to the particular circumstances under consideration, and that this adapting is a matter almost of mathematical calculation. For having our information of whatever nature duly designated, filed, and stowed away in a shape such that knowing the designation of any piece of information we can immediately turn it up, the problem is logically reduced to this. In any particular case the unknown quantity is the designating figure or letter, while the known quantity is some definite or indefinite knowledge of the information itself. Now, the index must be some method of arranging what will be the known definite or indefinite information in such a manner that we can obtain the unknown designating letters and figures from it.

Now, before going further, it will be necessary to dwell on the particular nature of the information for which the system about to be explained was intended. The information is, all information, of whatever kind, which an Ontario Land Surveyor collects in the pursuance of his duties as an Ontario Land Surveyor. To begin with, the Land Surveyor is required by Sec. 70 of the Act to "keep exact and regular journals and field notes of all his surveys and file them in the order of time in which the surveys have been performed, and shall give copies thereof to the parties concerned when so required," etc. The filing in order of time here seems to be a hint of the method which the surveyor should employ to find the information when required to give a copy. But all surveyors know that to attempt to find the information this way, especially in a long established surveyors' office, would be attended with annoyance and besides wasteful of time just when time would be most valuable. Besides this the

surveyor wants back field notes himself to help him, in other work in the locality, and he has no idea perhaps of the names of clients or of the dates of surveys made there. So there must be some method of indexing this information so as to be readily turned up. Then, besides field notes, the surveyor must for his own benefit keep copies of all plans he makes and generally keeps copies of all plans on which he has had to make a survey at all. The reports also which are given by a surveyor in the shape of descriptions and sketches may be regarded by some as worthy of indexing along with the other information. Now, seeing that the information consists of Field Notes, Plans and Reports of Surveys, we must decide what element we shall use in making the Index. We have (1) Date of Survey or Plan, or of Report, (2) Owner or Agent concerned, (3) Locality of Property Surveyed, as probably known elements by means of which we expect to turn up our information. The best possible method of indexing will be one in which we can find any piece of information from a use of only one of the above elements providing that we can be certain in every case that we shall know that element. Take the first element mentioned, may we always expect to know date of survey in hunting for information? No, often not. Thus we see that the plan hinted at in the Surveyors' Act is not general.

Let us try the second element mentioned. Do we or our clients always know the name of the Owner or Agent for whom the survey we hunt for was made. No, we do not. This like the first is a mere incident of the survey. Now, lastly, do we or our clients always know the locality in which the survey was made. Yes, certainly; otherwise our clients could hardly know what they were talking about. So our conclusion is to have an index depending on locality. One way to do this is by means of streets. A large book like a ledger may be used, an account, as it were, being opened out to each street. On the right half of each page the cross-streets, between which the information lies, are given and on the left half is the book, page, cabinet, drawer or file number needed to find the information. The entering on the pages is made as the information is gathered. This system is in use in at least one office in Toronto with regard to field notes, but why should we not use it for all information. Such is the method clearly outlined in "The Michigan Engineers' Annual for 1894," by G. M. Ames, where engineering notes of all kinds, profiles, and plans are all indexed promiscuously as far as anything other than locality is concerned.

Some surveyors depend on an index according to registered plan numbers to find their plans—but sometimes we have private plans on file which cannot be reached by such an index. This would not occur in the index spoken of above.

Now, a large plan would need to be indexed on more than one street, and so would extensive field notes, and if we have so much information under one street heading it will surely take time to single out the information we want, and it thus becomes necessary to further classify, especially in the case of a long street. This could

be done by allotting so much space for each block under the same street heading. The space needed would be probably proportional to the length of the block. We find, then, that our index has assumed more or less the proportions of a plan, and such we might make it only without depths shown. Or, if we have a plan on a large scale, it would make an admirable place to index all information. Such is the handy method which I wish to bring forward in this paper. This would suit well in some offices, for, perhaps, the surveyor has drawn up a plan of his whole district in the hope that he could put all his information on a large scale plan, and has found at last that he has no confidence in second hand information—*i.e.*, information put on the map from field notes or plans by some unreliable office boy or assistant—and so throws aside this plan, which could be easily turned into an index. An inexpensive method would be to use any atlas or compiled plan which has been published in the district, and if it were considered undesirable to mark up the atlas by index marks a tracing might be made inking in only the principal outlines and names of streets, etc., or tracing linen could be pasted by one edge over the plans in the atlas and the indexing could be done on the linen, the atlas plan underneath showing the locality to which the index marks refer. Goad's Atlas of the City of Toronto would do admirably for this purpose, and it might pay a surveyor here to have a duplicate copy solely for an index.

The method would require a plan wherever there was work done, but it is evident that a smaller scale would be sufficient the farther the survey were from the particular surveyor's headquarters. An atlas of Ontario would be the outside limit for an Ontario Land Survey. Then, perhaps, he could use his county atlas for nearer surveys and so on.

On the index map the information should be written with a fine pen and as concisely as possible, as, F.B., 1—21, for Field Book No. 1, Page No. 21. Registered Plan numbers and the corresponding office file numbers should be put together, the Registered number being distinguished by a circle or brackets. If the Registered Plan has not been drawn by the surveyor, but he has it copied in a sketch book, he can index opposite the Registered Plan : No. S.B., 1—81, for Sketch Book 1, Page 81. Then, if there are private or unregistered plans these can be indexed also. Thus, everything can be indexed in one and the same system.

When, in the course of years, an index plan gets pretty well filled a new one can be begun on a larger scale for that district, the index numbers being easily transferred, or the old plan may be used as an index for all surveys before a certain date, and the new one may be used only for new information. Recent surveys can be distinguished also by the higher designating numbers used, so that no fault can be found with the system in that old and new surveys and plans are mixed up.

Further, we can turn up plans without a knowledge of their registered numbers and an indefinite knowledge of locality will serve

to turn up any information in the office. The bare skeleton of this system then consists in an index map and the writing of a letter and the number upon it for each piece of information in the office. This indexing must be done very carefully and so as to indicate as well as possible the extent of the information, and the references may be thus entered sometimes twice or in large letters.

Of course a plan index, by means of which we can turn up registered plans from a knowledge of their registered numbers, would, perhaps, be convenient, in addition, and would serve a good purpose if there were errors in indexing on the general index map; but it would not be essential.

So also we may have an inventory of plans in the office, in order of time, as filed, so that we may be protected from loss of them. And with field notes also we may have an index in the back of each field book. It often proves useful in the field if we have lost the page in the book on which our information is. All these things, though, could be dispensed with in times of great pressure of work. Another thing worth mentioning is, that if it is thought necessary to have an index by means of which we can turn up information from a knowledge of the client's name we can accomplish it by means of the ordinary account ledger; for in it we can turn up the man's name and account and there find the order book page, entered there for that and other purposes. In the order book we can find the locality and hence the information from the general index map or we may have the field book references entered in the order book so that we need not go to the general map index.

In closing I would say that to me there is no question of the great convenience of the general map index; the only question seems to be that of getting a suitable map to index on, for if too small a map is used great slovenliness will no doubt result.

DISCUSSION.

Mr. P. S. Gibson—I think this is one of the most important papers we have to discuss to-day. In the cities you have your wards and streets, but with a country practice mixed up with a city practice it is quite a problem. My rule is to have a field book about 6x8 inches which I carry with me and make my sketches in the field, and write up the whole particulars. Sometimes I write the affidavits and enter them right in the field book too, so if I am called upon to give evidence in court, there I have a picture of the whole thing with me. Another advantage is when you do your work in the field and have it well worked up there you are sure it is right. An old surveyor once said to me, "Peter, the first thing you do when you are making a survey is to make up your notes as perfectly as you can and then sit down and explain to the farmers what you have been doing; and while you are doing so you will generally find you have made a mistake somewhere." I have the field books carefully tinted and written up so that I can distinguish the portions I want to work upon. I

write a full description of of everything I have done. If the parties give me instructions to do it as I please and mark everything, I put it down that way, but if they don't want to go to too much expense, I do it to suit them; and when I get to my office, may be some rainy day, I index these books, the township, the concession, lot, year, month and day, the pocket in which these descriptions go, the owner of the property and the surveyor, too, because sometimes I have field notes of other surveyors, and these I classify in the same way. I always copy my descriptions of property in my letter book; and I have an index in my letter book on which is entered up the concession and lot, the date and page. Now I have purchased about fifteen or twenty pretty large blank books, and I am going to index all my notes and all my father's notes, and copies of registered plans—and I have thousands of them. Every lot will be entered in these books, every survey, description and plan I have that relates to it goes right down on that one lot.

Mr. C. F. Aylesworth—As far as my practice goes, I have a large blank book, and I write down the different townships in that book, and then I go over the field books once every six months or so and enter under each township the work done in that township, the concession and lot. That is as far as country practice is concerned.

Mr. Chipman—I think the method I explained to this Association several years ago is, to my mind, the best yet brought forward; that is to keep the books exactly as they are kept in the registry office. Open one page or part of a page for a lot in a certain township, and index in that every note you have, plans and everything else. As soon as a field book is filled with notes, "post" it into your index book. You have then everything included in that, not only your notes, but all notes and plans in your office. I don't think the plan suggested by Mr. James would answer for ordinary country practice.

[This Association is not responsible as a body for any opinions expressed in its Papers by Members.]

FLOOD PREVENTION WORK AT BRANTFORD.

By C. C. FAIRCHILD,

Ontario Land Surveyor, Brantford,

DURING the winter of 1893-4 the low lying portions of Brantford were visited by two very severe floods, the first being on December 24th, 1893, and the second on March 5th, 1894. The latter, which was, perhaps, the more disastrous, owed its extreme height to the ice jam which took place at Two Fish Islands about a mile below the city.

The water at its greatest height stood at about 71.80 on the city levels at points above the dam, or about one foot higher than the last severe flood in 1887, while, below the dam, it reached an elevation of 66.80 at points east of Market street, or about three feet higher than in 1887.

The City Engineer, Mr. T. Harry Jones, A.M., Can. Soc. C.E., reported to the Council on January 8th, 1894, recommending the construction of a dyke for the protection of West Brantford, which is situated above the dam. No action was taken on this report, but after the second flood of March 5th, the Council adopted a report of the Board of works instructing the City Engineer to prepare a report on the causes of the flood and to suggest remedies.

After careful surveys and taking a mass of evidence on previous floods and their causes, a report was submitted on May 14th, 1894, in which the matter was very thoroughly discussed.

In this report the causes were given as:—

- (1) General.
- (2) Local.

GENERAL CAUSES

Under this head it was pointed out that year by year the floods were increasing in volume and suddenness owing to the clearing up of the forests along the river and the construction of drains running through these cleared districts into the river. The river was also carrying down gravel and sand from its banks above and depositing it in the bed of the stream, thereby blocking the channel and causing diversions of the stream and thus lessening the discharging capacity of the main channel of the river. Again the thaws were more sudden in the open or cleared lands, thus causing the ice to break up more quickly and in larger blocks, and consequently enhancing the danger of ice jams which are often the most dangerous feature in a winter flood.

LOCAL CAUSES.

Under this head attention was called to the dam which is primarily the cause of the extreme height of water in West Brant-

ford. A new dam had just been constructed and the old one was still in position so that an increased obstruction was offered to the flow of the river. The difference in level above and below the dam during flood time corresponds with the difference in the levels of the river at its normal height, except in case of high water caused by an ice jam at some point below the dam.

The extreme depth of water in Eagle Place, which is below the dam, was owing in a great degree, to an ice jam at Two Fish Islands, at which point the channel takes a sharp angle, and is further obstructed by a number of islands covered with large elm and other trees, the whole forming a lodging place for ice which renders it a menace to the inhabitants of Eagle Place and other low lying positions of the city below the dam.

There are also two railway bridges across the river below the dam and to these the people of Eagle Place owe at least a part of their discomfort. Both the Grand Trunk and the Toronto, Hamilton and Buffalo Railway Companies have narrowed the channel, and in the case of the latter the elevation of their bridge is considerably below the extreme height of flood level.

Two normal courses were open for the prevention of further floods, viz.

(1) Deepening the channel of the river so that it would accommodate the waters at highest flood level.

(2) Raising the banks to a height above the highest flood level.

The idea of sufficiently deepening the channel was impracticable both because of the presence of the dam and of the expense incumbent on an undertaking of such magnitude, and it was accordingly decided to erect dykes or embankments along the margin of the river, and to take the material for the construction of these embankments from the channel of the river in as far as practicable, thereby making to a certain degree a combination of the two methods above suggested.

The West Brantford work was first carried out. This consisted of the raising and enlargement of an old dyke along the Western limit of the city, built a few years before for the protection of West Brantford from the overflowing of D'Aubigny Creek and the extension of this dyke to the river bank and thence along the margin of the river to intersect the G. T. R. Company's track. This old dyke, which was 1,730 feet in length, was raised one foot bringing it to an elevation of 73.00 on the city levels, and the balance of the work, when completed, was brought to the same elevation. The embankment is 8 feet wide on top with a slope of $1\frac{1}{2}$ to 1, and contains 10,960 cubic yards, having a fall of from $3\frac{1}{2}$ to 11 feet and a varying bottom width of from 19 to 38 feet. About three-fifths of the earth for this embankment was procured from a small island lying in the river opposite the dyke, the average haul being about 600 feet. This island was entirely removed and this removal alone will do much to alleviate the tendency to ice jams at this point, as the island was situated at a place where the channel is very shallow. The balance of the earth was procured from the bed of the river between the railroad bridges, the average haul being about 1,800 feet.

The total cost of this embankment was \$2,480, or at the rate of about 22½ cents per cubic yard, the work being performed by the city and under the direction of the City Engineer and Overseer Howie.

Four cribs were erected along the river bank to assist this dyke to withstand the inroads of the river, the first being situated at the upper extremity of the embankment and the others at such points as it was felt they would be of most assistance to the dyke. Three of these cost \$300 each and the fourth \$200. They were sunk down below the bed of the river and raised to an equal elevation with the dyke being firmly imbedded in it at one side. These cribs were made of pine timbers 10 inches square fastened together with half inch drift bolts 18 inches in length.

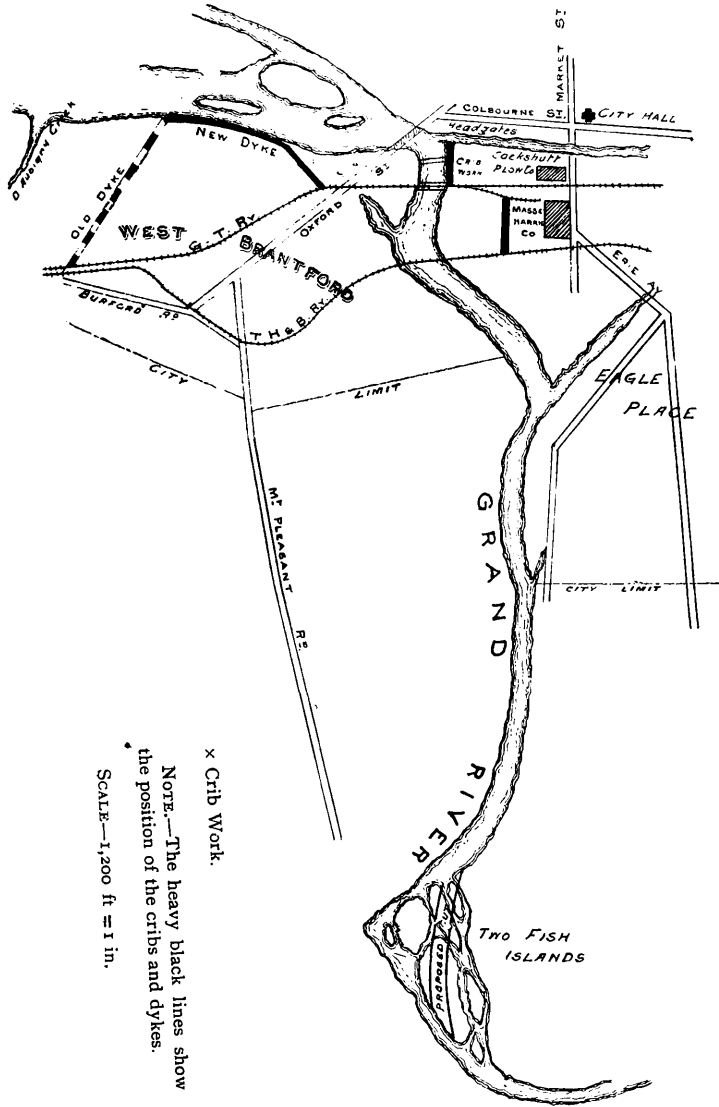
When this work was completed attention was turned to the headgates and cribwork below the dam and further dykes for the protection of Eagle Place. An embankment was built from railway to railway, but the raising of the T. H. & B. Ry. Companies' track and bridge has not yet been carried out.

The headgates were replaced by the Brantford Electric and Power Company according to plans and specifications prepared by Mr. H. K. Wickstead, M. Can. Soc. C.E., who also consulted with Mr. Jones on the work between the dam and the G. T. R. bridge, one-half of the expense for which was borne by the Electric and Power Company.

In the City Engineer's report it was recommended that this work be a solid faced crib raised to the elevation of 73.20 or about 12½ feet above the crest of the dam which is about 5½ feet above low water mark below the dam. Mr. Wickstead suggested that instead of bringing up the cribwork to this elevation that it be brought up to the level of the crest of the dam and from this to raise an embankment to be faced with loose stone. The work was carried out on this plan excepting that the back of the cribwork was raised 4 feet higher than the front which was brought to the level of the crest of the dam thus giving a slope of 3 to 1 to the top flooring of the crib, which was 12 feet in width. The embankment having a top width of 8 feet was carried up back of the crib on a slope of 2 to 1, and was faced with stone procured from the bed of the river, while the face of the cribwork was protected by piling stone along in front of the crib. The timber used was hemlock below water line and pine above, all being 10 inches square with a flooring on top 3 inches in thickness.

The total length of this work is about 180 feet and the total cost \$2,200. This crib is in a peculiarly exposed position, being just below the dam and on the side of the river against which the whole strength of the waters is thrown in flood time. During the last flood the water and ice swept over the banks at this point doing great damage to the large factories situated on the flats.

As an assistance to the dykes and to prevent further ice jams a cutting was recommended at Two Fish Islands, but this has not as yet been carried out. The efficiency of the dykes depends, in some measure, on this work, and it is to be hoped it will be carried out this



x Crib Work.

NOTE:—The heavy black lines show the position of the cribs and dykes.

SCALE—1,200 ft = 1 in.

summer. There was a question raised by the City Council as to their power to do this work, which is outside the city limits, without special legislation. There is some doubt as to whether the Drainage Act covers the case or not and it will be interesting to engineers when a settlement of the question is reached.

Other work not described in this paper has been done, the total expenditure being \$6,600. The accompanying plan shows the location and extent of the work.

DISCUSSION.

Mr. H. J. Bowman—I suppose the necessity for works of this kind is increasing all the time. No doubt years ago the Grand river was comparatively a quiet stream. That is generally found to be the case, but with the opening up of the country the water comes down so fast in the spring that it necessitates these works. I know farther up the stream they are having difficulties; railway tracks are being flooded that in years gone by were always dry. The cause, I suppose, is the drainage of the country; the clearing away of the timber and swamps, and the water rushes through the larger drains into the river, causing the floods.

The President—In Belleville, at the mouth of the Moira river, the causes are slightly different. There the water used to freeze to the bottom of the river, it being very shallow, and the water would come down in a flood in the spring and the ice from above would keep piling up, so they have gone to work and dredged a deep enough channel for the water to escape under the ice. In that way, while they have not got over all their trouble, they have improved their condition very much indeed, though it has cost a lot of money, it being all rock excavation. They have also embanked the shores to some extent.

Mr. T. H. Jones—In reference to the flood level increasing in height year by year, of course that is a common experience. As Mr. Bowman says, there is much more extensive drainage year by year; and not only that, but as the forests are cleared up the frost strikes deeper into the ground, and the water is carried off so much more quickly. There I had evidence extending back thirty-five years that, apart from the ice jams, which of course are another feature in connection with it, only at one time in that thirty-five years had the flood level approached to within two feet of the height—it was during this last flood.

Mr. P. S. Gibson—I think I have a case a little different from either of you. The trouble with us in the County of York is that the rivers are digging their own bottoms out; and it is difficult to keep them from tearing the adjoining lands away and forming an island in the bay. For many years, away back when I was a lad, in the township of York, there were mill dams almost every quarter of a mile, but at the present time, for twelve or fifteen miles from the lake, there are only one or two dams, and they are carried away whenever there comes a crush of ice. Now I am called upon from time to time

to protect the banks, and my practice is to drive cedar piles down and fill in the bank with brush, gravel and willows—I plant a great deal of willow. The object of the brush is when the bed of the river is dug out year by year—and it goes from three to five feet sometimes—the brush settles down to the foundation, and we build on top then or drive the piles deeper. Another trouble I have is with the foundations of our bridges; when the bed of the river is lowered the foundation disappears, and the result is we have to give plenty of water way. As a rule, I put no cribbing in at all, but simply put in piles; and instead of attempting to retain the embankments I extend the ends of the bridges and give lots of water way. In the last sixteen or seventeen years we have not lost any bridges at all, so that my system of protecting the banks with cedar piles, brush, gravel or stone, and planting willows, is a good one. We find our cedar piles last a great length of time.

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EXPLORATIONS AND SURVEYS IN RAINY RIVER DISTRICT FROM 1717-1894.

By J. F. WHITSON,

O.L.S., Toronto.

IN 1716 Vaudreuil, then Governor of New France, with a view of extending the fur trade westward, gave instructions to Lieutenant Noue to explore the country to the west of Lake Superior. Noue began by rebuilding the Trading Post on Kaministiquia River (where now stands Fort William) which was first built by Duluth in 1678. In the fall of 1717 Sieur de la Noue penetrated as far west as Rainy Lake (Lakemanigen or Lac la Pluie) on the west shore (north of Pithir's point) and build a trading post, the first established in Rainy River District. For several years following he occupied his time in extending the fur trade in the Rainy Lake region and bringing about friendly relations between the different Indian tribes. But the man to whom is due the most honor as one of the earliest and greatest explorers of this Western district is M. de la Verendrye, who in 1728 was in command of a trading post at Lake Nepigon, and who had for several years remained in obscurity as a trader in the region round Lake Superior, though his early life was a brilliant one, a victor in two campaigns, one in New England in 1704, the other in Newfoundland, 1705. As the discoveries with which Verendrye's name is associated are but little known, and although I cannot speak at any great length in this paper, I will mention a few occurrences which may throw some light upon their discoveries. With the hope of discovering a Western sea he laid his scheme before Beauharnois, then Governor of New France, who, after some delay, consented to the proposed western expedition, and, in order to meet the cost of the same, gave Verendrye the exclusive profits of the fur trade over the territory to be explored. On the 19th May, 1731, he entered into company with men in Montreal who advanced goods and equipments, taking with him his three sons and nephew and Father Messenger as missionary, besides several French voyageurs. We will then follow them from Kaministiquia where they arrived from Mackinaw (Michilimakinac) in the spring of 1731. He found himself at the grand portage on Lake Superior, 10 miles south-west of the mouth of Pigeon River, westward bound on the 26th August, 1731. After many a struggle through lack of means we yet see their parties the same year successively pass through Rainy Lake (Lac la Pluie), at the outlet of which they established Fort St. Pierre about $1\frac{1}{2}$ miles below the present H. B. Co's post at Fort Frances.

Thence passing down Rainy River, across Lake of the Woods (Lac Minitre or Des Bois), on the south-west shore of which, in Buffalo Bay, near the mouth of War River, they built Fort St. Charles

in 1732. They traversed and traded throughout the whole Winnipeg basin before 1750, after building forts on Rainy River and Lake of the Woods in 1731-32 and shortly afterwards on the Winnipeg Red and Assiniboine Rivers, taking possession also of the Upper Mississippi and Missouri to their source, they subsequently extended their forts on the lakes and rivers northwards to the Saskatchewan on which they and their successors had, up to 1755, built no less than five forts. They explored the Upper Missouri in 1742, and by the Yellowstone River reached the Rocky Mountains at the base of which they, in 1743, built a fort, thus commanding the whole trade of that vast region which they called the posts of the Western sea. One of these expeditions cost one of the sons his life, for a band of Sioux Indians massacred him with his whole party of twenty-one men in June 1736, on an island in the Lake of the Woods, near Rat Portage. Among the slain was Father Annean. Their bodies were discovered several days after the event. The bodies of the Frenchmen were placed on beaver skins, the greater number of them scalped. The missionary had an arrow in his head, his breast cut open. The explorer lay face down, his back lashed with a knife, a hoe buried in his headless body which they had ornamented with porcupine quills. The father, who was at this time in great destitution at Fort St. Charles, heard of the massacre of his son and the death of his nephew at the same time; but his devotion and courage, undismayed neither by misfortunes nor dangers, he continued the expedition, but it was only in 1743 that the eldest son and his brother reached the Rocky Mountains, returning the same year to Fort St. Charles on the Lake of the Woods, where they again joined their father, who, becoming discouraged at the unjust treatment he received from the King of France, returned to Quebec and died 6th Dec., 1750, leaving his two sons to carry on the work, which they did for several years in the Lac la Pluie region, and around the head waters of the Mississippi. The breaking out of the seven years war in 1757 ended their explorations and they re-entered the army. This war, which occasioned to France the loss of Canada, gave them both an opportunity of ending their lives nobly on the 15th Nov., 1761. They were both drowned on the wreck of the *Auguste*, and needed no longer to envy the death of their brother who was killed by the Sioux; but in viewing the misfortunes of their country they could say, "We die, but we die with it." Such is given as briefly as possible the unfortunate but not inglorious life of these brave explorers.

As to the Lac la Pluie District, it is a matter of history that from the period of its first discovery in 1717 the French traded and occupied the whole district, while the Hudson Bay Co. had, up to 1790, but one post on these inland waters, Cumberland House, on the Saskatchewan, built by Hearne in 1774, and up to this time no servant of the Hudson Bay Co. had set foot on these inland lakes. In 1790 the Hudson Bay Co. established a post on Red Lake trading into Lake of the Woods. The cession of Canada, 1783, caused many of the old French traders to return from these Western posts, but the same year

they formed themselves into the North-West Trading Co. with headquarters at Montreal. They soon rose to the position of formidable rivals of the Hudson Bay Co., and, in 1817, the district traded in by the two companies became the scene of animosities, feuds and bloodshed, involving the destruction of property and the demoralization of the Indians and the ruin of the fur trade; so much so that the Hudson Bay Co., who had, prior to 1800, been able to pay from 25 to 50% dividends were for the preceding 22 years only able to pay 3% per annum. The war between the two companies ended 1821, a union being arrived at under the name of the Hudson Bay Co., which company practically remained in undisturbed possession of the country between Lake Superior and Red River up to 1857.

By the Treaty of Paris, dated 3rd Sept., 1783, the Southern Boundary of Canada was defined, and later by the Treaty of Amity, Commerce and Navigation on 19th November, 1794, and still more definitely by the Treaty of Ghent, signed Dec. 24, 1814. By the 6th and 7th articles of said treaty Great Britain and the United States each appointed a commissioner, Anthony Barclay and Peter B. Foster, with David Thompson as surveyor to locate the boundary between the two countries. David Thompson was the first surveyor to receive official instructions to make a survey touching the District of Rainy River. He was born at Westminster, England, 30th April, 1770, entered the services of the Hudson Bay Company at Cumberland House, 1789, and spent the next eight years in exploring and mapping out the country traded in by said company and locating their different trading posts. In 1791 he entered the services of the North-West Company to perform a similar work; in Feb., 1798, he started with a dog team from Red River to explore the country between that river and Lake Superior; on April 27th he reached Turtle Lake, from which flows Turtle Brook, which he states to be the source of the Mississippi. Thus to this almost unknown geographer belongs the honor of discovering the head waters of that great river. From 1816 to 1826 he was engaged in surveying and defining the boundary line on the part of Great Britain between Canada and the United States. In August 17th, 1822, while on the survey of Lake Superior, he instructed his assistant, J. G. Sayer, formerly a trader in the service of the North-West Co., to explore the country between Fort William and the shores of Rainy Lake, and, on 29th August, Sayer started up the Pigeon River. The two following years Thompson was engaged on the survey of the different lakes and streams adjoining the boundary between Lake Superior and the west shore of the Lake of the Woods. On July 25th, and 26th, 1824 he planted the monument marking the north-west angle of the Lake of the Woods, being the south-west angle of Ontario. I am probably safe in saying that no other land surveyor has made so extensive surveys as Thompson, a survey extending nearly from ocean to ocean and from the Ohio River to the Hudson Bay. His deeds have never been trumpeted as those of some others, but in the northern and western explorations for the fur companies in their palmy days no man performed more valuable service

or estimated his achievements more moderately. He died in extreme poverty near Montreal, on 16th February, 1857.

In 1857 the Provincial Government, with a view of establishing suitable communication between Lake Superior and Red River organized an exploration party under George Gladman as Chief, Professor Hind as Geologist, W. H. Napier as Engineer, and S. J. Dawson as Surveyor. The primary object of the expedition was to make a thorough exploration of the country between Lake Superior and Red River. The party left Fort William on July 31st arriving at Fort Frances August 18th and at Fort Garry September 5th of the same year. The party continued their explorations through 1858. One of the results of this expedition was the building of the Dawson Route which served as the chief highway to Red River till the completion of the C.P.R. On March 31st, 1857, instructions issued from Her Majesty's principal Secretary of State, London, to Captain Palliser to explore the region between the west shore of Lake Superior and the Rocky Mountains, but more particularly between Lake Superior and Lake Winnipeg. In company with four other scientific gentlemen they arrived at Fort William en route up the Kaministiquia River on June 12th, and made a rapid exploration of the canoe route between Fort William and Rainy Lake, arriving at Fort Frances July 1st, and at Fort Garry on the 11th, collecting sufficient information on their rapid journey to enable them to form some idea of the resources of the country passed through, and taking numerous observations on the route, they arrived at the Rocky Mountains 1859.

The outlining and subdividing of Townships within this District was begun by the Dominion Government in 1872, and by the Ontario Government in 1888. Since 1872 twenty-eight townships, comprising an area of 493,000 acres, have been subdivided into lots of 80, 160 and 320 acres, and along the banks of Rainy River into lots from 50 to 200 acres with a ten chain frontage on the river. No less than 775 miles of Base and Meridian lines have been run during that period, not including the outlines of the Townships subdivided, but including 126 miles of the eastern boundary of the District which is run due north through the most easterly point of Hunter's Island, crossing the C.P.R. east of English River Station. This boundary was established by an Act of the Provincial Parliament on the 30th March, 1885, when Rainy River was set apart as a District.

Within the District nearly 1,300 mining locations and islands have been surveyed under the Mines Act by private individuals. Extensive timber surveys have been made in the southern portion of the district. In 1890 and 1892, 370 square miles were sold by public auction for \$254,600 bonus, or nearly \$700 per square mile, besides stumpage dues of \$1.00 per thousand, which, with the bonus, will amount to nearly \$2,000 per square mile, from which we can form some idea of the value of the extensive pine lands in the southern part of the district. Tamarac, suitable for building and railway ties, spruce and poplar, suitable for pulp wood, is found in great abundance throughout the whole district. Between 1883 and 1893 the Geological Survey De-

partment of the Dominion made a geological survey of nearly the whole district lying south of the C. P. R., making comparatively accurate traverses of most of the large lakes and main water ways.

Agriculture is, perhaps, one of the most promising of the economic prospects of the district, and will in this sense be largely determined by the facilities offered for the development of other industries such as its forests, mines and fisheries. Rainy River forms its source at Rainy Lake; to its mouth at Hungry Hall flows for eighty-five miles through a rich, alluvial plain, of the post-glacial formation, with clay banks rising on either side from ten to twenty-five feet high and an almost unbroken stretch of fine agricultural land on both the Canadian and American sides extending inland from six to twenty miles. The whole valley is covered with timber suitable for building, ties, pulpwood or fuel. From what I have seen of the Rainy River basin, I should say there is an area of no less than 800 square miles on the Ontario side, 65 per cent. of which is first class agricultural land, and the balance capable, when drained, of making good pasture land. It is entirely free from stone or rocks, well watered by small streams, and where settlements have been made well opened up with colonization roads. Many smaller tracts of flat lying land, probably old post-glacial lake bottoms, suitable for agricultural purposes, are to be found throughout the district. South of the Namekon River, along Rat and Big Turtle Rivers and many other streams, an extensive tract of the post-glacial formation, similar to that along Rainy River, extends along the Wabigoon River and around Wabigoon and Eagle Lakes.

The mineral wealth of this district, although hard to estimate, bids fair to be even greater than that of the timber and agriculture. The discoveries thus far establish the existence of unlimited deposits of rich iron ore along the Atikokan and Lime River; and, on the south side of Hunter's Island, gold has been found in paying quantities in several mines on the Lake of the Woods; while Rainy Lake and Lime River are having a gold boom at present which promises to assume considerable dimensions, and several stamp mills will be in operation before many months.

The Indians within the Rainy River District are Saulteux of the Ojibway nation. They derive their name from Sault Ste. Marie, from the neighborhood of which they originally immigrated. These Indians are embraced in what is known as Treaty No. 3, negotiated at the north-west angle of the Lake of the Woods in 1873, by Lieutenant-Governor Morris. This Treaty ceded some 35,000 square miles to Ontario and settled any difficulties that had arisen out of the encroachments of Canadian settlers and surveyors on what the Indians had regarded as their lands. Most of them still cling to their Pagan faith, and the habits and customs incidental to their unconverted condition; and, although rather hostile to christianizing influences, are not deficient in many of the qualities that command respect. They are brave, fairly honest and active, and good workmen when kept at it, and among themselves very capable of self-government. The

bands on Rainy River and Lake of the Woods meet frequently in council, discuss their affairs very intelligently, and enforce sternly the rules necessary for their common welfare ; and, while mostly retaining the primitive wigwam and practising Pagan rites, they are in some instances far more thrifty, prudent and industrious than many of their race. Within the district the forests yield them abundance of game and the lakes an unlimited supply of fish ; the immense marshes produce large quantities of wild rice, while the more industrious grow maize, potatoes and other vegetables. Within the district there are no less than sixty Indian reservations surveyed, containing 540 square miles. Around the Lake of the Woods and north on English River and Lac Seul the Indian population does not exceed 1,900, of which about 600 trade into Lac Seul, while along Rainy River and around Rainy Lake and on the eastern part of the district there are about 1,000, or a total in the district of about 3,000. In 1877 there were 2,890, and but a few years prior to the year 1856, 3,150. These are known to the Hudson Bay Company as the Lac la Pluie Indians ; 1,500 of them traded at Fort Frances when David Thompson made his boundary survey in 1823.

The southern boundary of the district between the north-west angle of the Lake of the Woods and Chaudiere Falls at Fort Frances was settled by the commissioners appointed under the sixth and seventh articles of the Treaty of Ghent, December 24th, 1814. The southern boundary east of Fort Frances was finally defined by the Ashburton Treaty, signed August 9th, 1842.

The northerly and westerly boundaries were defined on the 3rd of August, 1878, by the award of five arbitrators appointed by the Government of Canada and Ontario.

The eastern boundary was established by an Act of the Ontario Legislature on 30th March, 1885.

The Report of the Judicial Committee of the Privy Council, establishing the boundary between Ontario and Manitoba, bears date July 22nd, 1884, and was confirmed by her Majesty in Council, 11th August the following year.

DISCUSSION.

Mr. Speight—I think we are much indebted to Mr. Whitson for his very able and interesting paper. It is very apparent that he has gone to a great deal of trouble and research in getting all these facts. One thing I noticed in the biographical sketches that we listened to this afternoon was that Mr. Thompson's name was omitted. I think a paper on the life and doings of this surveyor would be one full of interest and instruction to the profession. It is very apparent, also, that the surveyors are the pioneers of civilization. I have, therefore, great pleasure in moving a vote of thanks to Mr. Whitson for his able paper.

Mr. Dickson—In seconding the vote of thanks, I may say that I am personally acquainted with a limited portion of that country, and as far as I know, it quite bears out every word that Mr. Whitson has said.

This Association is not responsible as a body for any opinions expressed in its Papers by Members.]

THE EIGHTIETH MERIDIAN, CANADA.

By WILLIS CHIPMAN,
O. L. S., etc.

THE object of the writer in presenting a paper on the above subject is to awaken an interest in our northerly heritage among the Land Surveyors, who are, as they should be, the pioneers in developing the natural resources of our country.

Few realize the vast extent of the territory north of the international boundary line. From Cape Breton to Vancouver Island, a distance of nearly 4,000 miles, Canada can be traversed by railway, and many books have been written on our potential wealth from the car windows. But the strip of territory that is well known, or that has been fully explored, is comparatively narrow.

In our own Province it may seem surprising to many to know that the trans-continental line of the Canadian Pacific Railway divides the Province into two parts of nearly equal areas. The northerly half of our Province, according to the above division, is probably as little known to-day as it was two hundred years ago.

The writer believes that when this territory becomes thoroughly explored and examined that it will prove to be a source of wealth to our Dominion, rich in minerals and in timber, and not without value to the agriculturist.

The impossibility of finding coal in northern Ontario has yet to be demonstrated. It is quite possible that some detached areas of carboniferous rocks may yet be found that may contain beds of merchantable coal. Quite recently an isolated area of Cambrian rocks has been found near Sudbury, and a small area of Niagara at the head of Temiscamingue.

In this paper the strip of territory described has for convenience been divided into four divisions and twelve sub-divisions

From the shore of Lake Erie to the shore of James Bay is a distance of about 570 miles, or as far as from Montreal to Windsor—all Ontario. This comprises the first division.

North of the Ontario division lies the great Hudson Bay division, about 792 miles in length, a vast region, the minerals and fisheries of which may be as valuable as those of Newfoundland, and their development will not involve us in any international disputes. Flowing into this great inland sea are many large rivers that drain about half of British North America, and a small part of the United States.

The third division, extending from Hudson Strait to the head of Baffin Bay, a distance of about 953 miles, is a region of ice, rock and water, probably of little value except for its whale and seal fisheries; but it is possible that the beds of coal that are found in several places might prove worth mining for whaling steamers, and for the smelting and reduction of the ores of economic minerals.

The fourth division of 955 miles from the head of Baffin Bay to the North Pole is a desolation of perpetual snow and ice, that will probably never be of commercial value until there is an amelioration in the climate.

The officials of the Meteorological Department give the latitude of the Observatory in Queen's Park, Toronto, as $43^{\circ} 39'.4$ North; and longitude as $5\text{h } 17\text{ min. } 34.65\text{ sec.}$ West of Greenwich.

Assuming the above as correct, the 80th meridian West of Greenwich will be about $30\frac{1}{4}$ miles west of the Observatory. The above calculation is necessary to fix the meridian, as, for the sake of clearness, (we will assume) the meridians and parallels of latitude are omitted from the latest maps of our Province issued by the Crown Lands Department.

We will now proceed with a description of the country along the 80th meridian.

DIVISION I—SECTION I.

On the banks of Lake Erie in the township of Walpole, County of Haldimand, the 80th meridian first strikes Canadian soil; following this meridian from the southward—the latitude of this point is approximately $42^{\circ} 48'$ north—Lake Erie has an elevation of 573 feet above mean sea level.

Running northward this meridian passes Hagersville Junction, crosses the Grand River in Brant County, between Brantford and Caledonia. Ten miles further on, the Great Western Railway is crossed about a mile east of Capetown, and at the head of the great valley that extends westward from the end of Lake Ontario between the Dundas and Hamilton Mountains so called. The distance to Burlington Bay from this point is about 8 miles, the elevation of the bay being 246 above the sea.

The main line of the Credit Valley division of the Canadian Pacific Railway is crossed near Campbellville Junction. From Lake Erie to beyond the Great Western Railway, the rock formations are overlaid with drift, forming one of the richest agricultural districts of the Province.

Northward from the Canadian Pacific Railway, the country is elevated and broken, the rock of the Guelph and Niagara formations being exposed in ravines in the north part of Halton County and the east part of Wellington County.

The main line of the Grand Trunk Railway is crossed at Acton, 31 miles west of Toronto, northward from which the country continues broken, the meridian crossing the Credit River near the Forks, one of

the most picturesque points in the older part of the Province. Clinton and Medina formations are exposed in the gorges of the Credit.

The Owen Sound branch of the Canadian Pacific Railway is crossed a few miles further on, the drift again covering the rock except in the deepest gullies.

Orangeville is passed about three miles to the westward. The height of land between the streams flowing to Georgian Bay and those flowing to Lake Ontario is crossed in the south-east part of the County of Dufferin, where the hills attain an elevation of 1,700 feet above the sea, probably one of the highest parts of the Province.

Approaching the County of Simcoe, the deep valley of the Nottawasaga opens out to the eastward

The Hamilton and North-Western Railway is crossed near Lisle Station, the Northern Railway near Sunnidale, the Nottawasaga crossed only three miles from Georgian Bay and again crossed at its outlet. The meridian now corresponds very closely with the eastern shore of Nottawasaga Bay for 10 miles, crossing the Tiny Peninsula, entering Matchedash Bay, elevation 581 feet above the sea, in latitude 44°02' north, and 141 miles from the shore of Lake Erie.

This ends the first section.

From Lake Erie to Georgian Bay the country is densely inhabited, this portion of the Province being well supplied with schools, roads, and railways; and its resources well developed by an intelligent and industrious population. All of this section is good farming land, the stratified Silurian rocks being overlaid with drift, with a productive soil.

In the southern portion peaches and grapes are grown, while the apple and the pear are grown in the northern portion.

The northern limit of the blackwalnut and the chestnut is passed near the Grand River and the hickory near Georgian Bay. The white pine has been removed from this area for many years.

By taking the Grand Trunk Railway train at Port Dover, thence by Hamilton & North-Western to Hamilton, Barrie and Penetanguishene the 80th meridian will be closely followed in this section.

DIVISION I—SECTION 2.

Crossing Matchedash Bay between the Giant's Tomb, with its historic ruins two miles to the west, and Prince Wm. Henry Islands to the east, the main land is struck a few miles north of the mouth of the Muskoka River. The Moon River is crossed at its mouth and the town of Parry Sound is passed, lying three miles to the westward.

North of Matchedash Bay the country is altogether different from what it is south of it. The Laurentian district is here entered, a great portion of the country being broken by rock exposures.

The Maganetawan is crossed at a point 200 miles from Lake Erie, and the French River near Lake Nipissing. The western part of this lake is crossed, the meridian running along the east side of McLeod's Bay west of Sturgeon Falls, the north point of which bay is touched by the trans-continental line of the Canadian Pacific Railway.

Lake Nipissing has an elevation of about 660 feet above mean sea level. This beautiful sheet of water has a length of 40 miles and a width of about 10 miles. French River, through which this lake discharges into Georgian Bay, is one of the most marvellous rivers in Canada owing to its numerous channels, its chutes, its cross-channels and its numerous rock-bound mouths.

Northward from Lake Nipissing the 80th meridian crosses the Sturgeon and soon enters unsurveyed territory, passing the southerly outlet of the great Lake Tamagamingue that forms one branch of the Sturgeon and thence along the easterly side of the main lake, crossing several bays, including the long north-east arm. This beautiful lake rivals the Muskoka lakes in size and excels them in beauty.

Passing onward, the Montreal River, a picturesque stream that flows to Lake Temiscamingue, is crossed, the head of which lake lies about 13 miles to the eastward. Temiscamingue has an elevation of about 620 feet above the sea.

The boundary line between the Provinces of Ontario and Quebec runs due north from the north end of the lake, and is about 19 miles distant from the 80th meridian, its longitude being $79^{\circ} 18' 58''$ west.

Five surveyed townships are passed through on the headwaters of the Blanche River and the height of land crossed in latitude $48^{\circ} 12'$, about 370 miles from Lake Erie and about 215 miles from Matchedash Bay. The height of land has an elevation varying from 900 to 1,800 feet above the sea. This we will call the end of the second section of our line.

The Laurentian region near Georgian Bay is much broken with rock exposures, streams and small lakes. It is sparsely settled by a hardy class of people, who obtain a livelihood from lumbering operations rather than from farming. The hardier grains and all root crops are grown, and immense quantities of pine timber and lumber is still being taken from this area. North of Lake Nipissing, for a short distance, the land is much better suited for agricultural purposes and excellent crops of roots and oats are grown. It is cheaper to import Manitoba flour than to grow wheat, but this is now generally true for all Ontario.

The untenanted wilderness, without roads or paths, except the trails of the aborigines, is entered a few miles north of Lake Nipissing and there is not a white settler between this and James' Bay. Opposite the north-west angle of Lake Temiscamingue, however, it is only a few miles to a settlement.

A few miles south of Lake Tamagamingue the Huronian formation is entered, with its characteristic rocks—rich in minerals requiring capital and brains to develop and make richly remunerative.

Two or three "islands" of Laurentian are crossed in the Huronian area, north-east of Tamagamingue and at the head waters of the Blanche.

Nearly the whole district is overlaid, where there is a soil, with the "Algoma" sands.

Heavy clays are met with around the head of Temiscamingue, there being several townships there in which there are no rock exposures.

The underlying rock at the head of the lake is supposed to be of the Niagara formation, which forms the high, well-defined escarpment that passes around the west end of Lake Ontario from Niagara Falls, thence north-westerly across the Province to Georgian Bay, underlying the County of Bruce and forming the south half of Manitoulin Island. This outlier at the head of Lake Temiscamingue must, therefore, be 160 miles from the nearest Niagara exposure, unless the limestone found on the islands in the east part of Lake Nipissing is Niagara. North-west of Subdury, about 10 miles, is an area of supposed Cambrian rocks covering about 200 square miles.

The area passed through by this second section of the 80th meridian is now being operated over by lumbermen and by mineral explorers. It is not probable that it can ever become an agricultural district.

The northern limits of the Red Cedar and the Butternut are passed near Parry Sound; White Oak, Beech, White Ash and Ironwood near Nipissing, the Basswood south of Tamagamingue, the Hemlock and Red Oak, near the Montreal River, and the Sugar Maple is left behind at the height of land.

South of Nipissing the country can be examined by train from Midland to Barrie, then by Northern to North Bay. North from Nipissing the only route is by canoe up the Sturgeon to Tamagamingue, thence to Temiscamingue, thence up the Blanche, a chain of lakes and connecting rivers a few miles east of and parallel to the boundary line between Ontario and Quebec to Lake Abitibi.

DIVISION I—SECTION 3.

The third section of the 80th meridian, in the Province of Ontario, commences at the southern edge of the watershed of Hudson's Bay.

The south shore of upper Lake Abitibi is struck 30 miles from the height of land. This lake extends about 30 miles to the east and 3 miles to the west, its width at the point of crossing being 6 miles, the average width being about the same. The upper lake has an elevation of about 850 feet above the sea.

At the eastern end of the upper lake is the Hudson Bay Co.'s post. Lower Abitibi Lake is connected with the upper lake by a river three or four miles in length. The lower lake is not quite so large as the upper lake, from the south-west angle of which the Abitibi River flows south-westerly, the westerly to a point about 25 miles from the lake thence northerly to its junction with its great brothers, the Missinaibi and the Mattagami, the three united forming the Moose River. The Moose River is doubtless the largest river wholly in the Province of Ontario, draining about 27,000 square miles of the Province.

The 80th meridian practically coincides with the eastern shore of the lower Abitibi Lake leaving the vicinity of the lower lake in latitude 49° North at 25 miles from the southerly shore of the upper lake.

From this point to the head of James Bay is practically a terra incognita, a distance of about 145 miles. The shore of James' Bay

is struck about 30 miles south-east of the mouth of the Moose River. The country along the meridian is probably very similar to that along the Abittibi River, the highway between Lake Abittibi and James' Bay, the river at no point being more than 65 miles from the 80th meridian.

Huronian rocks are met with about the south-west and north shores of Lake Abittibi and along the river banks for 80 miles below the lakes. Laurentian is also exposed north of the upper lake and east of the lower lake

Areas of Huronian and Laurentian rocks are reported alternating along the Lower Abittibi River, these areas extending to the eastward, the Laurentian predominating.

The northern limits of the Red Pine, the White Pine, and the Yellow Birch are passed in the vicinity of the Abittibi Lakes; the Black Ash and Bañskian Pine between the Lakes and James Bay, and the White Cedar at the Bay itself.

The Province of Ontario, therefore, has a length from Lake Erie to James Bay on the 80th meridian of about 570 miles, of which distance 150 miles is an agricultural and manufacturing country densely populated, with its resources well developed.

The southerly 100 miles of the central 220 miles is sparsely settled and partially developed, and the northerly 120 miles, rich in forests and minerals, is unsettled.

The northerly 200 miles is in a state of nature, only partially known to the employees of the Hudson Bay Company, its aboriginal vassals and a few explorers from the Geological Survey Department.

From Toronto to the head of James Bay is about 520 miles, being the same distance as to the city of Quebec, and a less distance than to Port Arthur on Lake Superior. The Province has a frontage of about 150 miles on James Bay, a coast line not yet traversed by a Land Surveyor.

DIVISION 2—SECTION I.

The Second Division includes James Bay and Hudson Bay.

James' Bay is about 150 miles in width, and from its south end to a line joining Cape Henrietta Maria on the west side and Cape Jones on the east side, the distance is about 300 miles.

The 80th meridian passes through James Bay about 50 miles from the east coast, Charlton Island and Solomon's Temples being on the east, and the Twins to the west.

On crossing the 55th parallel of latitude, Hudson Bay itself is entered, Cape Jones being due east.

This may conveniently be called the *Southern* or 1st Section of the 2nd Division.

The shore of James Bay has been fully explored, but there is no reliable map of it published since the British Admiralty map, issued before 1857.

Root crops are grown at all the Hudson Bay Co. ports, also hay and barley, the northern limit of the potato being passed at Cape Jones.

Around the bay the Hudson Bay Co have five posts—Fort Albany, Moose Factory, Rupert's House, East Main Fort and Fort George.

The south and west shores are low, muddy and strewn with boulders, and in places at low tide it is necessary to go beyond sight of the furze-covered land to obtain sufficient depth of water to float a loaded canoe.

Into this bay flow many large rivers in the following order, commencing at the north on the west coast: The Equan, At-tah-wah-pis-cat, Albany, Moose, Hannah, Nottawa, Rupert's, East Main and Big River. The last is probably the longest, being equal in volume to the Ottawa.

The At-tah-wah-pis cat, Albany and Moose, are navigable for great distances from James Bay by small steamers. The large inflow of fresh water into the bay makes it brackish. The east coast is also low, but the water is deeper than on the west side of the bay.

Devonian rocks underlie the western and southern sides of the bay, but are not exposed along the coast. On the east coast the Laurentian rocks are exposed, and as you proceed northward, the land rises. The northern limits of the Balsam, Fir, and the Canoe Birch are passed near Big River, and the Poplar near Cape Jones. The only remaining trees are the Tamarac, the Spruce, and the Balsam Poplar.

From records kept by the Hudson Bay Co. and observations of explorers, the summer climate of James Bay appears to be about the same as that of the north shore of Lake Superior and of the height of land. The mean winter temperature is colder, but more uniform. The climate increases in severity with the latitude and with the elevation above the sea. In this case the difference in latitude of two degrees is offset by the difference in elevation of over 600 feet. It is generally assumed that an elevation of 1,000 feet corresponds with a decrease of three degrees in temperature.

DIVISION 2—SECTION 2.

The Second Section of this division commences in latitude 55°, opposite Cape Jones.

The 80th meridian passes by the west of the south Belchers and the north Belchers, the latter being opposite Richmond Gulf, a remarkable harbor on the east coast.

Between Cape Jones and Richmond Gulf two large rivers, the Great Whale, in latitude 55° 16' north, and the Little Whale, in latitude 55° 55' north, discharge on the east coast.

The narrow entrance to Richmond gulf is 104 miles east of the 80th meridian, this being the most eastern point in Hudson Bay. This gulf is over 20 miles in length and 15 miles in width.

In latitude 56° 48' the Nastapoka River enters on the east coast, opposite the Baker's Dozen or Committee Islands, just east of our meridian.

Passing northward the coast line approaches the 80th meridian. The south Sleepers Islands are to the west of the meridian in latitude $57^{\circ} 35'$.

Cape Dufferin, in latitude $58^{\circ} 45'$, longitude $79^{\circ} 10'$ west, is the most westerly part of the east coast north of Cape Jones. This prominent point we will make the end of the second section in the second division.

Along the greater part of the east coast there is an elevated ridge forming a chain of narrow islands, between which and the main land is a channel varying from five miles to one mile in width.

Parallel to the coast, and about 100 miles to the westward, is a second chain of islands in groups; the Ottawa group, in latitude $59^{\circ} 45'$ and longitude 80, being the most northern.

Laurentian rocks are exposed all along the coast and in many islands. Between Great Whale River and the Nastapoka, the Laurentian formation is overlaid in many places with dolomitic limestones, and quartzose sandstones of the Devonian all being capped with trap and basalt. The inner chain of islands has a sharp descent towards the main shore, and a very gentle slope to the westward. All these islands appear to be capped with trap.

This part of Hudson Bay has been explored by Dr. Robt. Bell and Mr. A. P. Low of the Geological Survey Department.

A short distance north of Richmond Gulf the northern limit of forest trees is passed, the spruce being the last found. Inland the tree limit runs north-easterly to Ungava Bay.

The northern limit of the otter, the beaver and the black bear corresponds closely with the tree limit. All north of a line joining the outlet of Nastapoka River and the south end of Ungava Bay, may be called barren grounds, corresponding with the north-west side of Hudson Bay, north of Churchill. The reindeer and the wolverine are the only large animals to be found in this district, the musk ox not being found on the east side of Hudson Bay. The Hudson Bay Company has posts at the mouths of the Great Whale and of the Little Whale, the latter being the most northerly post on this coast.

Fort Chimo, on South River, about 30 miles south of the south end of Ungava Bay, is the most northerly post of the Company east of Hudson Bay. It is in latitude $58^{\circ} 30'$ north and longitude $63^{\circ} 40'$ east and about 320 miles east of the shore of Hudson Bay.

DIVISION 2—SECTION 3.

Northward from Cape Dufferin the east coast line bears north-easterly, then nearly north to Mosquito Bay, being fringed with rocky islands similar to the north-east coast of Georgian Bay.

The Ottawa group of islands, in latitude $59^{\circ} 45'$, is crossed by the 80th meridian.

The entrance to Mosquito Bay is about 20 miles in width, the bay itself extending inland more than 50 miles. The north shore of the bay extends westerly to about the same longitude, as Cape Dufferin.

The 80th meridian crosses the easterly part of Mansell Island, the north end of which, in latitude $62^{\circ} 30'$, we will call the end of the second division. Mansell Island is about 70 miles in length and 20 in width.

The east coast north of Cape Dufferin has not been accurately surveyed or thoroughly explored. It is reported to be a desolate, rocky country, probably Laurentian, with scanty vegetation, seldom visited by white men.

The north end of Mansfield Island is nearly opposite to Cape Wolstenholme, the most north-west point on the main land to the east. West from this cape on the outer Digges Islands is Port Laperiere, one of the posts established by the Dominion Government in 1884 for making meteorological observations and observing movements of the ice. The south-west shore of Hudson Strait extends south-easterly from Cape Wolstenholme, the width varying from 60 miles to 150 miles. From this cape to Cape Chudleigh, which guards the Atlantic entrance to the strait, is about 450 miles. Ungava Bay, with its tides rivalling those in the Bay of Fundy, is a southerly expansion of the easterly part of Hudson Strait, this bay being about as large as Lake Superior. The two observatory stations of Ashe Inlet and Stupart's Bay are situated on the north and south shores of the Hudson Strait, about half way between the Atlantic and Hudson Bay. Port Burwell is near Cape Chudleigh; in latitude $60^{\circ} 27'$ north and longitude $64^{\circ} 37'$ west.

Cape Farewell, the most southerly point of Greenland, is in latitude $59^{\circ} 50'$ north and longitude 44° west, and is distant about 750 miles from Cape Chudleigh and in almost a due east direction.

DIVISION 3—SECTION I.

Leaving the north end of Mansfield Island, the north-east end of Southampton Island is passed on the left, and Nottingham Island on the east, at the south-east end of which is Port De Boucherville, another Dominion observation station.

The five stations mentioned were established in 1884, and the observers withdrawn in 1886, two winters having been spent in this inhospitable region by our Canadian surveyors and scientists.

Bell's Island lies immediately west of the 80th meridian, a point in latitude $63^{\circ} 35'$ north nearly reaching this meridian. The axis of Chesterfield Inlet, a remarkably long arm, which extends westerly from the north-west side of Hudson Bay, if produced easterly would correspond closely with the south shore of Bell's Island and Southampton Island to the west of it. The east end of Chesterfield Inlet is about 350 miles west of Bell's Island. Southampton Island is about as large as the Province of New Brunswick.

Proceeding northward Fox Channel, one hundred miles in width, is entered, Southampton Island forming the south west shore and Cumberland Island the east shore. Southampton Island is separated from the main land of Melville Peninsula to the north by Frozen Strait and from the mainland to the west by Rowes Welcome. Repulse Bay, at the north-west end of Frozen Strait, is noted as being the wintering place of the explorer Rae in 1846, 1847 and 1853. The distance across the isthmus from the head of Repulse Bay to the south end of Committee Bay is only a few miles. The arctic circle is crossed near the head of Repulse Bay.

For convenience the arctic circle, latitude $66^{\circ} 32'$ north, will be made the end of this First Section in the Third Division. We are now only half way to the North Pole from Lake Erie.

In this Section the large whales are first found, and the musk ox ranges the west shores of Hudson Bay north of Chesterfield Inlet.

DIVISION 3.—SECTION 2.

The arctic circle passes through the narrow part of Davis Strait to the east, the entrance to Baffin Bay and skirts the north coast of the American continent, east of the Coppermine River.

The Fury and Hecla Strait, in latitude $69^{\circ} 30'$, separate the Melville Peninsula from Cockburn Island to the north. The east shore of Fox Channel, north of the arctic circle, does not appear to have been carefully explored, the channel being practically closed to navigation by ice.

Disko, on the east side of Baffin Bay, is in about the same latitude as the eastern entrance to Hecla and Fury Strait and about 650 miles distant in a straight course.

DIVISION 3.—SECTION 3.

From Fury and Hecla Strait to Ponds Inlet, in latitude $72^{\circ} 30'$, a distance of over 200 miles, the channel has not been visited by civilized men and it is only inferred from the movement of the ice that there is a continuous channel. Cockburn Island, which forms the western land, may prove to be two or more islands, but it is probable that the eastern land is continuous with Cumberland Island; if so, this latter contains an area nearly as large as the Province of Ontario.

DIVISION 3.—SECTION 4.

Pond's Inlet is in the same latitude as Upernivik, the most northerly post occupied by civilized men in Greenland. From the 80th meridian it is about 100 miles to the line of the westerly side of Baffin Bay, and 500 miles to Upernivik.

North of Pond's Inlet the meridian we are following crosses an island about 80 miles in diameter, and enters Lancaster Sound near Cape

Hay in latitude $73^{\circ} 50'$. Passing the eastern entrance to Lancaster Sound, about 100 miles in width, the 80th meridian crosses the easterly end of North Devon, an island as large as the Province of Nova Scotia, then crossing Jones Sound, about 70 miles in width, strikes Cape Tennyson, the most southerly end of Ellesmere Land, in latitude $76^{\circ} 15'$,

Latitude 76° corresponds closely with the north-west end of Baffin Bay, Cape York being in this latitude and 225 miles east of Cape Tennyson. Melville Bay, and its eternal pack of ice, extends east of Cape York about 125 miles.

This section has been thoroughly explored.

Laurentian rocks are found along Pond's Inlet and form the east part of North Devon and the west part of Greenland in the vicinity of Cape York.

Silurian rocks form the land on the south shore of Lancaster Sound and the west part of North Devon.

DIVISION 4.—SECTION I.

We now enter Division Four, this point being practically the extreme northern limit of navigation for whaling vessels and of safe navigation by experienced arctic mariners. The bay which converges uniformly to Smith's Sound is 130 miles in width in latitude $76\frac{1}{2}^{\circ}$ north.

In latitude $78^{\circ} 15'$ north, Smith Sound is only 25 miles in width, Cape Isabella being on the west coast and Cape Alexander on the east. Cape Isabella is in longitude 75° east and 70 miles from the 80th meridian.

Between Cape York and Cape Alexander the east coast is very irregular, Whale Sound and Inglefield Gulf extending inland 60 miles.

Lt. Peary wintered in latitude $77^{\circ} 40'$ in 1892-93, making this his starting point for his wonderful march north-eastward across Greenland. He has spent two winters in that vicinity since then.

North of Smith Sound, the channel opens out into what was known as Kane's Sea, on the east shore of which is the wonderful Humboldt glacier. To the west a channel extends that may yet prove to divide Ellesmere Land to the south from Grinnel Land to the north. In latitude $80^{\circ} 15'$, the channel again contracts to about 20 miles in width, and is called Kennedy's Channel to Cape Baird where a narrow fiord extends south-westerly for 60 miles and another runs southerly from the opposite shore for about the same distance.

The first is known as Archer Fiord, off the north end of which is Lady Franklin Bay, in latitude $81^{\circ} 44'$, where Greely spent two winters, and where the *Discovery*, with Captain Nares' expedition, wintered in 1875-76.

The southerly bay is known as Petermann or South Fiord.

It should be stated that the average direction of the east shore of Ellesmere Land bears 35 degrees east of north from the vicinity of Cape Tennyson.

Northward from Lady Franklin Bay the channel is known as Robeson Channel which opens into the circumpolar sea in latitude $82^{\circ} 15'$ north.

The *Alert* wintered at the west side of the north entrance to this channel in latitude $82^{\circ} 27'$, longitude $61^{\circ} 22' E.$, in 1875-76 from which point the north coast to the westward was surveyed, also the Greenland coast to the north-eastward.

In 1881-82, Lockwood, of the Greely expedition, extended each of these explorations

The 80th meridian crosses Greely Fiord on the west coast of Ellesmere or Grinnell Land in latitude $80^{\circ} 45'$, from the head of which a chain of lakes and streams extends north-easterly to the head of Archer Fiord.

Hazen Lake is a body of fresh water (or ice) 50 miles long and from 5 to 10 miles wide, lying west of Lady Franklin Bay and 25 miles inland.

The 80th meridian strikes the north shore line of Ellesmere, Grinnell or Grant Land (as it is differently called) in latitude $82^{\circ} 55'$ and about 170 miles from Robeson Channel to the eastward. The westerly half of Ellesmere and Grinnell land is practically unexplored.

Musk oxen, wolves, hares, white bear, ptarmigan and other smaller animals and birds are found in Grinnell Land, and the seal to the north of this land, where large bodies of open water appear.

A small party could probably secure sufficient animal food by hunting to maintain itself in Grinnell Land.

DIVISION 4.—SECTION 2.

This section includes the unknown tract between the north coast of Grinnell Land, in latitude 83° , and the Pole, a total distance of 486 miles; not so far as from Toronto to James Bay.

Parry, in 1827, succeeded in getting as far north as $82^{\circ} 45'$ by sledges and boats north of Spitzbergen.

Between 1847 and 1857, a great number of arctic expeditions were sent out to rescue the Franklin expedition lost in 1846 after making the North-West passage. These different expeditions explored nearly all of the islands lying west of Baffin Bay and Dr. Kane advanced to Cape Constitution beyond latitude 80° on Kennedy Channel.

In 1860-1 Hayes reported as having gone as far as $82^{\circ} 35'$ by the same route, but it is more than probable that he did not reach this latitude. (See Greely's narrative).

Hall, in the *Polaris*, in 1872-73, by the same route, went as far as $82^{\circ} 15'$.

Parry's farthest north, 1827, was not passed until 1875-76 when Nares and Markham pushed through Robeson Channel with the *Alert*, and Markham by sledges went as far as $83^{\circ} 20' 36''$.

The sister ship, *Discovery*, wintered at Lady Franklin Bay.

In 1881-82 and 1882-83 the Greely expedition wintered in Lady Franklin Bay, Brainard and Lockwood exploring the north-west coast of Greenland to latitude $83^{\circ} 24'$ the "farthest north" to date, this point being 459 miles from the pole.

Peary in 1893 attained $81^{\circ} 37'$ on the north-east coast of Greenland.

The writer is of opinion that the safest and most certain route to the pole is by vessel to Lady Franklin Bay, thence by sledges over the Poleocystic Sea, following the Greenland coast as far as possible.

DISCUSSION.

Mr. Chipman—I may explain to you that this map on the wall, which was drawn by Mr. L. B. Stewart, is on a projection which I have never seen described. The centre line is a straight line, representing in this case the 75th meridian. On that, commencing at the pole, were laid off the degrees of latitude; that is, the lengths were computed for each degree from some German table—I believe they were in meters, and reduced to English miles—and put upon this plan which is drawn to a scale of fifty miles to an inch. The total distance between the pole and this parallel of latitude was carefully scaled and the sub divisions made afterwards, so that the errors were not cumulative. The circles are drawn with the pole as centre. Then the length of each degree of longitude was found from tables and the arcs calculated; these were laid off in the different parallel and subdivided. You can understand there was a great amount of work in this. This took Mr. Stewart some two or three weeks before he began plotting on the topography. The topographical part is the least part of the work. When you examine it you will appreciate the excellence of the work. The distortion will be found to be very little. Approaching the pole we found that in laying off the arcs on this circle, the distortion was so small that it amounted to about the width of a line only in a degree, so that it was not apparent to the naked eye. The map extends from the 40th parallel to the pole and then over the pole into Siberia. The object of this plan was to exhibit a strip of territory on each side of this meridian right up to the pole and beyond, all being on the same scale of fifty miles to an inch. The common maps that we have of our country are generally so distorted that they give you a very poor conception of the extent of territory that is north of us. This plan shows the territory from the Labrador peninsula practically to the Lake of the Woods country, and it is the same width throughout. On most maps the great area surrounding the pole is generally shown as being water, whereas it is not known what it is.

The President—I am sure we all feel indebted to Mr. Chipman for the industry which he has expended upon both this paper and

the report of the Committee on Polar Research, for I can assure you that so far as I am concerned, although I am on the Committee, I have done nothing towards the work and I think Mr. Chipman has done most of the work himself. He has gone to a great deal of trouble in preparing this paper, and he has given us a great many facts which I think most of us have never given any attention to, and they are certainly interesting.

Mr. Gaviller—I would like to ask as to the coal deposits in the very high latitudes, Baffin's Bay; have you ever found if they are in actual existence?

Mr. Chipman—I have seen photographs of them, that is the best I can say. There is a coal seam at Lady Franklin Bay, about eight feet in thickness above the water level. It is a good quality of lignite, about equal to that in our North-West.

Mr. A. R. Davis—I have travelled a little east and west and south and have always had to pay railway fare—or nearly always—but to-night we have been taken on an excursion to the far north and it has not cost us anything, and it has been very interesting to me. I don't know whether the members of this Association are all crammed full of information about the north or not, but I must admit that I am not very well informed in reference to that country. When my ship comes over, if it has one-tenth of the wealth aboard that I am hoping for, I will gladly equip an expedition to send Mr. Chipman up there. Seriously, I think the members of this committee are worthy of the praise not only of this Association, but of the whole community, for the movement they are making in this direction, awakening an interest in the unexplored regions of our own country to the north. It is hoped that our Governments, both Dominion and Provincial, will in the future take some interest in a financial way in the development of that country; and I am in hopes that this is only the beginning of future researches in that direction.

Mr. Tyrrell—I am sure we were all extremely pleased with the paper we have just listened to; I know I was at all events, and with the report of the Committee also, which I am sorry to have to confess that, though a member of the Committee, I had nothing to do with. There are so many points that I feel like speaking about that I scarcely know where to begin. I might mention a point spoken of in connection with the report as to the expense of an expedition into the north. Mr. Chipman spoke of the necessity of chartering a vessel, but I scarcely think that would be necessary. American and Dundee whalers are in the habit of going as far north as Smith's Sound annually and calling at a point, I think it is called Cape Jones, but not the Cape Jones in Hudson's Bay, of course; it is just to the south-western end of Smith's Sound. An expedition could easily be taken out at a comparatively small cost by one of these whaling vessels; in fact, I happen to know just now of an American expedition which has already made arrangements for conveyance to the shore of Elles-

mere Land by a Newfoundland whaler. I think the cost of a small expedition, of say twelve or fifteen men would scarcely amount to any such figure as \$50,000. I know this American expedition I have already referred to, which has its headquarters at Washington, is only figuring on \$20,000 to \$25,000. Whether their estimate is too low or not I don't know.

Mr. C. F. Aylsworth—I must say that heretofore I have never been inspired with a very wild or savage interest in the aims and aspirations of this Association, but after listening to the way in which this subject was handled to-night I must admit I have been endowed with a new interest in it. I think the Association is to be congratulated on having members who are capable of grappling with such a problem as this. I think the fact of this Association taking hold of this subject is going to give it a standing it has not heretofore had.

Mr. Chipman—The object in preparing this paper was to awaken an interest, as I stated, among the members of the Association in our northern land. I believe that there is a great future for that country. We cannot, of course, expect that it will be developed as the southern territory is, but I believe that men can make fortunes there if they will only make up their minds to stand the hardships for a few seasons. It is unreasonable to think that a large territory such as that is a land of desolation, that there is nothing there. That the coal on the north of Hudson's Bay will be available here, of course, is out of the question, but there is a possibility that there is coal south of Hudson's Bay, and while that possibility remains we should not rest until it has been fully explored. I stated in my report that we now know less of that territory than was known two hundred years ago. Some may take exception to this statement, but I think it is literally true. As evidence of this, you will find in the corridor outside of this hall a cannon brought here from the north shore of Hudson's Bay. Others were found in the same vicinity, some four I think, and one was brought here. Up to this date we don't know when they were left there or for what purpose. We know nothing whatever about them. And it is so all through that territory, evidences of former visitants are continually being brought to light. Probably the Hudson Bay Company know something of this.

As to a Polar expedition, a great many people laugh at us, but we must just stand their ridicule. If I were only a more robust and younger man I don't think I would rest until I had set my foot beyond the 80th parallel; and I hope that, if any members of this Association at any time have an opportunity of joining in an expedition, they will do so as members of the Association, at least that they will connect the Association with their expedition or with their position in some such way that the Association of Land Surveyors of Ontario will be benefited thereby. It will not detract from the honor that will fall to them and it will be of perhaps great assistance to us.

Mr. Speight—I think the Association would be very glad to hear a few words from Mr. Stuart Jenkins. He is one who has taken quite an interest in that northern country and is here to-night.

The President—We would be very glad indeed to hear him.

Mr. Jenkins—I feel very much honored by the request, but I assure you I came here to-night to learn and not to teach, and Mr. Chipman has so thoroughly exhausted the subject that I don't think there is anything left to say.

Mr. Aylsworth—I would like to hear Mr. Chipman state what he claims to be the object of this expedition. I have been reading a little about the subject lately, and I have been discussing it a little too. Of course I am heartily in favor of it, but I would like to get the real, practical, scientific reason for it.

Mr. Chipman—I think I stated in my report that we will not argue the point with a strict utilitarian. We cannot argue it; it is out of the question. But for a scientific man I am sure the objects are sufficient. One object is to know what is now unknown; that is really the great object. There is a tract of territory there that we know practically nothing whatever about, though it has been theorized about for two hundred years.

Mr. Aylsworth—Is that scientific or sentimental?

Mr. Chipman—Well, it is both.

Mr. Bowman—Are there not certain observations that may be made there that cannot be made other places?

Mr. Chipman—Yes. Of course, the first thing to be done will be to find a practical route there; after that, scientific observations will be made. There is no doubt that if the trip be once made it will be repeated. In every difficult work undertaken that has been the rule. Take the scaling of the Matterhorn in Switzerland; it was not scaled until Whymper did it, but since then it has been done every season, and it will be the same with the North Pole.

There is one other matter I did not touch on. Perhaps you are not aware, as I was not until I thought it over, that probably this Canada of ours contains a larger area of unexplored territory than any other continent in the world. That is something, I think, Canadian surveyors may take home and think about.

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 " Northward, Ho!
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McClure Discovery of North-West Passage.
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Nares Voyage to Polar Sea, 1875-76.
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Payer New Lands within the Arctic Circle.
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Ray Report International Polar Expedition, Point Barrow.
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Wrangell Expedition to Polar Seas.

Reports of Geological Survey of Canada (Ottawa), 1871-72 ; 1872-73 ; 1875-76 ;
1877-78 ; 1878-79 ; 1879-80 ; 1880-81-82 ; 1882-83-84 ; 1885 ; 1887-1888.

Report of Select Committee House of Commons on Navigation of Hudson's
Bay. (Blue Book, Ottawa, 1884.)

Reports on Hudson's Bay Expeditions in 1884, 1885 and 1886. (Reports
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Report on Basin Moose River (Borron). (Department Crown Lands, Toronto,
1890.)

SUMMARY.

	Sections.	Latitude.	Miles.	
First Division.	1	42°48'	000	North shore Lake Erie
	2	44°02'	141	Matchedash Bay
		44°58'	200	Maganetewan River
		244	C.P.R., Lake Nipissing	
	3	48°12'	373	Height of land
		400	Abittibi	
				Ontario.
Second Division.		51°03'	570	South end James Bay
	1	.....	700	Solomon's Temple
	2	55°00'	843	Cape Jones
		56°48'	926	Richmond Gulf
		58°45'	1102	Nastapoka River
3	60°00'	1189	Cape Dufferin	
				Hudson's Bay.
Third Division.		62°30'	1362	North End, Mansell Island, Hud- son Straits
	1	66°32'	1643	Arctic Circle
	2	69°30'	1848	Fury and Hecla Strait
	3	72°30'	2055	Pond's Inlet
	4	73°50'	2150	South shore Lancaster Sound. . .
				Baffin's Bay.
Fourth Division.		76°15'	2315	Cape Tennyson
	1	78°15'	2455	Capes Alexander and Isabella. . .
		80°15'	2593	Cape Calhoun
		80°45'	2645	Greely Fiord
		83°00'	2784	North Shore Polar Sea.
	2	83°24'	2811	Furthest north by Lockwood, 1882. .
90°00'		3270	Pole	
				Polar Sea.

TABLE OF TEMPERATURES.

PLACE.	LOCATION.	LATITUDE NORTH.	LONGITUDE WEST.	THREE WARM-EST MONTHS.			THREE COLDEST MONTHS.			MEAN TEMP. OF YEAR.	YEARS.	AUTHORITY.
				Max.	Min.	Mean.	Max.	Min.	Mean.			
Toronto	Ontario	43°30'	76°24'W	99.2	28	69	37.0	26.5	+24.55	+44	1841-94	Meteorological Dept.
Ottawa	Ontario	45°26'	78°41'	99	29	64	55	33	+15	+43	1872-94	"
Mattawa	Ontario	46°17'	78°42'	95	22	63	51	43	+9	+37	1890-94	"
Quebec	Quebec	46°48'	71°13'	96	22	61	49	34	+14	+38	1876-94	"
White River	Ontario	48°20'	86°20'	92	19	55	53	70	-2	+31	1887-94	"
Fort Arthur	Ontario	48°27'	89°12'	96	21	58	63	40	+6	+35	1877-94	"
Winnipeg	Manitoba	49°53'	96°07'	98	19	61	47	46	+2	+32	"	"
Moose Factory	Ontario	51°16'	86°56'	94	26	56	53	47	+3	+31	1878-94	H. B. Co.
Prince Albert	Saskatchewan	52°55'	106°0'	94	14	55	57	60	-1	+29	1886-94	"
York Factory	Hudson Bay	57°0'	92°26'	106	23	53	44	53	-13 ¹	+21	1842-83	"
Fort Churchill	Hudson Bay	58°43'	94°10'	84	30	45	39	45	-18	+14	1885-86	"
Fort Rae	Great Slave Lake	62°39'	115°44'	78	28	53	26	48	-24	+22	1882-83	H. P. Dawson.
Average Observing Stations	Hudson Strait	63°	75°	68	27	39	30	40	-16	+12	1885-86	Dominion Gov't.
Point Barrow	Bothia Felix	69°59'	92°0'	14	38	36	30	56	-26	+2	1829-32	Ino. Ross.
Upernivik	Alaska	71°15'	156°35'	66	20	36	30	52	-25	+9	1881-83	Ray.
Port Bowen	W. Greenland	72°45'	55°30'	48	37	48	38	47	-7	+13	"	"
Bay of Mercy	Prince Regent Inlet	73°25'	89°0'	48	38	47	37	47	-7	+4	1824-25	Parry.
Sabine Island	Banks Land	74°32'	118°0'	48	37	37	35	47	-6	+2	1851-53	R. L. M. McClure.
East of Griffith's Island	East Greenland	74°45'	94°	48	37	35	35	41	-11	1869-70	Koldeway.	
Winter Harbour	Cornwallis Island	76°47'	111°	48	37	36	36	41	-9	+2 ¹	1850-51	Ino. Ross.
North Star Bay	Melville Island	76°54'	69°	48	37	36	36	41	-9	+1	1819-20	Parry.
Discovery Bay	Northumberland Isd.	79°51'	97°	48	37	36	36	41	-9	+5	1849-50	Parry.
Fort Conger	Frank Josef Land	81°44'	64°40'W	46	16	33	33	51	-21	-1	1872-74	E. Belcher.
Floeberg Beach	Grinnell Land	81°44'	64°45'W	53	16	33	33	71	-37	+4	1875-76	Fayer & Weyprecht.
	Grinnell Land	82°27'	61°22'W	50	18	34	34	66	-30	-4	1881-83	Nares—Discovery.
	Grinnell Land	82°27'	61°22'W	50	18	34	34	74	-30	-3 ¹	1873-76	Nares—Alfred.

¹ 24/8/54, ² 10/1/59, ³ 19/3/42, ⁴ With a break of four years—1895-98.

[*This Association is not responsible as a body for any opinions expressed in its Papers by Members.*]

THE DAWSON ROUTE.

By W. A. BROWNE,

O. L. S., Toronto.

THE Dawson Route derived its name from S. J. Dawson, C.E., who, with a staff of surveyors and Indians, had been employed by the Dominion Government for several years previous to the year 1867 in making surveys and explorations between the head of Lake Superior and the Rocky Mountains to find out the best route to reach the great North-West, and, after spending several summers and winters on the work, reported to the Government that Thunder Bay would be the best point to start the route from, and which was adopted by them, and in the year 1867, the Ontario Government sent a large party in charge of Mr. Bridgeland, P.L.S., to Thunder Bay, who commenced exploring, locating and building the road from Thunder Bay (now Port Arthur) to Dog Lake, and built about six miles that summer. In the year 1868 I was employed by the Dominion Government, under S. J. Dawson, in making further surveys and explorations to find out if the line adopted by the Government could not be improved and shortened. I had a party of Indians with me who could speak very little English and I could speak very little Indian, but by making a good many signs I made them understand what I wanted, and we ran a great many lines in different directions, plotted them, and reported to S. J. Dawson, who reported to the Government, and it was decided to change the line from Dog Lake to Shabandawan Lake, and in June, 1869, I was sent up again to Thunder Bay and having engaged a party of half-breeds at Sault Ste. Marie on my way up, as soon as I arrived I made explorations to locate the line between the part built by the Ontario Government and Shabandawan Lake. By the next boat a large party of French Canadians arrived to commence building the road, and another by the next boat, and I had to work my party of sixteen men from daylight till dark to get enough line located to keep them at work. I set them at work building shanties at different points so as to give me time. But after the first month we had an easier time and kept going backwards and forwards between the different parties and so kept them at work. We had four shanties or divisions and built about twenty miles of road that year besides getting out timber for bridges, etc. In the winter of 1869 and 1870 I started with a party of three white men and nine Indians to make a traverse of all the lakes, rivers and creeks on the proposed route, between Shabandawan Lake and Fort Frances, traversing about 500 miles to find out which were the most available, viz., with

the longest water stretches and shortest portages. Having travelled about 1,500 miles on snowshoes of course this was a compass traverse, and we did not take all our provisions with us, but *caché* them at several central points (what I mean by *caché* is: we packed down the snow and then put logs and brush on top and put our provisions on and covered them up with oilcloth, bark and brush), and I plotted most of my work as I went along, but, as you can imagine, it was pretty rough work, being done in a shed tent and a toboggan for a drawing table, and sent it down to S. J. Dawson at Ottawa whenever I could, who, after consultation with the Government, decided on the line, and in the year 1870 the Wolseley expedition, to suppress the Riel rebellion, took place, and I was sent word in March by special messenger that the road, water stretches and portages would have to be ready for them and that 1,500 men would arrive on the first boats to assist me. I immediately returned to Thunder Bay and engaged all the men I could and started locating road, pushing up provisions and locating points for the different shanties. I had a party of twenty-five men and it kept us on the jump all the time to get ready for them. We did the best we could, which was not very much, on account of the country being so rough and broken. I saw afterwards many places where it could have been improved if we had had the time. But I divided up the parties and laid out some for one, and went ahead and laid out some for another, and so kept them at work, and when the military arrived we made use of them in construction. The regulars were very anxious to work and kept bothering me to give them work, as we gave them the handsome sum of twenty-five cents a day extra. But the volunteers were not so anxious, but tried to get off. And when I got them all well started, I went ahead and laid out the portages between the different lakes, and built channels in the creeks and rivers by digging out the mud and stones with our hands, wading in the water, and made canals so as to allow the boats to pass. It was no child's play, standing in the water above your knees, and sometimes up to your waist, and digging out mud and stones, and building a wall on each side, forming a regular canal for the boats. The line that was adopted was the Dawson road to Shabandawan Lake, forty-five miles, through that lake and creek dug out as before described, and then portage of about half a mile to Kasha-boiawigamok Lake, then portage of about one mile to Lac. Des Mille Lacs, Baril Bay and portage to Baril Lake, nine miles, Brulé portage one quarter of a mile, Windegoostegoon Lake, twelve miles. French River, on which we built canals, by taking the stones out of the bottom and building a wall on each side to allow the flat boats to pass, and in some places building dams to raise the water, so as to overcome rapids. Then French portage, two miles, a very stiff portage, on account of the high and broken solid country, being all rock. Then through French Lake and river to Lake Kagassikok, fifteen miles, to Deux Riviere, portage two miles, Sturgeon Lake, twenty-seven miles, Island portage one-eighth of a mile, Lac La Croix, Tanner's Lake and then Rainy Lake, the longest stretch of water, to

Fort Frances, which was the principal Hudson's Bay post for this district. We met a great many Indians there and had the pleasure of meeting a medicine man, and seeing a white dog feast, which they kept up for three days, and you would think Bedlam had been let loose, what with the tom-toms, dancing and shouting. We joined in some of the dances, much to the amusement of the Indians. The men and women dance separately, but we joined in with the women and had a good time. And then we resumed our journey, making a short portage to avoid the falls (which are very pretty) into Rainy River, and then down the river to Hungry Hall at the mouth, where we were visited by about twenty-five very fine, tall Indians, and we had to be very civil to them, as they all had guns and tomahawks with them and were anything but civil to us. They threatened to rob us, but we gave them some provisions and kept them quiet, so as to give time to a party of about fifty, who were following us, to arrive. I felt anything but comfortable. We had two military men with us, but they took their rifles and went off into the bush and stayed there till the others arrived and then said they had only been off hunting. Then through the Lake of the Woods (120 miles, river and lake) to the north west angle, and then a waggon road of ninety miles to Fort Garry (now Winnipeg). I have tried to give you a general idea of the route, but being so long ago, I have forgotten a great deal, and especially the Indian names of the lakes.

DISCUSSION.

Mr. Chipman—I would like to ask Mr. Browne to draw on the blackboard a rough sketch showing the forty-ninth parallel, and explain to the Association how it was that the American Government claimed that little territory up there called the North-west Angle north of the forty-ninth parallel.

Mr. Whitson—At first it was supposed that it was on the forty-ninth parallel.

Mr. Kirkpatrick—Buffalo Bay is about on the forty-ninth. Then you go north quite a piece and then there is a line down, which leaves a tract, I suppose of three or four townships in the States, which has really no access to it. It is north of the forty-ninth parallel.

The President—Is there not a natural boundary there?

Mr. Kirkpatrick—No.

Mr. Chipman—I would like an explanation from some member of the Association how that occurred; how it happens that the United States territory extends north of the forty-ninth parallel.

The President—I think it is somewhat similar to the way Maine and Michigan happened to come into the United States.

Mr. Sewell—I believe that the principle in fixing the boundary was to follow the Hudson Bay water shed, commencing from Pigeon River as the northern boundary of the United States. From thence they were to go to the north-west angle of the Lake of the Woods, and then there were two disputes. One was with regard to Hunter's Island, as to whether the boundary line should go south or north of the Island. That was decided in favor of Canada; and then on a kind of reciprocity basis the "north-west angle" was yielded. From thence to latitude forty-nine, they had to go south.

Mr. Miles—It has always been my impression that it should have read the south-west angle. That there was a "clerical error" made in the draft of the treaty.

[This Association is not responsible as a body for any opinions expressed in its Papers by Members.]

FARMERS' LEVEL AND DRAIN GRADIENT INSTRUMENT.

BY ALLAN ROSS DAVIS,

C.E., O.L.S., Napanee.

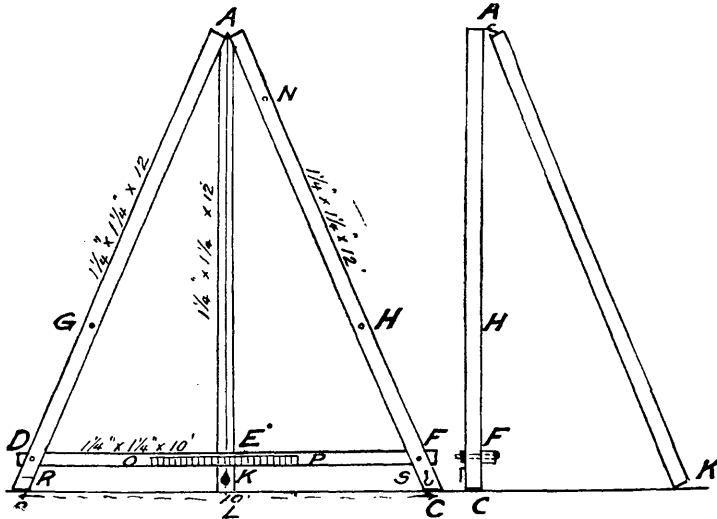
THE farmers of our country have always felt the necessity of some simple contrivance by means of which they could find the difference in elevation of any two points on a drain; and having obtained the fall to enable them to make the desired excavation on a uniform grade.

I have a distinct recollection of certain discussions with my brothers in years gone by when living on the farm in reference to the direction in which certain fields could best be drained and the probable fall to certain outlet points. Similar difficulties obtain to-day in the management of nearly every farm in the country. Ditches are constructed through every field, main drains, often deep and expensive, are excavated, tile sub-drains are made, road grading and side ditches to the roads continue from year to year on the various road divisions of every municipality, and rarely in such ordinary cases is a level of any sort whatever brought into requisition. If legal proceedings be instituted under the provisions of "The Drainage Act," or "The Ditch and Water Courses Act" an engineer or surveyor is usually employed to take the levels and establish grades. These are the more important drainage projects, however, where several owners, as a rule, are interested, where expensive rock excavations are frequently necessary, and where the drains, extending over several farms, demand careful instrumental work. For all such projects it will be necessary in the future, as in the past, for owners of land to employ engineers or surveyors to perform the work.

For the ordinary drainage purposes of each individual owner of lands, where it is customary to construct ditches or drains "by guess," I have constructed a simple, cheap, light instrument, which cannot get out of adjustment, which does fairly accurate work, and which can be manipulated by any intelligent school boy, who understands simple division, and can see out of at least one eye.

While engaged in drainage work in the county of Lennox and Addington last summer, the idea occurred to me that if a plumb line, suspended, would always assume a position in the vertical plane, it should not be a difficult task to obtain a true horizontal plane at right angles to the former. A symmetrical triangle was immediately suggested with a plumb line suspended from the apex. While considerable time has been spent since in obtaining suitable proportions and making

various experiments, the simple idea first suggested of a triangle and plumb line still forms the governing principle in this farmer's instrument.



Referring to the accompanying plan Fig. 1 is a front view of the level and Fig. 2 is a side view.

Two white pine legs B A and C A $1\frac{1}{4}$ " square and 12 feet long are hinged together on the inner side at A. The legs are opened until the distance B C between their extremities is 10 feet, centre to centre.

An arm D F $1\frac{1}{4}$ " square and 10 feet long is bolted on the legs at a distance of 1 foot from their extremities.

At a convenient height for the eye of, say, $4\frac{1}{2}$ feet from the bottom a small hole is bored part way through each leg at G and H, equally distant from H. A beveled cork is inserted in each of these holes, projecting out, when firm in place about $\frac{1}{4}$ of an inch.

Fine steel needles are placed in the centre of each cork, perpendicular thereto, projecting beyond the corks about 1 inch. These are the sights and may be made as fine as the eye will allow. Care must be taken to place these sights equally distant from the centre of the hinge H. The hinge rivet has an eye projecting out from each side in one of which—that corresponding with the side of the arm D F, the plumb line is fastened, while a hook at the end of the brace A K, passes through the other eye of the hinge rivet. The lower end of the brace A K is provided with a sharp brad, or grapple, which projects some two inches. A plumb bob is attached to the line so as to swing below the arm D F. The instrument is now erected to the perpendi-

cular, when if the surface B C be level the plumb line will cover the centre part of the arm D F at E. If by reversing the position of B and C, the line covers the point E again, the triangle is true and G and H, two fine sights 7 feet apart are level.

If the instrument be set in this position about equally distant between and in line with two points whose difference of elevation is required, the foot of the brace is brought in until the plumb line swings close to the arm. One leg, B or C, is then raised until the plumb line A K covers the centre of the arm. Then sending a man with a rod, a square piece of white paper and a pencil to one side of the field, the man at the instrument sights over the two needles and directs the assistant in marking his rod at a point in line with the sights. The assistant is now sent to the other end of the drain pacing the distance between the two points.

The same operation is performed there. The difference between the two marks is the difference in elevation of the two points on the ground. Measure this distance in inches, and divide by the distance between drain extremities in hundred feet. If the fall be 20 inches and the length four hundred feet, the grade will be 5 inches per hundred feet.

Having found the fall and the possible grade of the bottom of the drain the more important step of running such grade now becomes necessary. This is done by means of a graduated brass scale, screwed to the centre of the arm D F. The zero mark of the scale O P is at the centre E and the graduations thereon are made by elevating one leg B $\frac{1}{10}$ inch at a time, revolving the whole triangle around C, and marking the corresponding points covered by plumb line on the scale for each $\frac{1}{10}$ inch elevation of B until B is raised 10 inches.

To graduate the left end of the scale C is raised, revolving around B in a similar manner, a mark being made on scale for each $\frac{1}{10}$ inch elevation of C. The marks on the scale are extended into lines graven deeply in the brass about an inch long and are numbered consecutively from 0 to 100 on each side of centre of scale.

The distance B C being 10 feet, each graduation on the brass scale denotes $\frac{1}{10}$ inch in 10 feet or 1 inch per 100 feet.

Consequently when one leg is lowered so that the plumb line covers the fifth graduation from the zero mark, the feet B and C stand on the grade of 5 inches per hundred feet, that required for the case in point. Placing B at the lower end of the drain, we raise C until the plumb line covers No. 5, left of zero, B and C are on grade. The point C is preserved and after the section is excavated, the grade of another section is obtained by placing B on the point C, and again making plumb line correspond with No. 5. Thus each section is excavated if shovels be used. Should plows and scrapers be utilized, a more convenient way would be to make the excavation for a considerable distance approximately and then run grades over the bottom of the drain by setting up instrument in centre of field and elevating one leg until plumb line denotes the required grade on scale. There

the needle sights being on grade make the bottom of drain parallel to the line of sight over needles. Thus the instrument will not require moving until drain is completed. When the leg B is raised to the highest point, viz., 10 inches, the base is not 10 feet and therefore theoretically the grade would not be $\frac{1}{10}$ " for 10'. Practically, however, it does not appreciably affect the scale since the inclination to the horizontal is but 29 minutes and the length of the base is 9.999644 feet.

I have made several tests of the work done by one of these farmer's levels made by myself, not as carefully as may be done, and found the work to correspond very closely with that done by my level. I am convinced that when due care is exercised in their construction that levels sufficiently accurate for distances of about 200 or 300 feet on either side of the centre, may be taken, and the grades run with but little variations from the true grade. The County Council at its last session in Napanee adjourned one afternoon for a time to witness the operation of the level and expressed hearty approval of its simplicity, cheapness and necessity. When not in use the bolt D is withdrawn and the arm swung around until the bolt is placed through the leg at N. B and C are then drawn together and secured by a hook and eye, R. and S. The sights are removed and in a compact shape the level may be laid away.

The feet B and C are covered with a thin sheet iron plate to preserve them from abrasion.

DISCUSSION.

The President—It appears to me that this instrument will not interfere in the slightest degree with the engineer, as some might be inclined to think. We should remember that anything that we may do that will lead to the benefit of the farmer will benefit every man in the country. We, to a certain extent, depend upon the farmers for our living, very largely so in fact. And I think that if you can help the farmer to dig his small ditches he will not attempt anything larger. Of course if he were to undertake to carry out larger works, the inevitable result would be that the farmer would bungle the job and would throw away Mr. Davis' level in utter disgust and go and consult an engineer. In that way it seems to me it might do the farmer much good, and if it does it benefits us. It certainly cannot do us any harm.

Mr. Sankey—I quite agree with the remarks just made. I think that there is another point, though, that is probably worth considering. I have not myself had a great deal of experience amongst farmers in this country as to drainage, but before I came to Canada, I had a good deal of experience in that way—I refer now to the North of Ireland—and it was generally found that some farmer had a rough and ready way of draining, and the farmers in his neighborhood, when they saw that he got a good result from what he did, would get him to do it for them on their own farms. Then the result of all this

draining was that they accumulated so much water in the water courses outside that larger works had to be undertaken in order to carry off the water. Now I am not down on the Ontario farmer at all: he is a good, shrewd, hard-working man, and does not mind spending money if he can be sure that he will get a return for it. When he drains one field and sees the result he will go to another, and perhaps his neighbor will take up a field or two, and so on, thus making themselves better able to bear the assessments that will come on them for a large draining scheme. I understand from information lately received through a friend here in Toronto that there are a great many more thousands of acres in Ontario susceptible of drainage than even the surveyors know anything about, and I hope that some member, who is conversant with drainage matters will write a paper on that subject for next year, with any statistics he may be able to get during the year to show the enormous number of acres lying idle and useless in this province to-day for want of drainage. In the North-west they have been making some surveys for irrigation work in the neighborhood of Calgary, and it has astonished even the engineers themselves to find the large amount of land that is brought within the limits of a supply of water. I think the same thing would apply in the reverse direction here, that is we would be astonished to find the great number of acres that could be drained with comparatively small cost. The instrument seems to me to be a suitable and handy instrument. I was going to ask whether there was any means of elevating or depressing the legs?

Mr. Davis—There could be an extension leg.

The President—I think it would be just as well to confine it to the simple form. I am thinking of putting this into the hands of a farmer in some work I have to do to guide him in laying his tile drains. It is somewhat similar to the English boning rod.

Mr. Fawcett—I have seen ditches of some ten miles or more laid out with an instrument like that in British Columbia. It is used by Chinese and others for constructing ditches for irrigation purposes. They generally go along and just move the front leg of the instrument until they get the grade they want. In using an instrument like that they get their ditches constructed in a very good shape, so that the principle seems to have been already adopted out there.

Mr. Gibson—I suppose I am the only farmer present, and it strikes me as being important to know in the first place what the cost of the machine is.

Mr. Davis—It need not cost more than \$3.

Mr. Gibson—Well, it is within the means of "us farmers" anyway. You are probably aware that there are men who make it a business, almost a profession, throughout the county of York, to do drainage work, and there is always a little trouble about getting their levels. Now this instrument is one that cannot get out of adjustment and can be handled by anybody, the hired man or the roughest man

you can get hold of. Not only that, but it would encourage men to drain their lands and get rich, so I think it is a very excellent idea. I am much pleased with the machine.

Mr. Robertson—Up in our section of the country, where crude methods of farming are carried on very extensively in the shape of draining, the open drains are usually constructed first. The farmers do a great deal of tile draining, and, as Mr. Gibson says, there are tile drainers who do a great part of the work. A great many of the farmers, however, get an engineer to take the levels first, then they get this professional tile drainer to come on, and they have an instrument—I have not seen any like this, but this would answer the purpose very well—and they come on with it and complete their work with the stakes set by the engineer. In that way the drainage is chiefly carried on up there. Of course there are some who put in their drains without any instrument whatever, but in many cases they might as well bury their money as their tile in that way.

Mr. Ross—I think it would be to the advantage of the Engineer to have this generally adopted, because a man working with this would carry out his work in a good manner. The open drains would have an even grade and the water would run nice and smooth, and the engineer would get the credit; people would say he knows his business. There was a discussion on that matter last year in reference to a case where the tiles were very improperly laid, and the engineer got the blame for it, but with this, all work of that kind would be properly done.

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THE ANEROID.

By OTTO J. KLOTZ,

O.L.S., D.T.S., Ottawa.

In the following notes no attempt will be made to give any theoretical exposition of the theory of barometers—mercurial and aneroid—but simply to give results obtained in the field, compiled from observations by members of the Staff of the Alaska Boundary Commission, 1893-1894.

The object of the Alaskan survey was for the purpose of obtaining the topography of the country. For this end the photographic method was used. The triangulation necessary for orienting the photographs was made with 3-inch Troughton & Sims transits, reading to minutes in both horizontal and vertical circles. The trigonometric height of mountains was obtained with this instrument also. Each party was supplied, too, with several aneroid barometers, for convenience of knowing by simple inspection the approximate altitude. The final altitudes of all points, however, rest on the trigonometric determinations and those obtained from the photographs based thereon.

The aneroids were by H. Hughes & Son, London, and were of three sizes—2", 3" and 3½"; the first two had an attached thermometer, and the smallest a movable footscale. The 3-inch ones were found to be the best. Systematic and simultaneous readings of the aneroid, at camp and on mountain, including those of temperature, were not made by all the parties. In the following results, of course, only such were utilized. Nearly all the mountains were climbed directly from the sea; and the ascent and descent were made mostly in one day. The altitudes climbed range from 2,000 feet to 6,000 ft.

Mr. Edward Whympfer, the noted traveller, has made elaborate experiments with the aneroid, and from his investigations has arrived at certain conclusions, among which may be mentioned:—

1. That at low pressures (high altitudes) the aneroid is very unreliable; the difference of readings of mercurial and aneroid may amount to two inches.
2. That difference of height at low pressure may be obtained with considerable accuracy.
3. That from aneroid readings, mountain heights are almost invariably too great.
4. That the difference of level obtained in ascending is generally greater than in descending a mountain.
5. That all aneroids, without exception, lose upon the mercurial barometer when submitted to diminished pressure, and recover a portion of the previous loss when pressure is restored.

6. That index errors are seldom or never constant.

7. That the method of examination of aneroids at Kew Observatory is faulty, and the deduced corrections for various pressures (30 to 15 inches) incorrect.

These conclusions cover a wider ground than the experience in Alaska afforded; however, some of the foregoing conclusions have been corroborated.

The most marked is—That aneroids almost invariably lose upon arrival at the summit of a mountain, that is when the aneroid is read on reaching the summit, then again after several hours (after taking the angular measurements and photographs) it will show a diminution of pressure, that is an apparent greater altitude. This difference of reading, for a range of about 6,000 ft. of altitude, fluctuates between 0 and 5 hundredths of an inch, or say from 0 to 57 feet. From this observed fact it becomes evident, that if an aneroid and mercurial be placed under an air pump, and within a short space of time (an hour or so, as is customary) comparisons be made at various pressures, the results are erroneous for application in the field. The aneroid has constitutional properties and peculiarities, and even idiosyncrasies, the latter being a measure of our ignorance.

From comparisons which I made in 1893 and 1894 of the same aneroids, with a standard mercurial, I find that the index corrections are not constant. However, it is not essential that, for obtaining altitudes by difference of barometer readings (foot and summit) the index corrections be known, for unless it be large, the ratio of the uncorrected readings will practically equal that of the corrected ones. For example: Suppose the readings to be 30.15 in., and 24.72 in., indicating an altitude of over 5,000 feet, the index correction be +.05, the difference between the two deduced altitudes is less than 10 feet.

With reference to the difference of level obtained in ascending and descending a mountain, the Alaskan observations of 1893-1894, on 43 mountains, give the following results:—

Altitudes deduced without applying temperature correction—29 were greater from readings of ascent than of descent, the difference aggregating 1772 feet; 12 were less from readings of ascent than of descent, the difference aggregating 600 feet; 2 were equal from readings of ascent and descent.

When the temperature correction is applied, and this correction is a very important one, and should be well observed, that is the temperature of the atmosphere, and *not* by means of the attached thermometer which some aneroids carry, but a thermometer swung in the air, then it was found that 21 were greater from readings of ascent than of descent, the difference aggregating 1239 feet; and 22 were less from readings of ascent than of descent, the difference aggregating 1316 feet.

From the latter, which are of course the ones to be utilized, it would appear that the probability of the altitude deduced from readings of ascent being greater than that of descent, is equal to the probability of being less.

Furthermore, the mean difference is \pm 60 feet.

Mr. Whymper's experience that, from aneroid readings, mountain heights are almost invariably too great, the Alaska observations give the following results:—

HEIGHT.		DIFF.	HEIGHT.		DIFF.	HEIGHT.		DIFF.
Mean of Aneroid.	Trigonometric.		A - T	Mean of Aneroid.		Trigonometric.	A - T		Mean of Aneroid.	Trigonometric.
ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.
1796	1781	+15	3827	3893	-66	4558	4719	-161
2412	2478	-66	3886	4026	-140	4702	4774	-72
2457	2470	-13	3901	4052	-151	4710	4812	-102
2930	2971	-41	3942	4072	-130	4764	4836	-72
3009	3059	-50	3967	3983	-16	4773	4766	+7
3134	3173	-39	3967	4070	-103	4842	4982	-140
3258	3322	-64	4063	4092	-29	4847	4881	-34
3353	3340	+13	4065	4098	-33	5009	5175	-166
3380	3452	-72	4108	4156	-48	5097	5159	-62
3427	3493	-66	4182	4220	-38	5137	5268	-131
3479	3557	-78	4185	4209	-24	5390	5533	-143
3654	3670	-16	4219	4233	-14	5731	5917	-186
3748	3684	+64	4357	4440	-83	5748	5913	-165
3766	3850	-84	4399	4492	-93	5802	5913	-111
3774	3851	-77	4470	4483	-13			

It will be seen in the 44 comparisons of aneroid (mean of ascent and descent), and trigonometric height, only four show a greater height by the barometer, and the difference only averages 25 feet, whereas 39 show a marked less height. From the 44 comparisons we obtain a mean difference of 70 feet for a mean height of 4,200 feet. That is, the barometric height is too small, and is in error somewhat less than 2 per cent.

This is contrary to Mr. Whymper's observations; but it must not be forgotten that his results are obtained, I think, exclusively from very high altitudes in the Andes, and hence not strictly comparable, as the loss of the aneroid on the mercurial is not a direct function of the height.

Johnson, in his valuable "Theory and Practice of Surveying," says (p. 136):—" * * * to stop at a number of stations during the day for a half hour or so, reading the barometer on arrival and on leaving. The difference of these two readings shows the rate of change of barometric readings due to changing atmospheric conditions, and from these isolated rates of change a continuous correction curve can be constructed on profile or cross-section paper, from which the instrumental corrections can be taken for any hour in the day."

From the experience gained in Alaska, as also that of Mr. Whymper already referred to, the above conclusion appears faulty, for if while stopping at a station ascending a mountain the atmospheric conditions be constant, then we would experience a fall of the

aneroid, indicating apparently a change in the atmospheric conditions. This has been noted time and again where one barometer was read hourly at camp and another one read on ascending and descending mountains. From the former we could see the change in the atmospheric pressure.

The formula used for the determination of heights by the barometer was

$$Z = \log \frac{h}{H} 60384.3 \left(1 + \frac{t + t' - 64^\circ \text{ F.}}{900} \right)$$

In the use of the aneroid for determining difference of altitude, it is very essential that the temperature of the air at top and bottom of mountain be carefully read, not for the purpose of making any correction to the barometer readings, for the change of temperature alone of the air does not affect the barometer, at least not that at sea level, but for the purpose of correcting the constant, by which $\log \frac{h}{H}$ is multiplied. This constant represents the height of a column of air of uniform density, and at a temperature of 32° F. Consequently, when the mean temperature is greater than 32° F. the volume of air becomes greater, the density less, and the height consequently increased. The correction for temperature has, in some instances, amounted to over 300 feet.

CONCLUSION. Read the barometer carefully at ascent and descent; hold in same position, preferably horizontal; note by a good thermometer (not attached to aneroid) the temperature of the air, and the mean of the deduced altitude will give a very fair, say within two per cent., value of the difference of height, or absolute height if one station is at sea level.

Among the data obtained are some from which an approximate value of the relation between temperature of the atmosphere and altitude may be obtained. The thermometer readings were not taken with this end in view. This relation varies with the condition of the atmosphere, the most potent factor being that of humidity. As is well known, one of the manifestations of solar energy on the north-west coast of the American continent is the reception of humid thermal currents—the Japan current—from the south-west, whereby the climatic conditions, due to latitude, are greatly ameliorated. The drier the atmosphere, the greater is the difference of temperature in ascending or descending a mountain. The greater the humidity of the air, the less is the difference of temperature dependent on elevation; this is due to the latent heat given out by precipitation of the moisture. This property of the atmosphere makes itself apparent in our Chinook winds along the Rocky Mountains, and in the Foehn of Switzerland. To illustrate: Suppose a moist, warm current from the Pacific to strike the Cordilleran range of mountains in British Columbia. Let its temperature be 60° F. , and the rate of cooling be 1° F. for every 350 feet of height; suppose it to be carried to a height of

7,000 feet, its temperature will then be reduced to 40° F. Precipitation will have taken place, and the latent heat of the water given out. The current proceeds onward, eastward, and descends to a valley of say 1,600 feet elevation; that is, it descends 5,400 feet, but now as a comparatively dry atmosphere, and for which the rate of cooling due to elevation is 1° F. for about 180 feet difference of altitude. We would then have the current warmed 30° F., and this added to its temperature when beginning the descent would give us a "Chinook" with a temperature of 70° F. This is an ideal case, but the principle involved is the one that explains the Chinook and Foehn.

The result arrived at, that is the equivalent in altitude for a difference in temperature of 1° F., is obtained from 21 determinations, ascent and descent of mountains. Due to difference in the humidity of the atmosphere and other causes (unknown), there is a considerable range for the value of altitude, due to change of 1° F. in the temperature. The minimum value obtained was 141 feet, and the maximum 863. The arithmetic mean of all gave 376 feet \pm 25 feet.

Jordan gives the mean value for Middle Europe as 365 feet.

Bauernfeind in his investigations has found that the temperature of the air decreases in arithmetical ratio with the increase of altitude, and is proportional to the sixth root of the barometric pressure, the temperature being reckoned from the absolute zero.

DISCUSSION.

The President.—The last experience I had with an aneroid was when it brought out a hill about 300 feet high which I was on, below the swamp I started from.

Mr. Chipman.—We used the aneroid this summer on some work between here and Georgian Bay, and excepting on windy days we found the results quite satisfactory. On a windy day we did not rely on it at all.

Mr. W. F. King—What was the difference in height?

Mr. Chipman—I suppose you mean the difference between the extreme elevations measured. The error did not generally exceed five feet in a distance of one mile, the difference in elevation being 200 feet.

Mr. King—This table that Mr. Klotz gives shows that there is a good deal of irregularity in the results with the aneroid. The average is about 2 per cent., but there are many cases in which the error runs a great deal over that. I am inclined to think that if the observations were analyzed it would be found that the average error increases with the height. I think in measuring small heights, as Mr. Chipman says, you will get pretty close results, but when you run up to a certain point the aneroid seems to fail. I have noticed that myself in a small way in many years. I have made exploratory surveys on prairie where the differences of level were not very great, and used the aneroid and found it gave me very good results generally, that is, I would measure a hill and the result would come pretty near what I would guess it to be. I did not find any case where the top of the hill was lower

than the bottom. In one case I was driving to the Cypress Hills, where the ground rises gradually for a long distance, something like 40 or 50 miles, and I took careful aneroid readings all the way. We occasionally dropped into a deep valley of probably 150 feet, and it would record all right. The ground kept rising and rising until I got up to an elevation very nearly 4,000 feet above the sea, 3,500 anyway, that is a difference of perhaps 1,500 feet between that and the level of the prairie at the point I began the readings from, and so far it had recorded everything apparently right. Then I dropped into a valley of about 300 feet, and it showed that 300 feet, the depth of the valley, a great deal less than what it evidently was. Then we got from that up a steep hill on to the plateau of the Cypress Hills, about 4,000 feet, and the barometer absolutely failed to work; it showed the top of that hill to be at the same level as the creek below. I see in the first part of the paper, giving Mr. Whympers' results, he says (No. 4) "that the difference of level obtained in ascending is generally greater than in descending a mountain." Then these aneroids seem not to be tested or made accurate beyond a certain point, and if you get up near that point your aneroid is ruined by being strained. I remember on the old boundary survey of the 49th parallel, somebody taking an aneroid barometer up a mountain, and when it got up 4,000 or 5,000 feet above the sea the thing stopped, although the maker had graduated it to show a height of something like 12,000 feet. I may say in defence of the Alaska survey, that, though you may think these are wild results given in this table, the accuracy of the survey is not involved in these aneroid readings. It is merely an auxiliary reading used principally as a check upon the other work, and is taken out as an alternative instrument in case the triangulation work should fail. Two years ago when we started the Alaska survey, we knew nothing practically as to the climate of Alaska except that it was very wet and very cloudy, and we thought it would be impossible, perhaps, to apply the triangulation system with photographs, so we took aneroids and a lot of other rough instruments, for the sake of having something in case we could not get any photographs. But these aneroid readings do not enter into the results at all; the results are made complete by the very full survey we succeeded in making by means of the transit and camera.

Mr. Lumsden—I have done a good deal with the aneroid and I cannot say much for it.

Mr. Sankey—Is it found that the aneroid on returning from a high station returns to its normal condition and will register afterwards, or is it likely to be out of adjustment?

Mr. King—Well, it is likely to be out of adjustment, they say. We had about 12 or 15 aneroids on the survey, and half a dozen of these had to be returned for repairs. They seemed to work loose and got out of kilter. I don't know whether it was the extreme moisture that caused it, or the difference in level.

Mr. Chipman—Did you carry a mercurial barometer for checking it?

Mr. King—Yes, which was always kept at the sea level.

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TRIANGULATION WORK ON TOPOGRAPHICAL SURVEYS.

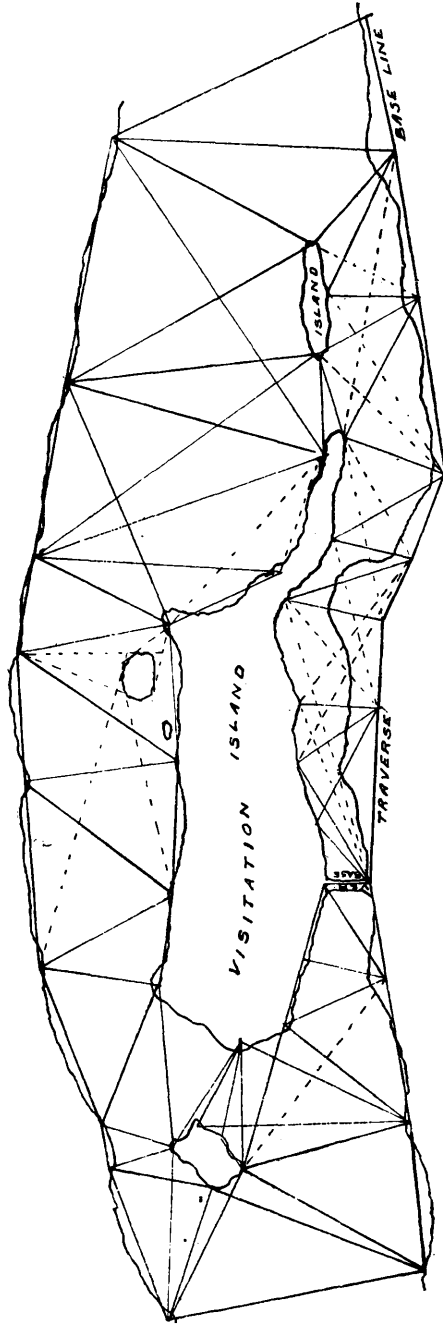
By HENRY K. WICKSTEED,

O.L.S., Cobourg, Ont.

IN the circular of the society dated Dec. 24th, among the subjects suggested for discussion is that of the above title, and the writer having frequently had recourse to the system under somewhat unusual conditions thinks that a few remarks may be of some value. He has found the method of peculiar value in the case of surveys of broad rivers, with thickly wooded banks, where the traversing of both banks would entail a large amount of chopping through tangled under brush, and consequently a strong party of axemen. By the triangulation method, a base being established, the chain can be done up and the survey can be carried on by the surveyor and assistant with two men and two canoes, at a rate much in excess of traversing, and varying from 2 to 4 linear miles per day according to the lengths of the sides of triangles, and the amount of detail desired.

It has always been the writer's practice in such surveys to mark the station points by a pole cut in the woods, and having two cross bars fastened to it at right angles to one another, so that from whatever distance it is looked at it always appears as a cross. When the angles are to be read the pole is lifted out of its hole, and the instrument set immediately over it. Plumbing over a hole 2 inches in diameter in a mud or gravel bank may not appear to be a very accurate method of proceeding, but it will be found that in ordinary work with an instrument reading to minutes the probable errors are very much less than it is within the power of such an instrument to detect and record.

A few months ago, upon a railway survey, the writer had occasion to run a traverse along the shores of a couple of long river-like lakes in order to block out a location, following them as closely as possible. Being very shorthanded and the country covered with wind falls and scrub the average progress had been only about one mile per day. He conceived the idea of triangulating, with the result that the rate of progress was doubled and one-third of the party were employed running supplies forward without any loss to the working party. The average length of side was 700 or 800 feet, and the result was of considerably greater use in determining the location than a traverse would have been. The area covered by this survey was some three square miles and the cost \$60.00, or \$20.00 per square mile, including only the rough plotting necessary for camp work. The only conditions necessary in



*Skeleton Plan of Triangulation
H. K. Wickstedt, O. I. S.*

choosing the station points were that at least three points, two behind and one in front, should be visible from it and that the subtended angles should not be less than 30° or more than 120° . All these angles of each triangle were invariably measured and the sum was expected to lie between the limits of $179^\circ 58'$ and $180^\circ 02'$, the angles being laid down on the paper with an ordinary protractor. Any less error was not considered worth looking up, but it was very seldom that the sum did not come within one minute of 180° . Another survey, of which a plot is given, was made of a portion of the Ottawa river. The area comprised was something less than one square mile, but the amount of detail was considerable. The measurements were carried over a traverse eastward for one mile or more along a side channel of the river with a number of subsidiary triangles in order to determine the widths at different points. The last line on this traverse was used as a base from which a chain of main triangles was carried westward up the main river for two miles and then back along the side channel to the first line of the traverse as a verification base. The resultant error was less than $\frac{1}{10}$ of 1 per cent. and was probably due to the imperfect chaining of a raw hand employed. The entire cost was \$20.00, and the time occupied two days. Only one assistant and, for a portion of the time, one laborer were employed. The ground on each side of the traverse was elaborately levelled and contoured necessitating a chained line of some sort as a basis for cross sections, otherwise a chain of triangles throughout would have been equally serviceable, and more rapidly measured. The writer believes it to be customary in such surveys to mark the two ends of the base line by permanent stone monuments which can be readily picked up at some future time in case it is required to extend or check or amplify the survey. Stone monuments are expensive things, iron bars are not quite proof against being stolen or moved, and the writer has found that the location from the base line of two or more existing permanent objects and the determination trigonometrically of their distance from one another (and bearing) answers every purpose, and that these objects need not necessarily be accessible. In the case under discussion a church spire and the iron stack of a mill formed two convenient points of reference by which to tie on any future work in the neighborhood. The writer believes that a survey of this kind, where correctness without any extreme precision are all that is required, as in filling in between the angular points of a precise triangulation, or in the case of a survey of a limited area for a special purpose, can be carried on with very much greater rapidity and cheapness than in any other way. As each triangle is complete in itself and is proved as the work proceeds, the surveyor is freed from the constant dread of errors due to careless chainmen and picketmen, which the writer, for one, always feels when running a long traverse to a closure.

DISCUSSION.

Mr. Gaviller—There is one point mentioned in this paper, the cost of triangulation, which has been inquired about, but this only

covered a very small area. I think it would be hardly proper to base the cost of a large triangulation upon the figures given here. Still, it is a very good paper, a practical paper, and one that I think would apply on the triangulation here, because it was mentioned by Mr. King that where the principle triangulation would take place in Ontario is level country, and being such, there are not very many prominent elevations to locate as permanent points and the lines would be consequently much shorter than they would be in a more hilly country.

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CO-EFFICIENT OF REFRACTION.

By OTTO J. KLOTZ,

O.L.S., D.T.S., Ottawa.

As a good many reciprocal zenith distance readings between mountain summits were taken in Alaska last season by Canadian members of the staff of the Alaska Boundary Commission, for the purpose of obtaining the heights of the mountains, it was thought that the data might furnish, too, an approximate value of the co-efficient of refraction. It must be remembered that the instruments used were 3-in. transits—Troughton & Simms—and reading to minutes on both circles. Hence the degree of precision is not comparable with that of primary triangulation. However, it will furnish a comparison to those engaged in similar work and under similar conditions. It is well known that the humidity of the atmosphere in Alaska is high. The mean temperature was about 56° F. for the season.

In the theoretical investigation for refraction the path of a ray is supposed to be concave towards the earth. Observation shows that this is not always the case. Simultaneous observations between two stations are made under the assumption that then the path of a ray is a circular arc, while if not so made—that is at different times—the circular arcs will probably be of different curvature, and the correction for refraction at each station not equal. By co-efficient of refraction is understood the ratio of the correction for refraction, to the angle at the centre of the earth, subtended by the distance between the stations, or, more accurately, to the angle between the normals.

For an exhaustive treatment of the subject the reader is referred to Helmert's "Hoehere Geodesie."

If z = observed zenith distance at one station.

z' = " " " " other "

dz = refraction correction to z .

dz' = " " " z' .

m = co-efficient of refraction.

C = angle at centre of earth subtended by distance between two stations,

Then, $z + dz + z' + dz' - \pi = C$

Assuming $dz = dz' = F$

Therefore, if $z + z' > \pi$

∴ $C - 2F$ is positive (C is always positive).

∴ either $2F$ is positive and $< C$.

Or, $2F$ is negative and $> C$.

- If $z + z' < \pi$
 $\therefore C - 2F$ is negative.
 $\therefore 2F$ is positive and $> C$, and hence m positive.

The co-efficient $m = \frac{F}{C}$ will be positive for all positive values of F .

$2F$, *i.e.* F , can only have a negative value when $z + z' > \pi$, and hence m negative only for same condition.

We find, therefore, that when m is negative that the path of the ray is convex towards the earth.

When $z + z' < \pi$ we infer a compound curve—convex and concave—for the path of the ray.

An astronomer once said to me in Washington, "Results alone should not be published, but always accompanied by the observations, so that the reader can draw his own inferences." This is very true, but this is essentially an age of "time is money," and most men say with *Bos*, "What we want is facts;" how they were obtained is to them immaterial. There is a limit however to "boiling down." Even if all details are not given, yet, in a "paper" presented to a society of professional men, enough of the method, instruments and conditions should be stated, that a fair estimate can be obtained by the reader of the value of the results given.

I may state that in compiling the reciprocal observations only two observations were discarded, and these showed palpably errors of sighting to the wrong peak in the reciprocal reading. By discarding largely divergent values, of course, the probable error of the resulting mean could have been materially reduced. The observations have all been reduced for an assumed uniform height of instrument.

From the subjoined observations we find the mean value of m to be $.0793 \pm .009$. The value of $m = .078$ for the sea horizon is given by Lee as determined by the U. S. Coast and the Geodetic Survey in the New England States.

From the mean of 144 values of m determined from the observations of the Ordnance Survey, it appears that the mean co-efficient of refraction is $.0771$. The co-efficient is somewhat greater (about 10%) for rays crossing the sea. From Jordan's "Handbuch der praktischen Geometrie," we quote the following:—

Extreme values of m .	
Delambre finds—	Maximum $m = .2977$.
	Minimum $m = -.0035$.
Geodetic Survey, East Prussia—	Maximum $m = .0769$.
	Minimum $m = .0632$.
Precise levelling, Swinemünde and Berlin—	Maximum $m = .1334$.
	With calm air and pleasant temperature.
	Minimum $m = .0415$.
	With strong winds and low temperature.

Gauss gives—

Maximum $m = .1039$
 Minimum $m = .0571$.

Coast Survey of Baeyer has—

Maximum $m = .1938$.
 Minimum $m = .0478$.

Fuss, Sawitsch and Sabler found, in the determination of the differences of level between the Caspian and Black Sea, even greater deviations, which, however, from the shortness of the distance, may be attributed to errors of observation.

The observed zenith distance is dependent upon the pressure, and hence variable. Temperature, too, affects the observed angle of elevation or depression; in short, the co-efficient of refraction is a function of the temperature and atmospheric pressure.

The angle of depression, irrespective of refraction, should always be numerically greater than the angle of elevation. There are instances (as we had) where two stations whose difference of level is not great, and distance apart considerable, mutually show angles of depression, but never both of elevation.

For a simple approximate rule, and one easily remembered, may be given:—"One seventh the number of thousand feet between two stations gives the difference in minutes of the reciprocal readings."

From this we know at a glance whether there is anything abnormal or any bulk error in the readings.

To determine the height of a mountain with a fair approximation to the truth is, with proper instruments and care, not a difficult matter, but to obtain accuracy within a few feet for high mountains is, from the nature of the problem in its present state, impossible.

COMPUTED VALUES OF M FROM RECIPROCAL ZENITH DISTANCE READINGS,
 NOT SIMULTANEOUS, WHERE $m = \frac{F}{C}$

Dis- tance.	m.	Dis- tance.	m.	Dis- tance.	m.	Dis- tance.	m.
FT.		FT.		FT.		FT.	
22903	.0342	43572	.0245	70640	.0040	102051	.1478
26420	.0615	45079	-.0593	70651	.1331	103636	.1667
26905	.0729	45885	.2190	74961	.1761	108238	.1116
28340	-.0587	47580	.0386	75769	.0590	124076	.0882
31614	-.0873	54631	.1236	84025	.0506	124930	.0794
31839	.0626	57433	.0705	87155	.0493	126925	.2414
36032	.1223	61351	.0268	89856	.0809	142990	.1115
38983	.1977	63612	.1387	93195	.0465		
42395	-.0273	64270	.0715	94792	.1184		

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REMARKS ON THE CRADLE THEODOLITE.

BY JOSEPH M. O. CROMWELL,

O.L.S., Perth, Ont.

I HAVE observed that the only figure of an English-made surveying instrument appearing in the annuals of the Association, is that of a cradle theodolite, and I am aware that a number of those instruments have long been and are yet in use, for all purposes, among our practitioners, and, while appropriate papers have appeared in the annuals relating to the transit theodolite, I have observed nothing relating to the cradle. I propose, as briefly as I can, to supply what appears to me to be requisite, mostly with reference to that instrument. I may, incidentally, refer to the English transit in passing.

The English cradle theodolite, especially the five inch, is a handy, portable instrument, sufficient for almost any work in surveying in the settled portions of this country, and for sub-dividing in original surveys, if in as exact adjustment as its construction admits, but, as supplied by the makers and vendors to the profession, it is not, so far as my experience goes, adapted for astronomical work at all. I speak whereof I know, in saying that more erroneous astronomical bearings have been recorded in Canada, owing to its use than from all other causes. How is it that, although most, not all, of its individual parts are well made, and the graduations equal to those of other instruments, material parts are so attached to each other, as to render it, for astronomical purposes, worthless?

The principal objections to those instruments are, that the standards, as usually made, admit of no adjustment for leveling the vertical axis, and they are seldom of equal height. I never found them so; and the Y's are screwed or otherwise so fastened on the Y plate without any attention as to whether they carry the optical centre of the telescope or line of sight, at right angles to the vertical axis, also the time and patience necessary to rectify those displacements.

I will, at the risk of taking up too much space, give an illustration or two, I could give many, by some results flowing from the use of those instruments in their usual form. In 1853 I was sent for to establish side-lines in two concessions in the vicinity of Ottawa, reputed to be 100 chains in depth, each, and, as there had been conflicting surveys in the two concessions, to save what was believed to be unnecessary costs, and end contentions, I was informed it had been mutually agreed to run the lines on the astronomical bearings of the governing boundaries, then lately ascertained by a

very reputable surveyor who was leaving the profession for more remunerative employment (then only \$4.00 per diem), which I declined to do, and took the bearings myself, using an eight inch English transit with two telescopes and illuminating axis and a mercurial false horizon. Both governing lines were well defined throughout, and we differed in our recorded bearings in both concessions, $0^{\circ} 17' 0''$, and $0^{\circ} 22' 25''$, respectively, both in the same direction. He informed me he had taken his observations on polaris at its greatest elongations, with a false horizon, at two places on each concession, and we both came to the conclusion that the most likely cause of the difference was, that he used a cradle theodolite, whose line of sight was, probably, not at right angles with the vertical axis, something that had not previously occurred to him. Where a farm survey of his came in contact with one of mine, the difference on the ground was very much less than the difference between our recorded bearings, *i.e.*, the cradle, under similar circumstances, gave approximately similar results.

In 1858, for the two townships, I made a survey of the town line between Nepean and March, extending the depth of four concessions, in Nepean, from the Ottawa river. It had previously been surveyed under instructions from the C. L. Department, and stone monuments planted on the original line where it intersected the concession lines by another surveyor who used a cradle theodolite. With my transit and a false horizon, I took the astronomical bearings of three of the four of the governing boundaries on it of Nepean. Afterwards I ran side-lines in those Nepean concessions, fronting on the Ottawa, one of which resulted in a costly law-suit, and the plaintiffs' attorney procured copies of the field-notes of the surveyor who placed the stone boundaries on the town line, which stones represented the front and rear ends of the lines governing the courses of the side-lines in Nepean, when, to our horror, it was discovered that his sworn astronomical bearings differed from mine $3^{\circ} 27' 00''$ on the concession in question, $3^{\circ} 37'$ and $4^{\circ} 02' 7\frac{1}{2}''$, respectively, on the other two concessions. The differences were all the same way. Under these circumstances they deemed it advisable to employ another surveyor to take the bearing of the boundary in question, to test mine, which was done. He used a fine Troughton & Simm's cradle theodolite, with two telescopes and a false horizon, and took his observation on the greatest elongation of Polaris, and we differed in our bearings about $0^{\circ} 7' 00''$, which was the nearest coincidence between the transit, in adjustment, and the cradle, as it came from the maker I had known, and was sufficient for our purpose. I suggested to the old gentleman, that, as he had not tested his instrument, which was nearly new, for that emergency, it was possible that the collimation of his instrument, owing to displacement of the Y's, might possibly be a little off, and, if so, it would describe a curve, and not a perpendicular straight line in passing from the star to its reflected image, and he enjoyed a hearty laugh at my expense, remarking, that "boys might be expected to give vent to nonsense like that."

The adjustment of those instruments is a tedious process, occupying several days. In unfavorable weather I have spent a week or more, at one. I have felt something akin to the old elder who always went to prayer before commencing to put up stove pipes. The first requisite is to adjust the collimation in the optical centre of the telescope. If the tubes are not accurately fitted to each other, the inner one will not travel in a straight line, and every movement of it is liable to change the collimation, and, in that event, the adjustments of the other parts become more difficult—it is something that cannot be remedied, and is hardly less objectionable than eccentricity, and is too frequently found in other classes of instruments as well as in this one.

The next thing is to make the vertical axis permanently level, which can best be done by the aid of an observation on polaris, which gives a perfectly vertical line of indefinite length. The instrument being accurately leveled by the levels, and made to cut the star, the deviation from cutting its reflected image in the false horizon will indicate which of the standards is to be raised (the bearings of those instruments which are chamfered cannot be lowered), thin slips of brass or copper are to be placed under the feet of the shortest standard,—they may be got from cartridge shells with very little alteration,—which is then replaced and fastened by its screws, and the operation repeated till the spider line cuts the star and its image. As the ends of the vertical axis of those instruments are not cylindrical, care must be taken in replacing the standard that the tops are the exact width of the axis, or chafing will result.

There are two sources of error in collimation peculiar to the instrument in question, viz., that of the lines in the telescope, and that of the Ys. I have already referred to the former, the latter is the most important, as already shown.

It is evident that if the collimation or line of sight is not at right angles to the axis on which it revolves, a small, and not a great circle of the sphere, will be described on its surface, and if the telescope is elevated and depressed on a horizontal axis (not a perpendicular straight line), but a curve will be described on a perpendicular plane surface, at right angles to the line of sight, the convex side of which curve will be opposed to the inclination of the line of sight. In other words, if the error in collimation be to the right, the error on an observation will be to the left, and *vice versa*.

TO ADJUST THE Y^s FOR COLLIMATION.

As the telescope cannot be revolved on its axis as on the transit, I have found the following to be the easiest method, viz: Hang from the gable of a building of at least two stories, the higher the better, as fine a plumb line as can be distinctly seen with the telescope, and of a different color from the building, to which fasten at about on a level with the telescope when the instrument is in position, a small block of wood with a card tacked on it at the back of the line, the

block to be just sufficient to let the card touch the line when taut, and when the twist is out and the line at rest, secure the exact place of the line by a perpendicular pen and ink mark on the card, set the instrument at right angles from the building and opposite the line sufficiently distant to bisect with the spiders lines, the top of the plumb line at an altitude of from 40 to 45 degrees, level the instrument in the usual way, and adjust the focus for distinct vision of the line. About half way from the card to the top of the line, place a false horizon in position to show the reflected image of the top of the line, and with the leveling screws, make the spiders lines bisect the line at top and its image in the horizon, and its deviation on the card will be the error in collimation, resulting from displacement of the Y's. And the operation must be repeated by detaching one of the Y's and removing it sideways on the Y plate and re-fastening it so as to throw the line of sight to the right, if the error, as shown on the card, was to the left, and *vice versa*.

After the telescope is focused for short distance, it should again be examined for collimation so that the Y may not be moved owing to a mistake as to where the error in collimation lies.

The tubes of a surveying or engineering instrument ought to be as truly fitted to each other as the spindle is to the cone, otherwise the object glass will not travel in a straight line, and every movement of it is liable to change the collimation, causing endless loss of time and worry and vexation, especially in inclement weather or amid a horde of mosquitoes.

It is an advantage peculiar to this instrument, that, as there are no attachments to the telescope it can be reversed in the Y's for transiting with little or no need of disturbance of the instrument, but it can be more easily and safely done if the telescope is given more room to pass, in and out of the Y's, which can readily be done by filing something off the heels of the clips to enable them to turn back, and moving that one of the Y's a little lengthwise on the Y plate, which may have to be moved for collimation, so that the flanges of the telescope will not necessarily impinge on the Y's. The collars being segments of one and the same cylinder there can be no objection to giving them sufficient play room on the Y's. I prefer the English cradle to the English transit for the production of straight lines.

Many years ago, in London, I remonstrated with a leading optician against sending out those instruments in the state I have indicated, his answer was, "it is not intended for astronomical work." That being so, it should, for Canadian surveyors, be either "mended or ended."

I may add a few remarks intended to relate to the English transit.

I know of no reason why Y, instead of circular bearings are made for the telescope to revolve in, except for reversing the axis in the Y's, nor is there any reason for reversing the axis at all, except to avoid the error so often found in collimation, and even if the collimation is all right, another difficulty is climbing in the Y's, and what I have found

to be the best and easiest way to avoid that, in so far as it can be avoided, is to soft solder plates of brass on the under sides of the ends of the clips so as to raise them sufficiently to admit a small slice of firm leather fastened with two small screws with deep threads, coming in from above and having two milled thumb-screws on each clip, instead of one milled and one common screw, by which to give the clips just sufficient pressure to secure the axis firmly without impeding it, and without a screw-driver. Also, if the shoulders of the axis fit close to the Y's, as they usually do, it will be difficult to reverse it in the Y's without disturbing the instrument, which may be largely prevented by extending the distance between the Y's just sufficient to let the axis pass in without grazing. As I have stated in reference to the cradle, it can be done by loosening the screws under the feet of one of the standards just enough to admit thin, narrow slips of brass, to be inserted under the inside edges of its feet, a very little lateral play to the cylindrical bearings can do no harm. My work has been all local, and I have always, on comparatively level ground, produced my lines with a pocket telescope and plumb-line, as I could in that way be up with my men and make better headway, with quite as much accuracy as in using the transit. I preferred reversing the axis in the Y's unless the collimation was exact. It requires considerable practice to picket correctly and rapidly with the pocket telescope. In transiting, I left the attachments of the telescope at home to facilitate reversing it in the Y's.

My practice of over forty-eight years, has all been local, almost exclusively astronomical. I never went on government surveys. I have preferred the five inch English transit (it comes cheaper here than the best foreign instruments), with perforated axis, and axis level reading to 20". I have discarded the English case and re-packed it in a longer, narrower case, about two-thirds of the cubical dimensions of the English case, with the telescope attached, which makes a much safer and more portable case. I have taken my astronomical observations on polaris, at nearly all hours of the night, when the stars could be seen—on the greatest elongation, when early in the evening—otherwise, on it in conjunction with any one of the other principal circum-polar stars. Sometimes, when I had surveys in several localities, miles apart, I took the observations at them all the same night, to avoid stopping over for a clear sky at either place. My eyes have not, for many years, been sufficient for day observations. The perforated axis is much to be preferred; it affords a constant, steady light, so desirable in hazy weather or floating clouds, and avoids the aberration caused by the flickering of a light held by an assistant, in windy weather. It is especially preferable when two stars are being used in conjunction with each other, as nearly as possible at the same instant of time. Also, the axis level, if properly constructed with vertical and lateral adjustments, is to be preferred to the false horizon, as it gives less trouble, and it is hardly possible to have the mercury packed in the case without particles of it getting on to the graduations, and it requires a rather dangerous heat to

evaporate it. As the axis of the cradle theodolite is not made to receive a level, the horizon is the only alternative, in astronomical observations, but there is no reason why its bearings should not be cylindrical and extended beyond the Y's to receive a level, except that it would be leaving the old rut of the makers.

In conclusion, it is not so vital the kind or size of the instrument, as the perfect adjustments of every part of them. An exceedingly small defect in the tripod or graduations, or the exact placing of the verniers, etc., etc., will more than counterbalance any advantage to be gained by a larger or differently constructed instrument. For example, I have had several instruments, in every other respect faultless, in which one or both of the verniers were a very little too near or too distant from the centre of the vernier plate, so that, although their zero lines were exactly opposite to each other, or 180° apart, on the vernier plate there was less or more error in the readings from them as they were taken from some division on the vernier less or more remote from its zero end. I have frequently had to detach a faulty vernier and replace it so that its lines at both ends would exactly coincide with the two divisions on the limb it was intended to embrace. Twenty or thirty seconds of error, resulting from the foregoing defect alone, would make all the difference in the results between a six inch instrument reading to $20''$ and a five inch reading to a minute.

DISCUSSION.

Mr. Abrey—There are a good many errors in this paper, as printed, that perhaps ought to be corrected before it goes in the report. When he says "false horizon," I suppose he means an artificial one; he even uses the word "vertical" where he means "cross" or "horizontal." And by "levelling the vertical axis," I suppose he means adjusting them. There are a good many errors like that all the way through.

In reference to the adjustments for placing the "Y's" at right angles to the cross axis, it is not always made so that that is easily effected. I got a transit made some time ago and I had the telescope made to revolve through Y's so as to give a chance of placing the collimation in the centre of the telescope. Then it became necessary to place the axis of the telescope at right angles to the cross axis and I got the Y's placed with adjusting screws so that that might be done. It was for the purpose of solar observations I got it made, and there are some advantages in having it revolve in that way as well as to revolve on standards.

I must say I am surprised at the amount of error he found in taking observations, "three or four degrees." I presume that the cause of error was simply because the telescope was not at right angles to the cross axis; there seems no other reason for it, and such a large amount is most surprising. Then, in taking astronomical observations, as he refers to here, of course there ought to be a pair of observations made. The north star is so elevated it becomes necessary to always

correct the error of the level of the cross axis so that in all cases I think that the observations should be made with a striding level.

In reference to what he says about producing lines with the theodolite, I think perhaps he is correct, that in careless or hurried work the theodolite produces lines better than the transit; it is less liable to get far astray. It does not matter much whether it is adjusted or not if the ground be comparatively level.

Mr. Gaviller—Another difficulty is a little ice getting on the Y's and swinging it off to one side.

Mr. Aylsworth—Do you suppose frost would affect the Y's?

Mr. Abrey—It should not.

Mr. Aylsworth—One cold morning, when I struck out to run a line with my transit, I took hold of the end of the telescope and it seemed to move in the Y's. I just put in a little piece of paper for that day, but I never saw it move that way afterwards.

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HIGHWAY BRIDGES.

By PETER S. GIBSON,

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WHEN the capital invested in these structures as well as the necessity of them is considered, we may well express surprise that more skilled and professional attention is not given to them.

1. At an early period of the settlement of our country, before our timber lands were cleared off and our swamp lands overrun by fire, our rivers and streams required very simple structures for bridging them, whereas at present, with our drainage systems and clearing up of our forests, high, violent and sudden floods are the rule.

My practice in constructing bridges in about 1858 on the Government Colonization Roads was to build King and Queen Post Trusses from 40 to 120 feet spans in the clear. The long spans were necessitated to facilitate the running of logs in the valley of the Ottawa River.

In the western part of Ontario short spans only were required, which for want of saw-mills were nearly all constructed of hewn timber, the plank alone being sawn lumber, and that, in some cases, whip-sawed at site of bridge.

The prices for such bridges were usually about, for hewn timber, 10 cts. per lineal foot; sawn lumber, about ten to fifteen dollars per thousand; board measure, iron from about 10 to 20 cts. per lb; stone in cribs, about \$1.50 per cubic yard—all to be furnished by the contractor, and paid for at these prices complete in the work. The price of the iron seems very large, but the transportation to site of bridge added materially to cost.

2. The sub-structure of these bridges was usually of timber piers and abutments connected by double dovetail joints, and pinned at angles with white oak or rock elm pins. Sometimes the piers required to be sunk in water from 10 to 20 feet in depth, and were sunk by filling in with stone in false bottoms of thin boards, which were broken through by the stone filling, which was not only intended to add weight to the piers; but, in case of the foundation or bed of river being uneven, or foundation of piers being undermined by currents in the river, the stone filling, usually of round boulders, would run from the piers into any holes about the base, and thus form a good foundation.

I have known of bridges having similar piers sunk in deep water, but with a timber bottom, which could not be broken, nor was intended to be broken by the filling in of stone. These bridges very

soon failed on account of the foundations of the piers being washed out.

3. In about the year 1867 I commenced building highway bridges in the County of York, where there were plenty of saw-mills and lumber reasonably cheap, so cheap that plank roads about up to that time were constructed in many places.

I found the old bridges which I was called upon to rebuild usually King and Queen Post Trusses. The main braces, straining beams, chords, joists, and needle-beams, all of heavy timber, from 10 inch to 12 inch, and 12 inch to 14 inch sections. These bridges did not usually last over 12 to 14 years.

These bridges had sub-structures, piers and abutments of heavy timber, or bents of similar timber, which did not usually last as long as the superstructure. Some of the bridges had masonry piers and abutments with poor foundations.

4. After examining these structures I recommended the councils to adopt a different system in building the bridges. To have the superstructures composed of built beams, the main braces, straining beams, chord timbers, needle beams, to be of two pieces for short spans, up to 66 feet, to be bolted together with oak blocks between, 3 inches thick, and joints lined with sheets of galvanized iron, and that heavy joists should not be used.

5. I also recommended that cribs of timber should not be constructed either for piers or abutments—not only on account of the liability to rot, but on account of the cost—but that pile piers and pile bents should be constructed for sub-structures, and especially that the old fashion abutments, whether of timber or stone, should not be constructed, but that an additional short span or spans should be built, as much less expensive, and also to give additional water-way for the sudden high floods, loaded with all kinds of rubbish and timber, which often blocked the water-ways and caused a new bed to form for the river.

6. Another recommendation was, that the superstructures should not be bolted to or built into the piers or bents, as in case of a jam of timber and rubbish forming at the bridge it would be much better to have the superstructure carried away readily with the floating materials than resist it till by its great weight it would either crush through the bridge or cut around and form a new bed.

It may seem strange to make provision for such cases, but not when it is borne in mind that for about the last 25 years there has been a gradual abandonment of water-power, and that it has been the regular thing for the mill dams to be carried away with the spring freshets, carrying timber, trees, and large blocks of ice and other materials, which no river-bed would accommodate.

I found that such bridges readily separated into their component parts and usually lodged near the site of the bridge, and that no very great expense was required to replace the superstructures on the piled substructure, which usually was not much damaged.

7. I found that such bridges could be cheaply built as the timbers were light, and so easily handled, and also required very little skilled labour, as the chord timbers were made up of short pieces, secured together with iron straps or plates and bolts, and no tenons or mortices were allowed in the structure.

8. I also suggested that painting of new bridges should not be done until the woodwork was well seasoned, as the combination of fixed and volatile oils of linseed and turpentine, with metallic salts and oxides and other materials, usually formed a crust or coating, that prevented the woodwork from properly seasoning, and thus produced a dry rot. I also objected to the use of coal tar, and similar substances often applied to woodwork before it is seasoned, especially when applied to heavy or large timber.

I have found that good paints are hard to get, and that even the best, when exposed to the weather, requires renewing in three years or less, and as bridge timbers are not always dressed for painting—and should not be painted without it—that the dressing and painting is quite an expense, and, also, as wood-work requires protection to keep from checking while seasoning.

9. I have adopted the plan of covering all the upper surfaces of the important members of the superstructure, including the needle-beams and sometimes the joists, with galvanized sheet-iron, which I specify shall have the sheets neatly lapped upon each other and extend down the sides not less than half an inch, and to be secured to the timber and each other with flat-headed wire nails, all to be done in a neat and workmanlike manner so as to protect the timber from the wet. This, with the above-mentioned lining of all large joints, is a much better plan and less expense than painting or sheeting in the trusses with some thousands of feet of inch boards, and also presents a neat and finished appearance to the structure, and gives facility to inspection and repairs if necessary, and tightening as the structure gets seasoned or may require.

10. I also provide that the railing shall be so constructed that the parts shall have snow-boards to keep the winds from blowing the snow off the roadway of bridge in the winter, as when bare in sleighing time the teaming is very hard on the structure.

11. I have the planking of bridge so arranged that there shall be a space between the ends of the plank so no filth or dirt shall run upon the chord timbers. If the roadway is to have 14 or 16 feet plank I have the space between chords made four inches wider and have alternate plank abutted on opposite sides against the chord timbers, thus leaving a two inch space on opposite sides for the slush to run off.

12. I find that bridges constructed as above-mentioned last a long time, and that the joints lined with the galvanized sheet-iron protects them, so that in bridges with joints so lined when taken apart after being constructed over 12 years or more, show the ends clear and white as just after being cut with the saw or chisel.

I have now many bridges which have been built over 16 years and show very little signs of decay.

13. Of late years I have found considerable trouble in securing a good quality of pine lumber, lumber merchants being anxious to include in the bill as much Norway pine and top lumber as possible. In one case, when constructing an iron bridge over 350 feet in length and about 90 feet high, I had to condemn a large part of the bill of lumber and have it removed from the site on account of Norway pine which had been shipped. This class of pine does not answer for bridges whether cut thin or thick, and does not last over 10 years, and, if heavy timber, less. Lumber cut from the tops of trees is very objectionable, as it may be said to be nearly all sap wood. It looks neat and clean and sound, and has small knots but soon decays, and should not be used in bridge works.

14. In building wooden bridges I prepare a plan, specifications, bill of materials and estimate of lumber, etc., and cost, and guarantee to the contractors who tender for the work that the bill of quantities of wood and iron, etc., is correct, and fix a price for each which will be paid for extra materials, if ordered. The contractors can thus prepare lump tenders with very little trouble, as they know that the lumber, iron, cedar and stone can be bought and put into the work all complete at about \$22.00 per thousand, board measure, for lumber, and cedar piles at about 25 to 30 cents per lineal foot, and iron bars, or spike and nails at about five cents per pound, and stone filling for piers at about \$12.00 per quarry toise. With such facilities for tendering, the tenders are often very close to each other, and on account of the simplicity of construction tenders are often very low.

15. Of late years all long spans of important bridges are built of iron and steel on masonry abutments and piers, but for ordinary country roads, wooden bridges with spans up to 60 feet in the clear, are preferable when constructed as above mentioned. In case of steel and iron bridges, whether constructed with pin, screw or rivet connections, they have a fine appearance, and it is a pleasure for an engineer to construct them, and if properly cared for, may be said to be permanent structures. But especially in case of the rivet connections, these bridges do not receive the attention as to cleaning and painting, etc., they should. The idea seems to be that when an iron bridge is built it requires no care. I know now large iron bridges which I may say are actually "rotting down," as they have not been re-painted for many years and the rust now hangs in scales from them. They are all thin plates connected with rivets. I am afraid these bridges will not have long lives.

16. In 1878 I had a large number of highway bridges to build, and with a view to economy I decided to take tenders for iron as well as wood. In one case the main span was to be 60 feet in the clear, and, as I do not build abutments at ends, but short approaches, I had one 20 foot approach at north end and two short spans, 20 feet each, at south end. I received a tender for the main 60 feet span, the superstructure only, for the sum of about \$1,000, to be of iron trusses, etc., and for the whole wooden bridge, including two heavy pile piers and pile bents for short spans, \$800. So I concluded to build the

wooden bridge, which has now been standing about 16 years and has had very little repair except re-planking, and only presents the appearance of being well seasoned.

17. I had intended entering into the consideration of the relative cost of bridges of wood and iron under the various circumstances and conditions in which they may or have been built, but find it would extend this paper to an objectionable length.

DISCUSSION.

The President—This is a very important subject to the county engineer, and I am sure it will be of considerable value to most of the members. In determining the area of waterway for bridges, a very good rule—I think it was announced by Mr. Myers some years ago—is to take the square root of the number of acres in the watershed and consider that the number of square feet for area and multiply by from two to four, depending upon the character of the soil. If it is agricultural soil, two is all right, but if it is a flat rocky area, four gives about the right figure. I have followed this rule for some years, and in no case have I had any structure flooded. He very properly points out that dove-tail joints for piers are a thing of the past. It is a mistake; it adds very greatly to the cost of putting up a pier and it is not as strong as a crib built in log-cabin fashion. I have tested them practically with a dredge, trying to tear one of these piers apart and I found I could not do it. As to the oak blocks, I would like to ask whether oak blocks placed in connection with pine do not produce mutual rot between them?

Mr. Gibson—No, because I line them with galvanized iron.

The President—Then about paints; for iron work there is no question about red lead paint stirred up with linseed oil being best. It is necessary, though, to keep one man stirring while one man is painting. In dealing with ordinary white lead, we asked some Montreal dealers recently to submit samples and prices of the best white lead paints. After we received them, each one of which was of course the very best white lead, guaranteed commercially pure, we submitted them to a simple little test with a blow pipe to see how much metallic lead was in each sample of paint. One proved itself to be nothing more or less than baryta there was not any lead in it at all. That is the paint that all the painters in that part of the country liked. If it were good lead it would settle to the bottom and therefore they didn't like it. In the second, we could find some minute particles of lead scattered through the baryta, and the one that the painters condemned absolutely was pure lead. So that a simple test like that, taking only about fifteen minutes with a blow pipe, will determine whether you are getting white lead or whether you are getting baryta.

The only other point I would like to touch upon is whether concrete sub-structures cannot be used more largely than they have been. All through this northern region, where there are extensive drift deposits, there are numerous gravel beds which could certainly be had

very cheaply. During the past year I constructed myself about 400 or 500 yards of concrete piers, using one mason only to see that it was properly mixed and rammed. It cost us \$5.75 per cubic yard in place. Some of it required excavation under water; that included foundations, cribbing and everything complete, and not only that, but the piers were of a peculiar form to cut the water, not unlike a plow-share. I took some trouble to get that shape, for in these places it is a fight between the strength of the ice and the strength of the masonry. I saw a test made a short time since of a block of ice 12 x 16 inches, and it required 120,000 pounds to crush it, so since seeing that test I have had more respect for the strength of ice than I ever had before.

Mr. Gibson—In building bridges I make point of pier curved and nearly vertical, and the ice passes around it. If point of pier is made sharp and sloped the ice slides off the point and breaks off the masonry by catching in the joints, and is likely to lodge in the pier. "Ice breakers" for points of piers do not often break the ice.

The President—In regard to the comparative cost of wood and iron, during the past year the Indian reserve down at Tyendenaga were about to build a bridge across a creek, and they wanted to build a wooden one. I prepared a plan for what I believed to be a good wooden bridge for the cost, but they were not satisfied. Then Mr. W. R. Aylsworth, of Belleville, thought of the fact that you can buy iron beams delivered to-day, rolled beams up to 20 and 24 inches in depth, weighing 80 pounds to the lineal foot, suitable for spans of 40 feet, for \$1.75. The result was that iron came very much cheaper than wood. He stayed them up very simply and cheaply, and put on a plank floor of cedar, and in that case the iron beams were quite a considerable saving on the cost.

Mr. Gibson—The great trouble we have with bridges in the County of York is that we are so near the lake the floods are very high and the ice jams and sweeps the bridges away, unless you go to great expense in putting up very heavy piers and abutments and very high bridges.

Mr. Davis—I have had some experience in the line of bridge building, though not very expensive, but I find there are very many points touched upon by Mr. Gibson in this paper that will be valuable in the future. The necessity seems to be as great to-day as ever for this smaller class of bridge all through the country, and the old ones are tumbling down. I find threshing machines are making sad havoc among the bridges in our county. A short time ago, when I came to take the measurements of a bridge, I found a farm engine keeled over and the bridge in a general state of demoralization. But we put up a bridge there that we are quite satisfied no steam engine will break down in future.

Mr. Ellis—I would like to ask whether you have had any experience with concrete bridges altogether, anything in regard to the cost of these?

The President—No, not yet. I think if you take pure concrete I have no doubt whatever that they can be built at a cost not exceeding \$7 per cubic yard. That is for arches.

Mr. Ellis—It has always been a surprise to me that it has not been adopted before in this country. It is the only material that improves as it grows older. Wood deteriorates, whereas concrete improves, and I believe that they can be built quite as cheaply as iron bridges. Of course, you would have to use a certain amount of iron in the structure.

The President—That would be adopting the "Melan" system that they are now pushing very strongly in the United States and Germany. Mr. Ransome has published a very interesting book in which he describes how he puts his rods of iron into some machine and twists them into spiral form and then puts them in so that the concrete grips the iron and you get the benefit of the iron upon the tension side of the arch. There it adds to the cost of the concrete, but compared to the iron it is more permanent no doubt.

Mr. Gibson—In the case of iron bridges adjoining Toronto, long and high structures, built upon the rivetted system, we find that the rust is attacking them fearfully.

The President—It is due to bad painting.

Mr. Gibson—Yes, but the trouble is to get good paint. Lead is the only thing you should use, but they use iron oxide, and that is actually plastering rust on the bridge to start with.

A Member—I would like to ask Mr. Gibson what he generally uses for flooring.

Mr. Gibson—White pine; I find Norway pine will not last more than five or six years; it is no use at all.

Mr. De Gursé—I had occasion to look into the matter in connection with the Michigan Central Railway bridge in the city of Windsor. They proposed putting in two thicknesses, the first three inches of white pine, and placing upon that three inches of oak. I suggested that they put in cedar in the bottom and use white oak instead of black or red, as they were intending to do. They adopted my suggestion very readily, and I imagine that would be one of the very best floors, because white oak will resist the wear well.

Mr. Gibson—The trouble is you can't get it here very readily. I have a bridge now that has to be re-planked about 300 or 400 feet; it was constructed with two-inch plank in the bottom and three inch on top, and it is a mass of rotteness. I think they better put on a four-inch single plank if they want thickness.

[*This Association is not responsible as a body for any opinions expressed in its Papers by Members.*]

GOOD STREETS.

By HERBERT J. BOWMAN,

Town Engineer, Berlin, Ont.

A GREAT movement has arisen during the past few years for "Good Roads." It is the purpose of the writer in this paper to touch upon the kindred question of "Good Streets," keeping in view, more particularly, the needs of the villages, towns and smaller cities of Ontario, and it is hoped that the discussion by the members of the Association will contain much valuable experience gained throughout the province.

LOCATION.—A few of the older town-sites were laid out by the Government usually where, at the time of the survey of the district, a considerable population had gathered. In this way the Town of Niagara (formerly Newark), at one time the seat of the Government, came to possess its broad and well located streets. Later on the Canada Company, when sub-dividing its wild lands in the Province, also laid out sites for future towns, that on which the City of Stratford now stands being one planned by their surveyors. However, a great many of our present centres of population have never had the advantage of any well considered plan for the location of their streets. At some water privilege a grist mill was perhaps first built, soon to be followed by a blacksmith's shop, a general store, a hotel and a few dwelling houses, located on a more or less direct trespass road leading to the nearest Government road allowance. This road has probably for years been all that the hamlet required till the advent of a railway brought a demand for more building lots. Some enterprising owner of adjoining lands then decided to supply the demand and located new streets as he thought best, to enable him to sell his lots. Fortunately, during the last forty years, our laws have required that before deeds of these lots could be registered, a plan, prepared by some provincial land surveyor, should be filed in the Registry Office. Thus the land owner had the assistance of a more or less competent man, whose advice, however, he was free to follow or disregard. Usually the owner's object has been to get the greatest number of lots out of a given area with little consideration for the future, and so we often see new streets laid out without any regard to existing streets, or to future extensions and without any examination as to grade or drainage. It is high time that this lack of system be remedied and the writer would suggest that all plans be assented to by the Municipal Council before they may be filed, and not, only those showing streets of less than standard width, as the law now is.

WIDTH.—The Registry Act now requires that all plans with streets of less than the standard width of 66ft. must be assented to by resolution of the Municipal Council, but this assent is far too easily obtained by any influential land-owner. A By-law of the Council should be required to be carried by a two-thirds vote at its third reading, before any plan showing new streets is filed; and where the width is less than 50 ft. it should be confirmed by the County Council, as is now required when a Township or Village Council opens up a street less than 66ft in width.

A greater width than 66ft. is seldom required even for a busy city street, and for residential streets 60ft. is an ample width and probably 50ft. is sufficient in most cases, as the tendency in the country towns is to allow the untravelled portion to become overgrown with grass and weeds. However, with streets as narrow as this, a "building line" should be laid down on every plan, say 25 feet from the street line, so that the rows of houses would really be 100 feet apart on a 50ft. street. Where comparatively narrow streets are laid out, the owner of the property can afford to dedicate an occasional square or gore as a public park, and as years roll by these will be the "lungs" of the future city.

CROSS-SECTION.—A business street should have sidewalks from eight to twelve feet in width slightly inclined towards the gutters. At the edge of the walk there should be a nearly vertical curb separating the walk from the carriage-way which occupies the balance of the street surface. A residential street unless calculated for street car tracks, does not require more than twenty-four feet between the curbs for the carriage way and from four to six feet will be wide enough for the walks, while the remainder of the street surface should be sodded. In some cases the walk is placed along the property line and separated from the carriage way by the sodded portion, while in others the walk is placed along the curb, and again in some few cases the walk divides the sodded portion into two parts. When the walk is placed along the curb, the sodded portion really becomes, to all intents and purposes, a part of the adjacent property and as such will undoubtedly have better care taken of it, and if a row of shade trees is planted between the walk and the houses, no unsightly fences will be required, and in addition the trees will not be damaged by being used as hitching posts for horses. However, the chief advantage is that in streets having a "tilted" cross-section it is much easier to fit in the street grade to suit the properties, and it is also easier to arrange streets intersections when the walks are along the curb lines.

GRADE.—In very few of our towns is any attempt made to fix the grades on streets; hence a person about to erect a building is unable to form any idea of the proper elevation at which to put the ground floor so that it may conform with the finished surface of the street, and it is a common occurrence to find buildings too low and others set ridiculously high in order to be out of harm's way. Every village, town and city should have the grades of its principal streets fixed by By-

law, as this power is apparently given to every Municipal Council by the Municipal Act (Sec. 550), which provides that Councils " may pass by-laws for opening, making, preserving, improving, repairing, widening, altering, diverting or stopping up roads, streets, squares, alleys, lanes, bridges, or other public communications, and for entering upon, breaking up, taking or using any land in any way necessary or convenient for the said purposes; for setting apart and laying out such portions of any such roads, streets, squares, alleys, lanes, bridges or other communications, as the Council may deem necessary or expedient for the purpose of carriage ways, boulevards and sidewalks, or for the improvement or beautifying of the same!"

SIDEWALKS.—Wood has until recent years been the usual material used in the construction of sidewalks, although expensive stone flagging has been used to a limited extent in the larger cities. A mixture of coal-tar and gravel, erroneously called asphalt, has been tried in a number of places but usually with poor results. However, since the general introduction of Portland Cement, it has become possible, with the addition of sand and gravel only, to make artificial stone walks that are satisfactory in every respect, and the cheapest of all walks when the lifetime is considered. A harder and more durable walk is made with crushed granite, instead of sand, in the wearing surface, but it has the disadvantage of being very slippery under certain conditions.

CURB.—On gravelled or macadamized residential streets cedar planking forms an inexpensive curb, but where a more permanent roadway is to be constructed, stone curbing should be used. The writer, however, sees no reason why artificial stone curbing of superior form and capable of being laid with closer joints, could not be made at half the cost of cut stone.

ROADWAY.—In the majority of towns having good gravel close at hand this material continues to be used for the surfacing of all except the busiest streets, as a good gravel road-way thoroughly tile-drained can be made for 25 cents per square yard. For streets having more traffic a good macadam roadway with stone foundation can be laid for less than 40 cents per square yard provided suitable stone may be obtained within 50 miles by rail. Wood as a paving material for roadways is now practically out of the field. In our larger cities there is a demand for a roadway with a minimum of dust and dirt and a smooth surface. A concrete foundation is the first requisite and on top of this the surfacing material is placed. Asphalt at the present time is very popular, but the cost is great being from \$2 to \$2.75 per square yard according to specification. Vitrified brick is used very largely in the Western States; but as all brick is now imported, it has not been used to any great extent in Canada, and on a concrete foundation is no cheaper than asphalt. For the heaviest traffic of a city street granite setts on concrete foundation are used, costing about \$4 per square yard.

PAYMENT OF COST.—Before much progress can be made in any town towards good streets the Local Improvement System must be

adopted, and to avoid any chance of trouble in the future a By-law should be submitted to the people providing that all street improvements shall be paid for by special assessment on the property benefited and according to the frontage thereof.

CONCLUSION.—If the farmers condemn the ignorance of the pathmaster and lament his inability to build good country roads, surely his methods should be excluded from the towns and cities where streets should be constructed according to the best engineering practice and with competent supervision.

DISCUSSION.

Mr. Gaviller—There is one point here that is a most important one, that is the establishment of the building line. Of course, as we all know, one of the great elements in streets is their width, and in country places where a small village cannot afford to have an efficient fire service, it is a great protection to have a good wide street. The law provides that in certain cases streets shall be laid out only of a proper width, but when the farmer, as we all know, stakes out village lots, his great idea is to get as many dollars for a square foot as he can for his land, and he does not consider the convenience of anybody. This is generally the case where a new village is commenced. It ought to be established by law, and this building line, I think, is one of the most important points in the paper.

Mr. Campbell—Can you oblige a person to build back to the line you establish?

Mr. Gaviller—Certainly; that is your idea isn't it, Mr. Bowman?

Mr. Bowman—Well, in regard to that, of course if a building line is shown on a plan and especially mentioned in the deeds made according to that plan, no doubt it would be binding, but at present there is no provision by which a municipal council of a small town may prescribe the lines up to which houses may be built. But as to cities, there is a section in the Consolidated Municipal Act, 545a, which reads in this way:—"The municipal council of any city, having a population of 50,000 or more, may pass a general by-law prescribing the minimum width of streets, lanes, alleys or other public places within the municipality wherein dwelling-houses may be erected or occupied, and the minimum area of vacant land to be attached to and used with any dwelling-house hereafter to be erected, as the courtyard or curtilage thereof, and the mode of erection of buildings occupied or intended to be occupied as dwelling-houses."

Now, it seems to me that there is no valid reason why that population limit should be placed there. It should be the council of *any* city, town or village should have that power. It is not likely they will exercise it to the detriment of the community, so that if the town council prescribed the distance from the centre of the road at which buildings might be placed on different streets there would be some uniformity.

Mr. Gaviller—I think that could be safely put in the hands of a township council and allow them to use their option in the matter, because we all know there is generally a pretty good vote in the villages and it is a vote that goes pretty solidly together, so that it is not likely the council would bring in an oppressive measure and kill their chances with the village vote. If that were extended to all villages it would be a very good idea.

Mr. Chipman—It is always a pleasure to read a paper of Mr. Bowman's. He writes so concisely that we can get at the points at once, and I think the Association is to be congratulated in having papers such as this presented. There are one or two points I would like to mention not touched upon in the paper. In respect to filing plans with township councils. I am of the opinion that these plans should be subjected to the supervision of some competent authority before being adopted. The plan itself does not show everything. I have known streets to be placed upon the most inaccessible rock, that could not be made accessible from other portions of the town without the expenditure of thousands of dollars. I have also found streets laid out along a running stream, the stream being zig-zagging across the street itself. In the town of Galt, where I am now putting in a sewer system, we find streets of considerable length, some 1,000 feet or more, without any cross streets, and the centre portion between the ends ten or fifteen feet below the ends, so that there is no possible outlet for drainage except by the purchase of lots. Now if proper profiles were filed with the plans or the elevations marked upon the plans themselves it would not be possible for these blunders to occur, which must be rectified at some time at the cost of the town at large. In Galt it is quite probable that new streets will be required. In the town of Brockville, in putting in a sewer system, we opened out a new street for several blocks, which was not required except for sewer purposes, but it was cheaper to do that than to purchase a right of way.

Another point I might mention is in regard to the width of the streets. In the east I know it was a common occurrence for the owner of a property to lay out streets half the proper width adjoining either one boundary or the other, he assuming that his neighbor when he laid out his property would give the other half. In this part of the Province I have known it to be the custom for an owner who is sub-dividing his property to lay out a street adjoining one limit of his property but leaving a small strip of one foot in width between the street and his neighbor, thus preventing his neighbor access to the street without paying for the privilege. Both these systems should be condemned. The men who are selling their properties should provide proper streets of the full width. You cannot get them too wide, but that remark I do not mean to apply to the travelled portion of the street. Mr. Bowman is quite right when he says that the travelled width of the street need not be more than twenty-four feet in width; in fact, I think a less width than that would do on a residential street. It is a great mistake to lay out a roadway of any great width. I know of a town where they laid out a roadway half a

mile or more in length, grading it very nicely, and it was really a beautiful looking street, but two years afterwards at least one half the width of that roadway was grown up with weeds, and the travelled roadway was a zig-zag across the street.

As to the question of cost, I will leave that to Mr. Ellis to speak about, but the question of sidewalks is one I have had some experience with. I am not satisfied that the concrete sidewalk is the proper one for any width more than five or six feet. By concrete I mean the concrete mentioned here, Portland cement, sand and gravel. Concrete of that kind being made in squares to resemble stone, I don't think its utility has been proven yet; we don't know how long it may last. Another difficulty is, that there is some trouble in putting in sewer connections and water pipe connections underneath it, especially for the business portions of the street. In the town of Belleville last year they put in, I think, nearly two miles of concrete sidewalks on the business portions of the streets. It looks like a good job; I hope it may be, but in that city the rock is only a short distance from the surface of the ground. They have their water connections in, but their sewer connections are not in, and you can imagine what expense and difficulty there will be in the future. It is a very foolish piece of business, which, I was surprised to find, some of the aldermen admitted. In Guelph they are doing pretty much the same thing, but there is no rock there to speak of. Brantford, wisely I think, put in flagging instead of concrete on the business streets, using concrete only on the residential portions.

Respecting the use of tar asphalt, or coal tar and gravel, it has usually given very poor results, I believe. I found at London it was disintegrated in a short time, and when I was there a very few years ago they were then taking it out with picks and carting it away and replacing it with wooden sidewalks, planed, using wire nails. The object of the planing of the upper surface was that poor lumber was more easily detected, not from any superiority in its wearing qualities. The extra cost of planing was more than off-set by the better lumber secured and the ease of inspecting. As to this tar asphalt, the case I have mentioned is one where it was very poorly laid or very poor material used. In Barrie, where we put in a sewer system in 1892, it appears to wear unevenly, but it is not disintegrating to any extent.

Mr. Gaviller—It is a little too hard there; they have petitioned against it; they said it wore their boots out.

Mr. Chipman—Yes, the gravel projected through the tar, and it was really a cobble stone pavement, but there was no objection to it from disintegration. But in the town of Galt they have put in many miles of that sidewalk, and I must say it is about as pleasing a sidewalk as I ever walked upon. It is exceptionally well laid; there is very little of it disintegrating, and they are putting in every year a larger amount. There is no other town in Canada where they have the method of constructing this tar sidewalk so perfected as they have in Galt. There is only one man in Ontario to-day, to my mind, that

knows how to make tar sidewalk, and that is Mr. Curliss, of Galt. If I were interested in making tar sidewalks any place where I could get tar cheaply, I would certainly pay that man a very high salary for his services. In Stratford they have adopted a certain amount of it, to what extent I don't know. I would not like to say off-hand what they cost, but they are very reasonable, much less than concrete.

I don't know that I can add anything further; I am not prepared to go into the question of cost here, but I am of the opinion that vitrified brick or a brick that will answer for paving purposes can be laid for a much less sum than you would gather from the paper.

Mr. Ellis—There is one thing I wanted to speak about in regard to the width of the streets, that is, I see you say sixty-six feet is ample width for a street. Well, it is all right enough as long as you have not any street car tracks on it, but if you take sixteen feet six inches off the middle of the roadway for car tracks, and twelve feet on each side for sidewalks, that makes forty feet, it only leaves you about thirteen feet on each side available, and the result is that it hardly leaves you room to pass between the car and the next vehicle. I think streets on which there is to be a double line of street car tracks should be at least eighty feet wide. Another thing too, when a street is confined in that way with street car tracks on it, it throws the whole of the travel on exactly one portion of the roadway, and the result is your pavement goes to pieces just on those spots where the wheels go and where the horses keep hammering in the same place, whereas, if it were a little wider the travel would be more evenly distributed and the pavement would wear longer. In Toronto, on Bloor street, where they have got street car tracks and macadam roadway on the sides, it is impossible to keep it in good repair.

I see Mr. Bowman speaks about the cross-section of the street. That is very nice where you haven't any buildings, but where there are houses on both sides of a street, one side of which is a foot and a half or two feet higher than the other, you cannot slope it off to the buildings; if you do you are in for damages.

Mr. Chipman—In some places in the Province you haven't a difference in inches, but a difference of seven or eight feet from side to side.

Mr. Ellis—Well, then, you must go in for damages or something of the kind; there is no other way of getting at it, but I am speaking of where there is two or three feet. We have some places two feet and a half, but we have only paid \$480 damages in the whole change of eighty miles.

In regard to the question of kerbing, there is a patent artificial stone kerb made, kerb and gutter I ought to say. It is used very largely in Duluth and several other cities. We have not adopted it here because we can lay stone cheaper. Stone costs us about forty cents a lineal foot delivered on the ground, six-inch stone kerbing, twenty-four inches deep. But the kerbing has given satisfaction everywhere it has been put in. In some cases, it is made hollow and elec-

tric connections and wires are run through that, so as to avoid disturbing the streets.

In regard to cost, I don't see how Mr. Bowman can put in a gravel roadway for twenty-five cents a square yard. We have to pay ninety cents a cubic yard for our gravel, and say you put on six inches of gravel, that would be fifteen cents for gravel alone without any rolling, or excavation, or grading, or anything.

In regard to macadam roadway, I would like to know what he pays for his stone. We have to pay from \$16 to \$20 a toise. (216 cubic feet) for broken stone, broken to go through a two-inch ring. If you want a man to make you a broken stone roadway, the best gauge is to say, you must not put a piece of stone in that road that you can't put in your mouth. If he can put it in his mouth it is the right size, but nothing larger. Supposing you put, say, six inches of broken stone on the roadway, that would be $\frac{1}{8}$ of a cubic yard, and even at \$2 that would be over thirty cents. But I would sooner have three inches of stone and an inch of gravel on top of that and thoroughly rolled.

In regard to the cost of vitrified brick, Mr. Chipman took some exception to that. Vitrified brick on concrete foundation costs us about \$2.15 a square yard here, and we can lay asphalt pavement for \$2.10. We have to pay \$18 a thousand for vitrified brick. The cost of the brick is about \$8 50 and the freight and duty is \$10. I may say I was shown a sample of a new material of paving brick put in within the last few days that they propose to manufacture in Toronto. It has beaten anything I have seen yet in the way of vitrified brick that is imported from the States, and they say they can turn it out in Toronto for about \$18 a thousand. They can not only turn it out in the shape of brick but in slabs six by four feet, and in the shape of columns, say, six feet long and eighteen inches through. I understand that they wish me to go down to New Jersey to examine and report on it for some of the people here, and I will know more about it then. They use the refuse clay from the brick kilns, the clay that is rejected and not fit for burning into brick. It will take a polish like granite. I saw some medallion work done here that looked more as if it had been engraved. They also use it for manufacturing mantelpieces and it polishes like marble. There is a piece of roadway of it in New York, down four years, and there is absolutely no wear on it at all, and it has some of the heaviest traffic in New York. It is called Pyro Granite. I put it in the "tumbler" with 300 pounds of shot and I gave it thirty revolutions to the minute, and kept it going for two hours, then I took it out and gave it another two hours after that, and I think there was one per cent. wear on it. So I came to the conclusion that it would stand fairly well.

In regard to the local improvement system, we are rather suffering from it here in Toronto, at least some say so. There is a difficulty about it in this way. Supposing, for instance, a person has a lot of property out in the suburbs and you go and lay a new pavement, who is going to carry on repairs? Why should the city pay that any more than anybody else? Why shouldn't they carry the local

improvement system into repairs as well? They do in some towns but it complicates matters tremendously.

In regard to the plans and profiles of new streets before they are laid out, I think it is a very good idea, indeed, that every new street before being accepted by a city or municipality of any kind, the person laying it out should be compelled to put in plans and profiles subject to the approval of the municipal engineer. In some cities they will not accept a street at all until it is not only graded, but sewered and paved; the proprietor must do that before the municipality will accept it.

In regard to the one foot reserve, I have had a good deal of trouble with that here too, but now it simply means that the council will not accept any plan with a one foot reserve on it at all. We found ourselves tied up in several places.

Mr. Bowman—Under the city's special Act they require all plans to be submitted to them?

Mr. Ellis—Yes, to the city engineer for approval.

Mr. Bowman—But country towns have not that Act.

Mr. Ellis—I am not sure about that. I don't think they are obliged to accept a street; they may simply say, We won't accept the street, and we won't put any public work on it.

In regard to Mr. Chipman speaking about pavement of residential streets being less than twenty-four feet wide, I must say that I think he is mistaken. Take any ordinary buggy and it takes about twenty-four feet to get around. We have one or two where the pavements are eighteen and twenty feet here, and I have seen cases where there was a good deal of trouble before they could turn around, but in twenty-four feet you can do it comfortably.

Mr. DeGursé—I think twenty-eight feet should be the minimum width.

Mr. Chipman—Any ordinary driver can turn around in twenty-four feet, or even in twenty feet; and a poor driver, if he can't turn in twenty feet, can go to a lane or a street crossing.

Mr. Ellis—Yes, but the difficulty is they don't; they drive up on to the boulevard and get up on to the concrete walks.

Mr. Chipman was speaking about the difficulty with these walks of making connections. Of course they are a little difficult in that way, but we tunnel in every case.

Mr. Chipman—So do we, but that does not apply to where the rock is near the surface.

Mr. Ellis—In regard to the lifetime, we have had them here for nine years and they are in just as good condition as when they went down, they are not more slippery. I tried a new mixture on the Queen street walk, that is, through Queen's Park, last year or the year before. We dusted sand over it evenly, and instead of trowelling it to a fine polish we left it, and it is standing well and

showing no signs of being slippery, whereas older walks have become very slippery indeed.

Mr. Gibson--What is the object of giving so much curvature to your asphalt roadways ?

Mr. Ellis--Partly to get the water off.

Mr. Gibson--Well, but you get the horses down in every way, and we have a terrible time.

Mr. Ellis--Well, there is about six inches in forty-two feet. In regard to the price of sidewalks, I would like if Mr. Bowman could give me some information as to these tar sidewalks. Wooden sidewalks cost about five cents a square foot and you have to renew it every six years at the very least. If it doesn't rot out it wears out.

Mr. Gibson--I put down my sidewalks with cedar mud sills and they last ten or fifteen years.

Mr. Ellis--The average life of wooden sidewalks in Toronto, as given by the Street Commissioner, is five or six years. Of course we have some of them which last from ten to twelve years where they are not worn out by travel. I was trying to make a little calculation the other day as to what it cost at five cents a square foot, renewing every six years, and it cost about thirty cents at the end of thirty years. Now, take a concrete sidewalk, which costs about twenty cents, and it is certainly good for thirty years, so that would be a saving of ten cents a foot in that time, irrespective of interest.

Mr. Bowman--You notice this paper is not written as an authority or anything of that kind ; it is more for the purpose of bringing out discussion than anything else, and it is not compiled from my own experience to any great extent ; it is more from the reports of other engineers.

Mr. Chipman spoke in regard to the merits of concrete versus stone flagging for sidewalks, and I quite agree with him, that in a town having rock so near the surface as two feet, it would be very foolish for them to lay concrete sidewalks in advance of the construction of sewer connections, water works services and gas connections, but in places not having rock anywhere near the surface there is no great difficulty, as a concrete sidewalk properly made I think can be moved quite as readily as flagging. The blocks are probably not quite as strong, but if properly handled and put back again with a proper foundation they can be taken out as well as flagging. There is no comparison between the wearing of concrete and stone flagging of the kinds used in Ontario. If you go along King street, Toronto, you can soon see the quality of stone flagging. Yesterday, when it was wet, one had to be dodging in and out of pools of water, and that walk has been down I think not quite ten years ; whereas, a little farther along the same block, at the Rossin House corner, you will find a walk put down at the same time, with granite surface, and you might say it is as good as the day it was put down.

In regard to the remarks of Mr. Ellis about the width of streets, I may say that I was in my paper simply quoting the views advanced by Professor Haupt, in a paper that appeared in the January number

of *The Engineering Magazine*, on "The Planning of a City," in which he advanced the opinion that sixty-six feet was ample width for business streets. However, I am glad to have the experience of Mr. Ellis brought out that this is not sufficient for a business street such as they have in the city of Toronto, and it would be valuable for the engineers of the Province to know that business streets should be wider than that, probably eighty feet.

In regard to the sloping of the streets, the conditions that obtain in a country town are not the same as in a city, and although it would be inadmissible to have the sides of the streets sloping towards the lots in a crowded city, still in a country town where there is usually only one house to every sixty-six foot lot, there is no reason usually why the water that falls on this portion of the street may not be allowed to drain across the lots.

In reference to the cost of gravel and macadam roadways, I may say that these figures were quoted direct from a paper read by City Engineer Campbell, of St. Thomas, in regard to his practice in that city. This paper was read at a meeting of the Good Roads Association a year ago.

I don't know that it is necessary to say anything about the local improvement system; it may have been abused here in Toronto, but throughout the country there is not so much danger of damage being done to the community by this as the "booms," one of which has lately exploded in this city.

Mr. Robertson—Don't you think that the streets of the future should provide for bicycle tracks as well?

Mr. Ellis—In regard to the wooden pavements, Mr. Bowman says they have practically gone out. Well, there is a good deal of truth in that, but at the same time they are the cheapest pavement and easiest laid you can possibly get. A young town can lay cedar blocks for about fifty-nine to sixty cents a square yard, and even if you renew it every four years it is a cheap pavement, and it keeps the roadway in fairly good travelling order until the community can afford to put down a first-class pavement.

A Member—It is all very well for places where real estate is very valuable, and they can afford it, to put down costly pavements; but taking growing towns, I think there is no pavement that will meet the requirements of the people so cheaply as wooden pavement.

Mr. Gibson—And have first-class drainage.

Mr. Gaviller—Yes, and a good fresh breeze blowing over it in the morning. The objections to the pavement are on sanitary grounds, I think, as well as the cost and quickness of its wearing out; and its absorbing qualities are rather too great.

[This Association is not responsible as a body for any opinions expressed in its Papers by Members.]

MINING AND SMELTING OF THE COPPER NICKEL ORES OF THE SUDBURY DISTRICT, ONT.

By J. D. EVANS,

O.L.S., C.E., Trenton, Ont.

It was in the year 1883 that copper ore was first discovered in this district by rock cuttings made during the construction of the Canadian Pacific Railway; but it was not until late in the year 1886 that the discovery was made that nickel was associated with the copper, the latter occurring in copper pyrites (chalcopyrite) and the nickel in magnetic iron pyrites (pyrrotite), these two minerals being more or less intermixed and the one or the other prevailing.

These ore bodies occur usually in irregular large masses or isolated patches through the gangue rock (diorite). No well defined veins have been so far discovered. The deposits are extremely variable in their form and occurrence, sometimes cropping out on the slopes of hills, or on the top, while at other places indications are that the heaviest bodies of ore may be found in flats adjacent to elevated ground or ridges of rock.

When prospecting for and opening up a body of ore the work must be done with very primitive appliances, but so soon as the work done reveals a body of ore sufficient to warrant it, machinery should be employed, and in course of time that of the most approved description, for handling and treating the product, with a minimum outlay for manual labor, should be provided in order to be able to compete with those mines fully equipped with such machinery and appliances.

This equipment should consist of a suitable shaft-house and rock-house, which may be combined in one building, if surrounding circumstances admit of it, and provided with a suitable hoisting plant, rock crusher, revolving screens, assorting tables and a number of hopper bins for receiving the various classes of broken ore, etc., and also a ready means of reloading on to cars for transportation to the roasting yard.

The ore having been broken in the mine, with the use of dualin, in the usual way, and reduced to a size sufficiently small to be handled and loaded into tram cars by manual labor, it is hoisted to the surface in skips, or tram cars, or other equally suitable manner, and to an elevation in the rock house of a sufficient height to enable all the fol-

lowing methods of treatment to be done to the ore by gravity. The ore having been discharged from the skip or tram car and delivered near to the crusher, any rock or ore of too low a grade should be sorted out and sent to the waste dump, the remainder is then fed into the machine, which should be set to reduce it to a size that will pass through a $2\frac{1}{2}$ -inch ring. From the crusher it passes into a revolving screen about 10 feet in length set in a slight incline (say 1 in 12), and having holes of two different dimensions; those occupying the first or upper 5 feet long of the screen should be $\frac{3}{8}$ -inch in diameter, and throughout the remainder $1\frac{1}{2}$ inches in diameter. The product from the crushers, while passing through this screen, will be separated into three grades of fineness; that of the first is designated "fines," the second as "middlings" or "ragging," and that which passes along and discharges at the end of the screen is called "coarse" ore. The fines and ragging discharge into separate bins and are used as will be described hereafter; the coarse ore is, however, discharged on to a shaking table, set on a small incline, or any other device of a similar and suitable description. As the product passes along the length of this table all rock and low grade ore is picked off by boys or men (ranged along the sides of the table) and thrown into bins provided for the purpose. The good ore is discharged over the end into a bin or other receptacle.

From these various bins the product is drawn off by gravity and discharged into tram or railway cars, as circumstances necessitate, and is transported to the roasting yard.

In this condition the ore will assay about 5 or 6 per cent. nickel and a like percentage of copper. This, however, is subject to much variation, the copper and nickel contents vary very materially, usually from 2 to 10 per cent. for each of these metals and in rare instances up to 18 or 20 per cent. The iron and silica also vary, some ores having iron in excess and others silica.

The next process is for the purpose of getting rid of the excess of sulphur and consists of roasting or calcining the ore. The roasting yard should be at some considerable distance from the mine, from one half to a mile distant and usually in a south-easterly direction, in order that the sulphur fumes, arising during combustion, may cause as little annoyance as possible where the mining operations are carried on and the prevailing winds will carry these fumes away from the mining works.

If the nature of the ground admits of it, there should be two railway or tram tracks prepared with the roast heaps between, one elevated track to be used for placing the green or raw ore upon the heaps and the other a low track for removing the roasted ore from the piles or heaps. These heaps may be of any desired dimensions, but perhaps the most convenient and suitable would be about from 40 to 50 feet wide and from 100 to 120 feet long, with a passage way of, say, 4 or 6 feet between them. The space devoted to the roast yard should be of sufficient length to enable as many of these heaps to be built as will be necessary under the circumstances, which will depend entirely upon the output of the plant.

The floor of this yard should be prepared and made with a slight fall in cross-section and should be made impervious to surface water with a layer of clay or other suitable composition, and this should be covered with a layer of from 4 to 6 inches of fines (fine ore) before commencing to build the ore piles or heaps. The bottom for these piles is first laid with about 15 inches of wood; dry pine is very serviceable, or say two sticks of cordwood high regularly laid down in tiers, and provided with air spaces or canals about a foot wide at the ends of each tier, which is filled with fine kindling wood and will thus form flues for the fire to follow. Upon this wood is placed the coarse ore which is piled up to a height of about 6 feet, the sides and ends standing at a slope of about 45 degrees. This body of ore is then covered, top, sides and ends, with 6 or 8 inches of ragging or middlings and finally with a light layer of fines. To fire this heap a small quantity of kindling and cordwood of dry pine is placed along the ground all round and against the outer margin and fired, the fire making its way gradually into the interior. At this stage great precautions are necessary and a constant watch must be kept to prevent the fire from burning too rapidly. Cracks and openings will form in the outer crust, due to the wood being consumed and the ore settling, thereby creating too great a draft and too much heat and thus causing the ore to melt and run together in large masses and give endless trouble and expense in breaking it up again. This can be largely avoided by throwing on fresh fine ore and thus check over-burning. After the fire is well started, say from 4 to 6 days, combustion will proceed without much further attention for from 60 to 90 days, the fuel being furnished by the sulphur contained in the ore. After the fire has expended itself and the pile cooled off, the ore is ready for the next process, that of smelting.

During the process of roasting a large percentage of the sulphur is thrown off and oxygen is taken up. Sufficient sulphur should, however, remain in the ore to carry on the process of smelting successfully.

The next process is smelting. The ore is taken from the roast yard and transported to the smelting furnace where it is deposited in suitable bins adjacent and convenient to the charging door of the furnace. Smelting is for the purpose of eliminating all rocky constituents and a large per cent. of the iron and thus reduce the weight of the resultant to from about one-seventh to one-twelfth of that of the ore charge, the product being known as matte, containing copper, nickel, sulphur and iron. A charge may consist of any quantity of ore from 2,000 to 6,000 lbs. at a time, with the requisite quantity of coke about one-seventh in weight. The best furnace for modern work is that known as the Herreshoff Water Jacketed Blast furnace, consisting of a shell, oval in shape, in plan 4ft. x 7ft. at the tuyeres and 8 feet deep from the charging door, set up upon cast-iron legs about 2 feet from the floor, built of sheet steel, the inside lining being five-sixteenth inches thick and the outer one-fourth inch and having a two inch water space between; the bottom consisting of a cast-iron

plate covered with one tier of fire brick. The tuyeres are 13 in number, 5 on each side and 3 at the back. In front of the furnace is placed a circular fore hearth or well made of cast iron, with a water space similar to the furnace around the circumference, which is lined throughout with fire brick; it has also a cast-iron lid or cover. This well is about 3 feet in diameter and 2 feet deep and is placed on four wheels for easy transportation. It has an opening in the back near the bottom, opposite to a similar opening in the furnace, through which the molten material flows and fills up the well to the top. A lip is formed in front at the upper edge, over which the slag, which separates from the heavier matte and floats to the surface, flows in a steady stream and discharges into a cast-iron pot provided for the purpose. This pot is removed at intervals and another substituted. In the meantime the matte continues settling and accumulating at the bottom of the well until a sufficient quantity is stored up when it is withdrawn through an opening called the tapping hole, placed at the side and at the height of about the centre line of the well. When a sufficient quantity has been taken the hole is closed with a clay plug. This process is repeated as often as is necessary, great care being taken to prevent any of the matte passing off with the slag and also the slag following the matte when tapping. The difference in appearance between these two products can be readily detected by a practised eye and easily recognized by the workman.

A furnace of the dimensions mentioned is capable of smelting from 100 to 125 tons of ore in 24 hours. Under very favorable circumstances as much as 150 tons have been smelted. The resultant matte will assay from 15 to 25% nickel and 20 to 25% copper, the slag about $\frac{3}{8}$ to $\frac{5}{8}$ % of 1% of each (nickel and copper), this last showing a loss of less than 1% of the two metals, which is considered very good work. In the process of separation of the matte from the slag in the well, the sulphur performs a very important part. It first takes up or absorbs the nickel and then the copper, after which it takes up iron. If there should not be sufficient quantity of sulphur to take up all the copper and nickel and some iron, a loss would be entailed, as copper and nickel would go off with the slag. Had the roasting process been carried too far, thus leaving an insufficient quantity of sulphur, the shortage could easily be made up by introducing a certain quantity of green or raw ore in the charge.

The furnace charge is made up of ore and about $\frac{1}{4}$ its weight of the best coke, there being no necessity for any flux of any description, providing that the ores are assorted so as to give the requisite quantities of silica and iron.

The matte can be raised to a higher grade by a process called bessemerizing or blowing in a converter. This can be done by passing the molten matte at once to the converter, or it can be resmelted in a cupola and then transferred to the converter. During the process of blowing, the iron is oxidized and is removed in the form of slag, as is also a portion of the sulphur, resulting in a product carrying from 8 or 10 to 15% sulphur, the balance being copper and nickel.

The further process of refining the copper and nickel as an alloy, or separating the two metals and producing them in the pure metallic form, or as an oxide, cannot be done in Canada, there being no works for that purpose. But the matte is shipped to the United States or Europe to undergo further treatment.

In order to ascertain the value of the product of the mines and furnaces and the loss, if any, during the process of roasting and smelting, repeated assays are made.

Samples should be taken from each and every ton of ore shipped from the mine and assays made thereof, say once a month, also of samples taken from the charges at least every six hours and assayed every week, also of samples taken from each pot of matte when in its liquid condition and the same of the slag taken as often. These should be assayed for every day's run.

It is essentially necessary that the furnace charges should be very carefully weighed for each and every charge, and in order to have correct returns of all the products, the ore should be carefully weighed on track scales in transit from the mines to the roast yard, as also each and every pot or other unit of matte should be weighed and preferably while in its liquid state.

DISCUSSION.

The President—It just occurred to me while you were talking about sulphur going to waste, why they could not utilize it for the manufacture of sulphide pulp.

Mr. Evans—That question has often been taken up, but the ore is of a magnetic quality and is a mono-sulphide, and it requires bi-sulphide to make it valuable.

APPENDIX.

BIOGRAPHICAL SKETCH OF LIEUTENANT-COLONEL JOSEPH BOUCHETTE, SURVEYOR-GENERAL FOR THE ESTABLISHMENT OF THE INTERNATIONAL BOUNDARY, UNDER THE TERMS OF THE TREATY OF GHENT, IN 1817-18; ALSO SURVEYOR-GENERAL FOR LOWER CANADA.*

ONE of the ablest topographers of the age, he was born in Canada in 1774, and was the son of Commodore Bouchette, who distinguished himself by an exploit which history has recorded and which is well known to have prevented the threatened surrender of the Canadas to the arms of America—"the taking of General Carlton (Lord Dorchester), which appeared almost certain, would have rendered their fate inevitable."

Commodore Bouchette, however, landed the commander-in-chief in safety at Quebec, after escaping the most imminent danger that menaced them in their descent of the St. Lawrence from Montreal to Quebec, the banks of the river being occupied by the enemy who were bivouacked on the shores of its narrow passes.

As early as the year 1790, Lieutenant-Colonel Bouchette was employed as a draftsman in the office of his late uncle, the Hon. Major Holland, then Surveyor-General of British North America, and subsequently of Lower Canada, after the division of the Province of Quebec.

In 1791 he was tempted to follow the profession of his father, and in consequence entered the provincial navy, and sailed on the great lakes in Upper Canada till 1796. In the year 1794, at a very early period of his life, he succeeded, through the most vigorous exertions in raising and saving His Majesty's war vessel *Onondaga* (the Commodore's ship), carrying 14 guns, which had been cast away in York (now Toronto) harbour, and totally abandoned as lost; and taking the command, he sailed with her to Niagara, where he was received amidst the cheers of the garrison and others assembled on the shores to greet the arrival of the rescued vessel.

This service elicited the unqualified approbation of Lord Dorchester, and "young Bouchette" was promoted, on the 12th May, 1794, to the rank of Second-Lieutenant in the provincial navy.

He continued in the command of an armed vessel until 1796 during which period he made surveys of the most important harbours on

*From "Sketches of Celebrated Canadians," by Henry J. Morgan, and "Portraits of British Americans" by W. Notman, with Biographical Sketches; edited by Fennings Taylor.

Lake Ontario, including the harbour of York, previous to that place being established as a military post and town in 1793.

The provincial navy was partially reduced in 1796 and it was Lieutenant's Bouchette's lot as junior officer (then commanding an armed vessel) to be included in the reduction. Owing, however, to the illness of officers who remained in command, he continued on duty for several months afterwards, successively commanding the vessels of those officers who were victims to the fever and ague, so generally prevalent. His activity meanwhile had not been altogether unnoticed, for he immediately obtained an unsolicited lieutenancy in the Battalion of Royal Canadian Volunteers; and having raised his quota of men continued in that provincial corps until its reduction in 1802.

Being known to possess some nautical knowledge, he was selected in 1797 to command an armed row-galley, with a detachment of 30 men of his regiment, and four artillery-men, to cruise between Quebec and Montreal, in order to detect certain treasonable practices, which led to the execution of Colonel McLean, an American, at the former place. This service afforded Colonel Bouchette an opportunity of conveying much valuable information to the Government, relative to the soundings, etc., of the harbour of Montreal and several other sections of the St. Lawrence.

In 1800 he was the officer chosen by the order of His Royal Highness the late Duke of Kent, then commander of His Majesty's forces in North America, to repair to Halifax with a detachment of his regiment to acquire a more uniform system of military tactics, and subsequently conveying the same to his own regiment, which he effected to the entire satisfaction of the commander-in-chief in Canada, by whom he was appointed Adjutant of the regiment.

By this time Major Holland, the companion-in-arms of the immortal Wolfe, had become, through age and infirmity, in some measure inadequate to the duties of his laborious office of Surveyor General, and Lieutenant Bouchette was in consequence attached to his department. After Major Holland's death in 1803, he was appointed deputy Surveyor-General, and in the following year received His Majesty's commission of Surveyor-General of Lower Canada and thus became the successor of his venerable uncle.

During the American war of 1812, he was actively employed in the campaign in conveying important despatches from headquarters to Major-General Sir Roger Sheaffe, commanding in Upper Canada, with confidential instructions to report on the general defensive state of the frontier, whether possessing any interesting posts and at the same time to reconnoitre and ascertain the position and strength of the enemy as he proceeded. For this service he received high commendation and his views of the defenceless state of York, now Toronto, and of the manner in which it would be taken by the enemy proved but too prophetic.

In November 1813, at a very critical juncture, he was ordered to repair to Lachine whither it had been found expedient to assemble a considerable force, and, on the 9th, that place became the headquar-

ters. He accompanied the commander of the forces to Coteau-du-Lac, where he received important reconnoitering instructions. The American generals, Hampton and Wilkinson, were at this period concerting a junction of their respective armies; the one marching into the Province by the Chateauquay country, whilst the other descended the St. Lawrence. Their project was frustrated and ended in a repulse and precipitate retreat within the limits of their own territory.

Colonel Bouchette had, however, previously followed up closely his instructions, and did not return to Lachine until he had ascertained the strength and position of the enemy at the cross-roads, some miles above McMartin's mills on the Riviere aux Raisins, and, under cover of the night, proceeding in a canoe with two Indians to the mouth of that river, crossed over to the south side of Lake St. Francis, near the Salmon river, to watch the movements of the enemy, then in full retreat; being uncertain, however, whether they meant to proceed further down the St. Lawrence (although about entering Salmon River), he immediately went down the Beauharnois channel, ascertained the condition and situation of the gun-boats, and, having put the forces on that line of military communication on their guard, he repaired to headquarters to submit his report.

In the month of August 1814, the project he had long conceived of publishing a topographical and geographical exhibit and description of Canada, being matured, notwithstanding the various other objects, of a military character, he had been called upon to attend to, he sailed from Canada to England, on board the man of war *Ajax*, for the purpose of personally superintending the publication of his work.

The colonial patronage this work received from the governor-in-chief and provincial legislature paved the way to the distinguished countenance and auspices under which it was afterwards produced to the world.

Colonel Bouchette, whilst in England, was nominated Surveyor-General, under the several articles of the Treaty of Ghent, for establishing the boundary between His Majesty's possessions in America and the United States. After his appointment, he prepared, at the instance of the Commissioners and the agent under that treaty, a project of operations for the year 1817, which he submitted to the Board at Boston.

In the spring of that year he commenced his field operations; and, after erecting a monument, in conjunction with the American surveyor, at the source of the River St. Croix, from whence the land boundary departs, he proceeded in the establishment of the due north line from that point, dividing New Brunswick from the State of Maine, to the highlands, continuing, however, the exploration line to the extent of one hundred miles in the wilderness, making numerous exploratory surveys of the various rivers intersected in his progress, and sketching the face of the country, frequently from the summit of the loftiest trees, to the imminent peril of his life.

By these arduous means he ascertained the position of the several ridges of highlands, stretching westward from the exploring line, and was enabled to judge, from their continuity and elevation, which ridge was most likely to become the boundary between both territories, in virtue of the fifth article of the Treaty of Ghent.

The result of his labors during the summer of 1817 was conveyed to the Board of Commissioners in extensive and explanatory plans, sections and reports, for which he received the commendation of the Board, and upon which the strongest arguments of His Majesty's agent were chiefly grounded, in claiming the whole extent of country north of Mars Hill ridge of highlands, which is that pointed out by Colonel Bouchette as the legitimate boundary between that part of the British possessions and the territory of the United States. And, although the Ashburton Treaty of 1842 afterwards yielded to the pretensions of the United States to a boundary much further north, and coming within a few miles of the St. Lawrence, it is now generally admitted that the line of boundary pointed out by Colonel Bouchette was that upon which the British negotiator should have insisted.

The ensuing season he was proceeding to the establishment of the geographical boundary on the 45th parallel of north latitude when he was taken dangerously ill at Montreal, on his return from Burlington, where he had met the Board, and received its encomiums for his field services of 1817; and, from the continuance of his illness during part of the summer, the service was performed by Mr. Tiers, as His Britannic Majesty's astronomer.

In 1827, with a view of ascertaining the statistics of Lower Canada, he visited all parts of the Province, and, devoting himself to long and laborious researches, he deduced explanatory reports and tabular statistical statements, that met with the marked approbation of His Majesty's representative in the colony.

Availing himself of these several tours as a means of perfecting his topographical work on Lower Canada, he solicited from the seigneurs copies of the plans of their respective *fiefs* and *seigneurs*, and was enabled to compile maps of the Province still more voluminous and correct than the former; and, desirous of rendering the information thus acquired as generally useful as possible, not only to the Government, but to the public in the mother country and the colony, he repaired to England in 1830, under the formal sanction and support of the Provincial Legislature and the approbation of the Executive Government, to superintend the publication of a new work on the topography, geography and statistics of Lower Canada, which grew out of the materials studiously collected during the previous fifteen years, with a view to the accomplishment of that object.

The works published by Colonel Bouchette are as follows:

1815.—Topographical maps of Lower Canada in two sections. First, District of Quebec, Three Rivers and Gaspé. Second, the District of Montreal. Geographical map of British America and of the United States. These maps, which were published on a very

large scale, were accompanied by a topographical description of Lower Canada. They were, moreover, published simultaneously in English and French.

1831.—British Dominions in North America, 2 vols. 4to.; elegantly printed and illustrated with vignettes, views and plans. Topographical Dictionary of Lower Canada, 1 vol. 4to. Topographical map of the District of Quebec and Three Rivers. Topographical map of the District of Montreal. Geographical map of British America and of the Northern, Western, and Central States of America. This map, though published by the subject of this sketch, was, it is said, compiled by his eldest son.

Colonel Bouchette died at Montreal on the 9th April, 1841, and was buried in the Church of Notre Dame in that city. We cannot, in concluding this memoir, do better than to quote the following passage, taken from one of the many obituary notices of his death, which appeared in the public journals of the time :

“ For sentiments of loyalty to his sovereign, and he honestly and faithfully served not less than four of them ; for his veneration and attachment to constitutional government, and for the perpetuation of the connection of his native Canada with Great Britain, the late Surveyor-General was also conspicuously distinguished. With such qualities both of head and heart—and we regret that we cannot, on the present occasion, do them greater justice—the memory of Colonel Bouchette will be long cherished by his surviving friends, and his public labours reflect honour and credit upon his native country.”

PAPERS USED AT THE APRIL, 1895, SESSION
OF THE BOARD OF EXAMINERS.

BOARD OF EXAMINERS' RECORDS

BETWEEN JULY, 1892, AND FEBRUARY, 1895.

PRELIMINARY CANDIDATES.

NAME.	ADDRESS.	DATE OF CERTIFICATE.
Abrey, George Spencer.....	Toronto Junction.....	12th November, 1892.
Code, Abram Silas.....	Glencoe	" " "
Hopkins, Marshall Willard.....	Stony Creek	" " "
Bolton, Ellsworth Doan	Listowel	8th April, 1893.
Richardson, Jocelyn Johnston	St. Catharines	" " "
Heaman, John Andrew.....	London	9th November, 1893.
Bow, James Alexander.....	Orillia.....	4th April, 1894.
Ford, William Butterson.....	London	" " "
Gibson, Wilbert Silas	Willowdale	" " "
Maclean, William Arthur	St. Thomas.....	" " "
McNaughton, Finlay Donald.....	Cornwall	" " "
Newman, John James.....	Windsor	" " "
Ward, Archeson Thomas	Toronto	" " "

(No candidates for Preliminary Examination at November, 1894, session.)

FINAL CANDIDATES.

NAME.	ADDRESS.	DATE WHEN SWORN IN.
McMullen, William Ernest.....	Toronto	11th November, 1892.
Deacon, Thomas Russ.....	North Bay.....	12th " "
Moore, Thomas Alexander	London South	" " "
Newman, William.....	Leamington	" " "
Silvester, George Ernest.....	Ringwood	" " "
Beatty, Herbert John.....	Pembroke	8th " 1893.
Harvey, Thomas Alexander	London	13th " "
Hopkins, Marshall Willard.....	Hamilton	" " "
McLennan, Murdoch John.....	Williamstown	" " "
Fairchild, Charles Court.....	Brantford	9th April, 1894.
Allan, John Richard.....	Renfrew	6th November, 1894.

PRELIMINARY.

(No candidates).

FINAL.

SUBJECT NO. 1—GEOMETRY.

Max. Marks 100, Min. Marks 50.

1. All the exterior angles of any rectilineal figure are together equal to four right angles. Prop. 32, bk. i.
2. In any right-angled triangle the square which is described upon the side subtending the right angle is equal to the sum of the squares described upon the sides which contain the right angle. Prop. 47, bk. i.
3. Trisect a right angle.
4. If a straight line be divided into two equal and also into two unequal parts, the squares of the two unequal parts are together double of the square of half the line and of the square of the line between the points of section. Prop. 9, bk. ii.
5. If from the vertex A of a right-angled triangle, BAC, AD be dropped perpendicular on the base, show that the rectangles of BC and BD, BC and CD, BD and CD are respectively equal to the squares upon AB, AC, AD.
6. If from any point without a circle two straight lines be drawn, one of which cuts the circle, and the other touches it, the rectangle contained by the whole line which cuts the circle, and the part of it without the circle shall be equal to the square of the line which touches it. Prop. 36, bk. iii.
7. The angle at the centre of a circle is double of the angle at the circumference upon the same base, that is, upon the same part of the circumference. Prop. 20, bk. iii.
8. To inscribe an equilateral and equiangular pentagon in a given circle. Prop. 11, bk. iv.
9. In a right-angled triangle if a perpendicular be drawn from the right angle to the base, the triangles on each side of it are similar to the whole triangle, and to one another. Prop. 8, bk. vi.
10. To cut a given straight line in extreme and mean ratio. Prop. 30, bk. vi.
11. To find the centre of a given circle. Prop. 1, bk. iii.

SUBJECT NO. 2—ALGEBRA.

Max. Marks 100, Min. Marks 40.

1. Find the arithmetical, geometrical, and harmonical means between 2 and $4\frac{1}{2}$.

2. Solve $\frac{7x+1}{x-1} = 3\frac{5}{9}$; $\frac{x+4}{x+2} = 3\frac{1}{3}$

3. (a). To what power is x raised by being multiplied n times by x ? (b). Express x^a in another form.

4. Define "pure" and "affected" quadratics and give an example of each.

5. Solve $\frac{10x^2+17}{18} - \frac{12x^2+2}{11x^2-8} = \frac{5x^2-4}{9}$

6. The stones which pave a square court would just cover a rectangular area whose length is six yards longer and breadth four yards shorter than the side of the square. Find the area of the court.

7. There are two bars of metal, the first containing 14 oz. of silver and 6 oz. of tin, the second containing 8 oz. of silver and 12 oz. of tin. How much must be taken from each to form a bar of 20 oz., containing equal weights of silver and tin.

8. A train, an hour after starting, meets with an accident which detains it an hour, after which it proceeds at three-fifths of its former rate and arrives 3 hours behind time, but, had an accident happened 50 miles further on, it would have arrived $1\frac{1}{2}$ hours sooner. Find the length of the line

GROUP NO. 3—TRIGONOMETRY, PLANE AND SPHERICAL

Max. Marks 100, Min. Marks 50.

1. What is the value of the unit of circular measurement expressed in minutes? Show how this value is arrived at.

2. Write down the trigonometrical ratios of an angle and show which are reciprocals.

3. Given three sides of any plane triangle, show formulæ for angle A in terms of $\sin \frac{1}{2}A$, $\cos \frac{1}{2}A$. Prove the truth of the formulæ.

4. From an eminence of 268 feet in perpendicular height, the angle of depression of the top of a steeple which stood on the same horizontal plane, was found to be $40^\circ 3'$, and of the bottom, $56^\circ 18'$. What was the height of the steeple? Illustrate your solution by a diagram.

5. Find area of a triangle, two of whose sides are 80 and 90 feet and the contained angle = $28^\circ 57' 18''$.

6. State and prove Napier's Rules of Circular Parts.
7. In any spherical triangle the sines of the angle are proportionate to the sine of the opposite side. State as a formulæ and prove the truth of the expression.
8. State and prove Napier's Analogies.
9. Given $a = 68^\circ 20' 25''$, $b = 52^\circ 18' 15''$, $C = 117^\circ 12' 20''$. Find c , A , B .

GROUP NO. 4—MENSURATION OF SUPERFICIES AND LAYING OUT AND DIVIDING LAND.

Max. Marks 150, Min. Marks 75.

1. Explain the method and give the formulæ for finding the areas of a triangle, a circle, and a regular polygon.

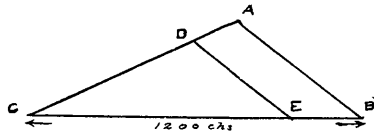
Find the areas of the following :

Triangle, 2 sides being 24 yds, 17.6 yds., included angle 30° .

Triangle, equilateral, perimeter = 125 ft. Give area in sq. yds.

Find the length of the minute hand of a clock, the point of which moves over an arc of 5 in. in $3\frac{1}{4}$ minutes.

2. Define the terms—Latitude, Departure, Course, Distance.
How are areas calculated by Latitude and Departure.



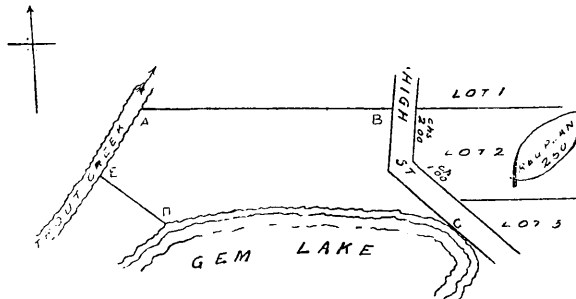
3. Describe and explain the uses of a traverse table.

4. Area of $ABC = 12.06^{ac}$
Cut off 3.24^{ac} from E by a line $//$ with AB . Find CE .

SUBJECT NO. 5—DESCRIPTIONS.

Max. Marks 100, Min. Marks 75.

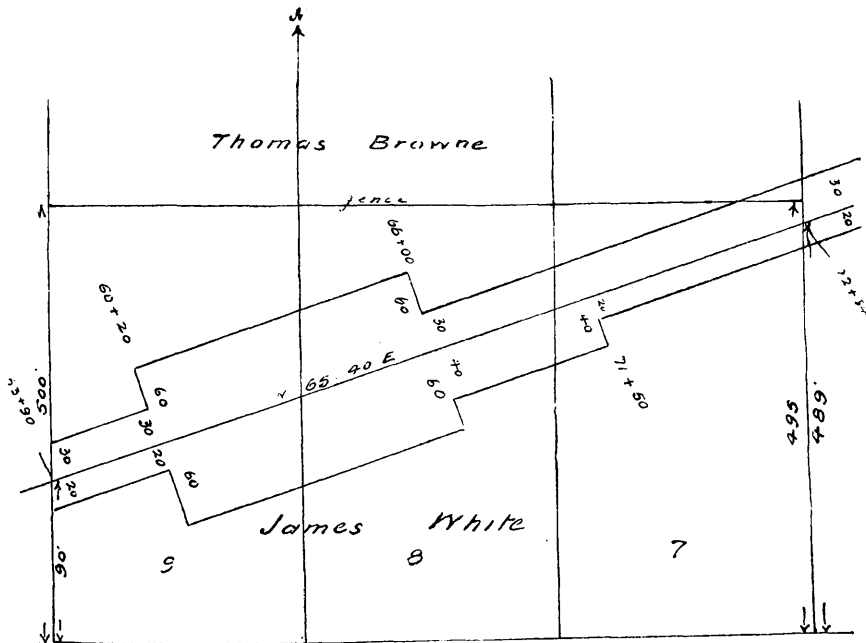
1. If, in a description, a distance is given "more or less to a post," and the position of the post cannot be found, what would govern for such distance?
2. Define a boundary to the shore of a lake, and to the shore of a mill-pond.



3. Write a description of property A B C D in the above diagram, giving imaginary bearings and distances.

4. Describe, by metes and bounds, the north-east two acres of a 200 acre lot, in a double-front concession in a township in which the concession lines run due north and south and the side lines due east and west.

5. Define the terms (a) "Party wall," (b) "Centre line," with reference to right of way of a railway.



6. Calculate area in acres and describe lands required from James White.

GROUP No. 6—USE AND ADJUSTMENT OF INSTRUMENTS FOR SURVEYING AND LEVELLING.

Max. Marks 100, Min. Marks 70.

(Vivâ voce.)

SUBJECT NO. 7—THE LAYING OUT OF CURVES.

Max. Marks 50, Min. Marks 20.

1. Show, by lettered diagram, and explain the meaning of the following terms: angle of intersection, degree of curve, length of curve, radius of curve, deflection angle, simple, reversed, and compound curves.

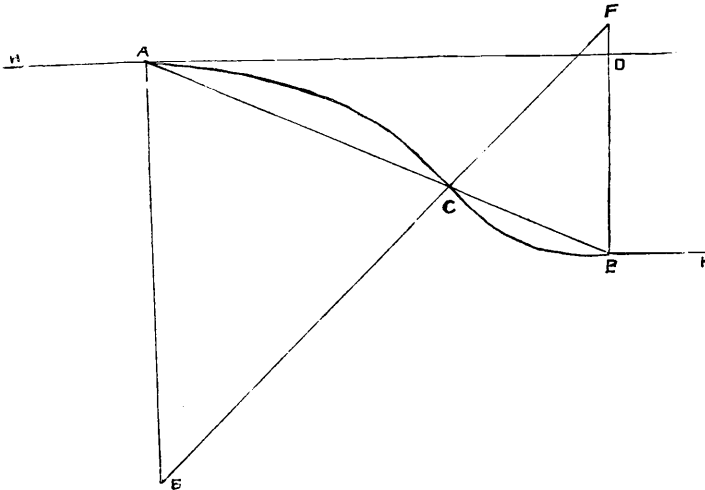
2. Show, by lettered diagram, and prove, (a) That the angle of intersection is equal to the central angle subtended by the chord joining the tangent points; (b) That the deflection angle is equal to half of the degree of curve; (c) That the reversing point of a reverse curve between parallel tangents is in the line joining the tangent points.

3. (a) Show, by lettered diagram, and explain how to lay out on the ground, simple, compound and reverse curves. (b) If a 2° curve has been located and it is desirable to change the curve so that the E C may be on a tangent parallel to, and a few feet from, the former, but preserving the B C; shew by lettered diagram, and explain how to find the degree of the new curve—the angle of intersection being known.

4. Given angle of intersection, $I = 16^\circ . 52'$ and deflection angle $D = 1^\circ . 20'$; find the length of curve.

5. Given angle of intersection, $I = 28^\circ$, and deflection angle, $D = 1^\circ$; find the tangent.

6. Show, by lettered diagram, how to lay out a curve by tangent and chord deflections.



7. Given the perpendicular distance between two parallel tangents $BD=b=8$ feet, the distance between the two tangent points $A B=a=160$ feet and the first radius, $EC=R=900$ feet; of a reversed curve uniting the tangents HA and BK ; find the chord $AC=a'$ and radius $CF=R'$.

SUBJECT No. 8—PRACTICAL ASTRONOMY.

Max. Marks 150, Min. Marks 75.

1. Show, by lettered diagram, and explain the meaning of the following terms: azimuth, hour angle, prime vertical, celestial longitude, true horizon, sensible horizon, dip, parallax, ecliptic, right ascension, declination, equation of time.

2. Show, by diagram, the relative positions of Ursa Major and Ursa Minor with Polaris on its upper transit; also show, by lettered diagram, and explain how to obtain the azimuth of Polaris on its eastern elongation and draw a meridian line.

3. In latitude $24^{\circ}..30'..00''$ N., in the forenoon, the true altitude of the sun's center was $33^{\circ}..20'..00''$ when its declination was $6^{\circ}..47'..50''$ S. What was the apparent time of observation?

4. When in latitude $48^{\circ}..51'$ N., the sun's declination is $18^{\circ}..30'$ N., and its altitude $52^{\circ}..35'$; what is its azimuth from the north?

5. At a given place in south latitude, when the sun's declination is $15^{\circ}..8'..10''$ S., and its true altitude $39^{\circ}..5'..28''$, at 2h..56m..42.7 sec. p.m.; find the latitude of the place.

6. Show, by lettered diagram, and explain the three systems for finding the position of a body on the celestial sphere by spherical coordinates.

7. Show, by lettered diagram, and explain the method of finding the latitude of a place when given two altitudes of the sun and the interval of time between the observations.

SUBJECT No. 9—SURVEY ACT.

Max. Marks 150, Min. Marks 90.

1. Give definition of a "proof-line;" and when would you use it?

2. State what steps should be taken to have monuments planted on governing lines of townships.

3. In cases where concession lines and side road lines or parts of same were not run in original survey, or have been obliterated, what steps are necessary to have such lines surveyed and permanently marked on the ground?

4. In cases where concession lines were not run in the original survey, or have been obliterated, how would you establish the depths of adjacent concessions?

5. Describe the different methods of running a line between lots in a single front concession.
6. What is a double-front concession? and how are posts to be replaced where lost, and lines between lots therein to be run?
7. Describe the sectional system of survey and the different methods of running lot lines in that system.
8. How would you establish a side-line between lots in townships where the side-lines only were run in original survey?
9. In a single-front concession, lots 37 to 40, adjoining west boundary, are broken in front by a lake and no posts were planted in the original survey to regulate the widths of these lots. How would you run the side-lines of these lots?
10. In what case would you run a side-line between lots on the astronomical course given on the original plan and field-notes?

GROUP NO. 10—MINING AND OTHER ACTS.

Max. Marks 100, Min. Marks 35.

RE MINING ACT.

1. Define Mining Location.
 - (a) When a mining location in the unsurveyed territory within the districts of Algoma, Thunder Bay and Rainy River, and that part of the district of Nipissing which lies North of the French River, Lake Nipissing, and the River Mattawa, borders upon a lake or river, what reservation is made by the Crown?
 - (b) Which is the front of the location?
 - (c) What direction and length shall its other outlines be?
 - (d) What shall be its area?
 - (e) In what cases may the Commissioner of Crown Lands direct that the reservation referred to in (a) shall not be made?

RE REGISTRY ACT.

2. When any land is surveyed and subdivided for the purpose of being sold or conveyed in lots, by reference to a plan which has not been already registered—
 - (a) Who shall file with the registrar the plan?
 - (b) In what time?
 - (c) On what scale shall the plan be?
 - (d) How shall the plan be mounted?
 - (e) Who shall sign the plan, and how shall it be certified? Give certificate.

RE DITCHES AND WATERCOURSES ACT.

3. Give limit of work that may be carried out under this Act and what lands are liable for the construction of a ditch under this Act.
4. Under this Act how do you proceed to enforce maintenance? Who may ask for such maintenance?
5. After the Clerk receives the requisition, up to the time of his notifying the interested parties of the filing of the Award, state the duties of both Engineer and Clerk.

RE DRAINAGE ACT.

6. Under what heads shall the Engineer, in his report, make his assessment? Distinguish between the heads, and give form of schedule for assessment.
7. Define Construction, Maintenance, Sufficient Outlet, Initiating Municipality, Owner.
8. Write out short report for drainage work, having due regard to the arrangement of the various heads of which the report is made up.
9. What shall the Engineer's estimate of the work include?

SUBJECT NO. 11—LEVELLING.

Max. Marks 50, Min. Marks 35.

1. Define, Level line, Horizontal line, Levelling. Is it usual in ordinary levelling to make corrections for curvature and refraction? Give reasons,
2. Name some of the different methods of levelling with the instruments used in each case. For what purpose is each particularly adapted?
3. Describe the "Dumpy level" and show how to adjust it.
4. How would you determine whether the rod is being held vertical or not by the ro'man?
5. Why is it best to take foresights and backsights of equal length?
6. Give the method of procedure in levelling a certain distance for sections, with form of Field Book and method of keeping notes.

GROUP NO. 12—PRINCIPLES OF EVIDENCE AND DRAWING UP OF AFFIDAVITS.

Max. Marks 50, Min. Marks 35.

1. What is evidence?
2. State what you consider would be good evidence.

3. Distinguish between hearsay, traditional, circumstantial and direct evidence.
4. Under what circumstances would you attach value to a person's evidence for or against his own interest?
5. Prepare a good affidavit to establish an original corner over 80 years old, giving the several steps of proof?
6. Prepare an improper affidavit, pointing out the defects therein.

GROUP NO. 13.

(Vivá voce, and specimens)

GROUP NO. 14--GEOLOGY AND MINERALOGY.

Max. Marks 75, Min. Marks 25.

1. Explain, by diagram or otherwise, the following terms: conformable, unconformable, fault, fold, strike, dip, vein, anticlinal, synclinal, outcrop, country rock and gangue.
2. Name three of the principal geological agencies engaged in the shaping of the earth's surface and describe the principal points of each.
3. In which rocks are the most valuable ores found in Ontario?
4. Into what three great classes are rocks divided? Give a short description of each class.
5. Describe the formation of coal-beds. Where are the principal coal-fields in the Dominion of Canada situated? Name the classes of coal found in these fields. What are the names of the different varieties of coal?
6. Name and describe two of the great limestone formations of Ontario. Give the relative position of each as to other formations.
7. How are the various mountain ranges supposed to have been formed on the earth?
8. Describe two causes in the formation of valleys.
9. Explain the economic values of the rocks in the following formations: Hudson river, Salina and Carboniferous.
10. Name, and fully describe, six characters by which minerals are distinguished from one another, with example of each.
11. How may carbonates and silicates be distinguished by the use of the blow-pipe?
12. Make a diagram showing the structure of oxidizing and reducing flames and state which they are.

13. Name the minerals composing the scale of hardness, and explain how the scale is used.

14. Explain the commercial uses of the following minerals and give the general composition of 6 of them : graphite, hematite, halite, calcite, malachite, gypsum, barite, apatite, limonite, asbestos, anthracite, muscovite, dolomite, galena, cerussite.

15. Give an account of petroleum ; how it originated ; under what condition it now exists and with what it is associated. How is petroleum obtained ?

16. To which classes of minerals do the most abundant ores of iron belong, or name the minerals.

17. Distinguish the following : (*a*) granite from gneiss, (*b*) galena from graphite, (*c*) native gold from copper pyrites, (*d*) granite from pegmatite, (*e*) common limestone from marble

18. Give a method of determining each of the following metals in the ore : iron, copper, lead, sulphur, mercury, aluminium.

19. Explain the differences between quick-lime, hydraulic lime, and Portland cement.

FORMS OF CERTIFICATE.

[FORM A] CERTIFICATE OF SERVICE (Ordinary Term).

I,
(Name of Surveyor.)
a Land Surveyor
for Ontario, duly admitted and practising therein as such, hereby certify that
.....
(Name of pupil.)
has served regularly and faithfully as an
apprentice with me, under written articles, duly executed before two witnesses, and
filed with the Secretary of the Board of Examiners, for the term of three successive
years, being from the day of
189.., to the day of, 189..

Dated at Ontario,
this day of, 189..
Ontario Land Surveyor.

[FORM B] CERTIFICATE OF SERVICE (Shortened Term).

I,
(Name of Surveyor.)
a practising Land Surveyor for
Ontario, hereby certify that
(Name of pupil.)
a graduate
of, has served as an apprentice with me, under articles
duly filed, as required by section 17 of chapter 152, Revised Statutes of Ontario
(1887), during twelve successive months of actual practice, being from the
..... day of 189.., to the
..... day of, 189..

Dated at Ontario,
this day of, 189..
Ontario Land Surveyor.

NEW BY-LAWS.

By-law No. 40. "The following Surveyors, having duly registered, and having proved to the satisfaction of the Council that they had been respectively in actual practice as duly authorized and qualified Land Surveyors for Ontario for a period of not less than 35 years prior to July 1st, 1892, are hereby placed on the list of Registered Surveyors for Ontario, and are exempt from the payment of further dues under the authority of sub-section 4 of section 10, chapter 34, Ontario Statutes, 1892, viz. : Tom S. Rubidge and James A. Gibson." Passed by the Council of Management 6th November, 1894. Ratified by the Association at annual meeting, 27th February, 1895.

By-law No. 41. "To provide for the exemption of certain surveyors from the operations of the 'Act to Incorporate the Association of Ontario Land Surveyors.'

"Whereas, under section 10, sub-section 4, the Association may exempt from the operations of the Act any Surveyor who has been in the actual practice of his profession for a period of thirty-five years or more as a duly qualified Surveyor; and whereas Charles J. Wheelock, Thomas Weatherald, Michael Deane, John Smith Brown, and William Edward Yarnold have represented to the Council that they had been in practice as aforesaid for a period of not less than thirty-five years previous to the date of the assenting to of the said Act, viz., 14th April, 1892; be it resolved that the said Surveyors be and are hereby exempted under the said Act." Passed by the Council of Management, 4th April, 1895.

By-law No. 42. "To provide for the exemption of Alexander Davidson from the operations of the 'Act to Incorporate the Association of Ontario Land Surveyors.'

"Whereas, under section 10, sub-section 4, of the said Act, the Association may exempt from the operations of the Act any Surveyor who has been in the actual practice of his profession for a period of thirty-five years or more as a duly qualified Surveyor; and whereas Alexander Davidson has requested that he be exempted as aforesaid in consequence of physical disability; be it resolved that the said Alexander Davidson be and is hereby exempted under said Act." Passed by the Council of Management, 4th April, 1895.

OBITUARY.

WILLIAM ROBINSON.

We have this year to record the decease of one of the oldest of our members. Mr. William Robinson, O.L.S., died at his residence in London, on October 11th, 1894, after a long life of usefulness. He was born at New Ross, County Wexford, Ireland, on March 27th, 1812. From his brother he got his first idea of land surveying. In 1836 Mr. Robinson came to Canada with his father, mother, three brothers and one sister and located at Burford, but in the following spring he went to Hamilton, where he found employment as a carpenter, of which calling he had previously acquired theoretical and some practical knowledge. From Hamilton he went to Brantford, and, after eighteen months' further experience, he proceeded, in the spring of 1839, to London, where he spent two years, and located in Toronto at the end of that period. Here, while in the service of the late Thomas Young, architect of King's College, also City Engineer and Drawing Master for the College, Mr. Robinson took a course of private study in land surveying and architecture. After leaving Mr. Young he purposed going to New York, but, having received a good offer of employment from Mr. Ritchie, one of the most prominent builders of the time in Toronto, he availed himself of it and remained for two years in Mr. Ritchie's employ, adding to his other duties that of instructing the workmen in geometrical drawing and the various practical problems connected with their work.

At the end of this time he again resumed the study of land surveying, receiving his commission at Montreal in May, 1846, with the Hon. William Henry Boulton and Hon. W. Robinson as his sureties. Returning to Toronto, the following winter was spent by him in teaching geometrical drawing to the workmen, and in the spring of that year he accepted the position of Superintendent of Buildings.

In April, 1849, he commenced a survey of the Toronto and Owen Sound Road diagonally through the Townships of Melancthon, Artemesia, Hill, etc., and completed the work (embracing about 200,000 acres) by the middle of December.

After his return he, in company with Mr. C. Rankin, conducted a business in Toronto for two years, when Mr. Rankin removed to Owen Sound, and the business was carried on by Mr. Robinson until 1852. Owing to ill health, he then returned to his father's at Burford, but shortly afterwards entered a partnership with Mr. W. B. Leather, an English engineer, and together they conducted a prac-

tice in London (Canada) for four years, at the end of which time Mr. Robinson again opened an office for himself.

In May, 1857, he was appointed City Engineer for London and held the office for more than 21 years, until the completion of the water-works, in 1878, when he resigned, with the request that his then partner, Mr. T. H. Tracey, be appointed to the position. He then paid visits to Europe and New York and returned to London, where he resided up to the time of his death. From his estate of \$30,000, he bequeathed liberal legacies to all the benevolent societies in the city in which so many years of his life had been spent. He was a gentleman of rare skill and attainments, and was universally respected.

The famous water-works of the Forest City, constructed from plans prepared by himself, will be a standing monument to his memory.

THOMAS WILLIAM WALSH.

Since the date of our annual meeting the grim reaper has claimed another member of the Association in the person of Thomas William Walsh, who died at his residence, John street, Simcoe, on 14th March, 1895, in the 76th year of his age. His father was Francis Leigh Walsh, who held the position of Registrar of Deeds for Norfolk County from the beginning of the century up to a period little more than ten years ago. Thomas Walsh, the grandfather of Mr. T. W. Walsh, was a U. E. Loyalist, and one of the first two settlers in what is now Norfolk County. He also was a Land Surveyor, and the name has thus been prominent in the profession ever since that portion of Canada took its place in history.

Born in the Township of Charlotteville, in Norfolk, in May, 1819, the subject of this notice was a life-long resident of that county. He received his commission as a Land Surveyor on 25th April, 1842, and continued to exercise the duties of that calling for more than 52 years.

In 1858 Mr. Walsh was a candidate for political honors, but was unsuccessful, being defeated by Walker Powell, now Adjutant-General of Canada.

Since that date Mr. Walsh filled honorable municipal positions in Simcoe, and was for two years Warden of the county. In 1855 he received his appointment as County Treasurer, and up to the time of his death continued to occupy that office with efficiency. Upon the establishment of the Association of Ontario Land Surveyors Mr. Walsh became enrolled as a member, and was placed on the honorary list of exempted members on 4th April, 1894.

His widow, a son, daughter and three orphaned grandchildren survive him.

LIST OF MEMBERS.

The names of those members granted exemption by By-laws ratified by the Association are marked*.
The names of those granted exemption by By-laws passed by Council since the annual meeting are marked†

NAME.	RESIDENCE, P.O. ADDRESS.
Abrey, George Brockitt.....	Toronto Junction. <small>D.L.S., Town Engineer.</small>
Allan, John Richard.....	Renfrew. <small>Grad. S.P.S.</small>
Aylsworth, Charles Fraser, Sr. . . .	Madoc. <small>D.L.S.</small>
Aylsworth, Charles Fraser, Jr.	Madoc.
Aylsworth, John Sidney	Selby, P. O. Box 23. <small>D.L.S.</small>
Aylsworth, William Robert	Belleville, P.O. Box 2. <small>D.L.S.</small>
Baird, Alexander	Leamington. <small>D.L.S.</small>
Barrow, Ernest George.....	Hamilton. <small>D.L.S., M.C.S.C.E.</small>
Bazett, Edward	Burk's Falls. <small>D.L.S.</small>
Beatty, David	Parry Sound. <small>D.L.S.</small>
Beatty, Herbert John.....	Pembroke. <small>Grad. S.P.S.</small>
Beatty, Walter	Delta. <small>D.L.S.</small>
Bell, Andrew	Almonte. <small>D.L.S.</small>
Bell, James Anthony	St Thomas. <small>D.L.S., Co. Engineer, Elgin.</small>
Bigger, Charles Albert	Ottawa, 68 Daly Ave.
Bolger, Francis.....	Lindsay. <small>D.L.S.</small>
Bolger, Thomas Oliver.....	Kingston. <small>D.L.S., City Engineer.</small>
Bolton, Jesse Nunn.....	Toronto, 264 Major st. <small>D.L.S.</small>
Bolton, Lewis	Listowel. <small>D.L.S.</small>

LIST OF MEMBERS.

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NAME.	RESIDENCE, P.O. ADDRESS.
Booth, Charles Edward Stuart	Kingston, 196 Colborne st.
Bowman, Clemens Dersteine	West Montrose.
Bowman, Herbert Joseph	Berlin. <small>Grad. S.P.S., Town Engineer.</small>
Bray, Edgar	Oakville. <small>D.L.S.</small>
Bray, Harry Freeman	Oakville.
Bray Samuel	Ottawa, Dept of Ind'n Affairs. <small>D.L.S.</small>
Brown, David Rose	Cornwall. <small>D.L.S.</small>
†Brown, John Smith	Kemptville. <small>D.L.S.</small>
Browne, Harry John	Toronto, 17 Toronto st. <small>D.L.S., C.E.</small>
Browne, William Albert	Toronto, 17 Toronto st.
Burke, William Robert	Ingersoll. <small>D.L.S.</small>
Burt, Frederick Percy	New York, N. Y. <small>Manager and Treasurer Eng. News Pub. Co., Tribune Building.</small>
Butler, Matthew Joseph	Napanee, P O Box 359 <small>M.I.C.E., M.A.S.C.E., M.C.S.C.E., C.E.</small>
Caddy, Cyprian Francis	Campbellford. <small>D.L.S.</small>
*Caddy, Edward C.	Cobourg. <small>D.L.S.</small>
Caddy, John St. Vincent	Ottawa, 559 King st. <small>D.L.S.</small>
Cameron, Alfred John	Peterborough.
Campbell, Archibald William	St. Thomas. <small>City Engineer.</small>
Carre, Henry	Belleville, P.O. Box 203. <small>City Engineer, B.A. and C.E. (Trin. Coll., Dublin), D.L.S.</small>
Carroll, Cyrus	Hamilton, 6½ James st. s. <small>M.C.S.C.E., D.L.S.</small>
Casgrain, Joseph Philippe Bâby	Morrisburg. <small>D.L.S., F.L.S. (Que.), C.E.</small>
Cavana, Allan George	Orillia. <small>D.L.S.</small>
*Cheesman, Thomas	Mitchell. <small>D.L.S.</small>
Chipman, Willis	Toronto, 103 Bay st. <small>B.A., Sc. (McGill), M.A.S.C.E., M.C.S.C.E.</small>
Coad, Richard	Glencoe. <small>D.L.S.</small>

NAME.	RESIDENCE, P.O. ADDRESS.
Cozens, Joseph	Sault Ste. Marie. D.L.S.
Creswicke, Henry	Barrie. D.L.S.
*Cromwell, Joseph M. O	Perth. D.L.S.
†Davidson, Alexander	Arkona. D.L.S.
Davidson, Walter Stanley	Arkona.
Davis, Allan Ross	Napanee. B.A., Sc. (McGill).
Davis, John	Alton.
Davis, William Mahlon	Woodstock. Grad. R. M. Coll.
Deacon, Thomas Russ	Rat Portage. Grad. S.P.S., Town Engineer.
†Deane, Michael	Lindsay. D.L.S.
Deans, William James	Oshawa.
DeGurse, Joseph	Windsor, P.O. Box 167. Chief Eng., L.E. & D.R.R.
DeMorest, Richard Watson	Sudbury.
Dickson, James	Fenelon Falls. D.L.S., Ins. of Crown Land Surveys.
Dobbie, Thomas William	Tilsonburg. D.L.S.
Doupe, Joseph	Winnipeg, Man., 190 Smith st D.L.S., P.L.S. (Man.), C.E. (McGill).
Ellis, Henry Disney	Toronto, City Hall. D.L.S., Eng. in charge of Roadways.
Esten, Henry Lionel	Toronto, 157 Bay st.
Evans, John Dunlop	Trenton. D.L.S., Chief Eng., Cent. Ont. Ry.
Fair, John	Brantford.
Fairbairn, Richard Purdom	Toronto, 127 Major st. Surveyor for Dept. of Pub. Works.
Fairchild, Charles Court	Simcoe. Grad. S.P.S.
Farncomb, Alfred Ernest	London, 213 Dundas st.
Farncomb, Frederick William	London, 213 Dundas st.
Fawcett, Thomas	Ottawa, Dept. of Interior. Dom. Topographical Surveyor.

LIST OF MEMBERS.

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NAME.	RESIDENCE, P.O. ADDRESS.
Fitton, Charles Edward	Orillia. D.L.S.
Fitzgerald, James William	Peterborough, Box 333. D.L.S.
Flater, Frederick William	Chatham.
Foster, Frederick Lucas	Toronto, 157 Bay st. D.L.S.
Francis, John James	Sarnia, P.O. Box 304. D.L.S.
*Fraser, Charles	Wallaceburg. D.L.S.
Galbraith William	Bracebridge. D.L.S.
Gamble, Killaly	Toronto, 193 Bloor st. e. D.L.S., P.L.S. (Man.)
Gardiner, Edward	St. Catharines. D.L.S.
Gaviller, Maurice	Collingwood, Box 773. C.E. (McGill), D.L.S.
Gibbons, James	Renfrew.
Gibson, Harold Holmes	Willowdale.
*Gibson, James Alexander	Oshawa. D.L.S.
Gibson, Peter Silas	Willowdale. C.E., M.S. (Mich. Univ.), D.L.S., Engineer Tp. of York.
Graydon, Aquila Ormsby	London. City Engineer.
Griffin, Albert Dyke	Woodstock, P.O. Box 612.
Hanning, Clement George	Preston. D.L.S., C.E., (Trin. Coll., Dublin).
Hart, Milner	Toronto, 103 Bay st. D.L.S.
Harvey, Thomas Alexander	London, 1 Oxford st
Henderson, Eder Eli	Henderson P.O., Maine.
Henry Frederick	London, Albion Building.
*Hermon, Royal Wilkinson	Rednersville. D.L.S.
Hewson, Thomas Ringwood	Hamilton, 42 James st. n. D.L.S.
Hobson, Joseph	Hamilton, G. T. Ry. Office. D.L.S., Chief Eng. G.T.R.
Hopkins, Marshall Willard	Hamilton, 28 James st. s. B.A., Sc. (McGill), A.M.C.S.C.E.

NAME.	RESIDENCE, P.O. ADDRESS.
Howitt, Alfred	Gourock. D.L.S.
Hutcheon, James	Guelph. Grad. S.P.S.
Innes, William Livingstone	Peterborough, 372½ Water st. C.E. (Toronto Univ.)
James, Darrell Denman	Toronto, 72 Victoria st. B.A., Grad. S.P.S.
James, Silas	Toronto, 72 Victoria st. D.L.S.
Johnson, Robert Thornton	Orangeville.
Jones, Charles Albert	Petrolia. D.L.S.
Jones, John Henry	Sarnia. D.L.S.
Jones, Thomas Henry	Brantford. City Engineer, B.A.Sc. (McGill).
*Keefer, Thomas Coltrin	Ottawa. D.L.S., C.E.
Kennedy, James Henry	St. Thomas, P.O. Box 43+. C.E., (Tor. Univ.), M.C.S.C.E.
Kippax, Hargreaves	Huron, South Dakota. Assistant Surveyor General.
*Kirk, Joseph	Stratford, P.O. Box 373. D.L.S.
Kirkpatrick, George Brownly	Toronto, Dept. of Crown Lands Director of Surveys, D.L.S.
Klotz, Otto Julius	Ottawa, 437 Albert st. C.E. (Mich. Univ.), Dom. Topographical Surveyor.
Laird, James Steward	Essex. D.L.S.
Laird, Robert	Toronto, City Engineer's office. Grad. S.P.S.
Lane, Andrew	Sparrow's Point, Md. Grad. S.P.S., Draughtsman Maryland Steel Co.
Lewis, John Bower	Ottawa, Brunswick House. D.L.S.

LIST OF MEMBERS.

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NAME.	RESIDENCE, P.O. ADDRESS.
Lougheed, Aaron	Port Arthur. D.L.S.
*Low, Nathaniel E.	Wiarton. D.L.S.
Lumsden, Hugh David	Toronto, 63 Homewood ave. D.L.S., M.I.C.E., M.C.S.C.E.
*Lynch-Staunton, Francis H.	Hamilton. D.L.S.
Macdougall, Allan Hay	Port Arthur. D.L.S.
MacKenzie, William Lyon	Galt.
MacNabb, John Chisholm	Chatham. C.E.
MacPherson, Duncan	Montreal. Eng. Dept. C.P.Ry.
McAree, John	Toronto. Dom. Topographical Surveyor, B.A.Sc., Toronto.
*McCallum, James	Fort Frances. D.L.S.
McCulloch, Andrew Lake	Galt. Grad. S.P.S., A.M.C.S.C.E.
McDonell, Augustine	Chatham, 4 & 5 Ebert's Block. D.L.S.
McDowall, Robert	Owen Sound. Town Engineer, Grad. S.P.S.
McEvoy, Henry Robinson	St. Mary's. D.L.S.
McFarlen, George Walter	Toronto, Court House. Grad. S.P.S.
McGeorge, William Graham	Chatham, 5 Sandwich st. w. D.L.S.
McGrandle, Hugh	Huntsville.
McKay, Owen	Windsor, P.O. Box 167. Grad. S.P.S.
McKenna, John Joseph	Dublin.
McLatchie, John	Ottawa, 28 Stanley ave. D.L.S., P.L.S. (Que. & Man.)
McLean, James Keachie	Elora. D.L.S.

NAME.	RESIDENCE, P.O. ADDRESS.
McLennan, Murdoch John	Williamstown. B.A., Sc. (McGill).
McLennan, Roderick	Toronto, 115 Avenue rd D.L.S.
McMullen, William Ernest	Toronto, 7 Murray st.
McNab, John Duncan	Owen Sound.
McPhillips, George	Windsor, P.O. Box 556. D.L.S.
Malcolm, Sherman	Blenheim. D.L.S.
Manigault, William Mazyck	Strathroy, P.O. Box 300. D.L.S.
Marshall, James	Holyrood. D.L.S.
Miles, Charles Falconer	Toronto, 343 Huron st. D.L.S.
Moore, John Mackenzie	London, Albion Building.
Moore, John Harrison	Smith's Falls.
Moore, Thomas Alexander	London South.
Morris, James Lewis	Pembroke. D.L.S., C.E. (Toronto Univ.)
Mountain, George Alphonse	Ottawa. M.C.S.C.E., D.L.S., P.L.S., (Que.)
Munro, John Vicar	London, Albion Building.
Murdoch, William	Rat Portage. D.L.S.
Murphy, Charles Joseph	Toronto, 157 Bay st.
Newman, William	Windsor, 57 Sandwich st. Grad. S.F.S.
Niven, Alexander	Haliburton. D.L.S.
Ogilvie, John Henry	West Superior, Wis., 1810½ D.L.S. [Tower av.]
Ogilvie, William	Juneau, Alaska, U.S. D.L.S.

LIST OF MEMBERS.

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NAME.	RESIDENCE, P.O. ADDRESS.
O'Hara, Walter Francis	Chatham. D.L.S.
Paterson, James Allison	Toronto, 23 Adelaide st. e. C.E.
Patten, Thaddeus James	Little Current.
Pedder, James Robert	Doon. Grad. S.P.S.
Pinhey, Charles Herbert	Coteau Landing, P.Q. Grad. S.P.S., A.M.C.S.C.E.
Proudfoot, Hume Blake	Toronto, 33 Tranby ave. D.L.S., C.E. (Toronto Univ.)
Purvis, Frank	Eganville. D.L.S.
Rainboth, Edward J	Ottawa. D.L.S.
Rainboth, George Charles	Aylmer, Que. D.L.S., P.L.S. Que.
Reilly, William Robinson	Regina, Assa. D.L.S., P.L.S. Man.
Ritchie, Nelson Thomas	Kincardine.
Roberts, Vaughan Maurice	New York, N.Y., 137 Broadway.
Robertson, James	Glencoe. Grad. S.P.S.
Roger, John	Mitchell.
Rombough, W. R	Durham. D.L.S.
Rorke, Louis Valentine	Sudbury.
Ross, George	Welland. B.A., Sc. (McGill).
*Rubidge, Tom S	Cornwall. D.L.S., Asst. Eng. Dept. Rys. and Canals.
Russell, Alexander Lord	Port Arthur. D.L.S.
Sankey, Villiers	Toronto, City Hall. D.L.S., City Surveyor.
Saunders, Bryce Johnston	Brockville, P.O. Box 114. Town Engineer, B.A., Sc. (McGill), D.L.S.

NAME.	RESIDENCE, P.O. ADDRESS.
Scane, Thomas	Ridgetown. D.L.S.
*Schofield, Milton C.	Guelph. D.L.S.
Seager, Edmund	Fort Frances. D.L.S.
Selby, Henry Walter	Toronto Junction. D.L.S.
Sewell, Henry DeQuincey	Port Arthur. D.L.S., A.M.I.C.E.
Sing, Josiah Gershom	Meaford. D.L.S.
Smith, George	Woodville.
Smith, Henry	Toronto, Crown Lands Dept. Supt. Colonization Roads, D.L.S., M.C.S.C.E.
Speight, Thomas Bailey	Toronto, Yonge St. Arcade. D.L.S.
Steele, Edward Charles	Goderich.
Stewart, Elihu	Collingwood. D.L.S.
Stewart, John	Montreal. D.L.S.
Stewart, Walter Edgar	Aylmer.
*Strange, Henry	Rockwood. D.L.S., C.E.
Tiernan, Joseph Martin	Tilbury Centre.
Traynor, Isaac	Dundalk. D.L.S.
Turnbull, Thomas	Winnipeg, Man., C.P.R. Office. D.L.S., C.E., (Toronto Univ.)
Tyrrell, James Williams	Hamilton, 42 James st. n. Co. Eng. for Wentworth, C.E., D.L.S.
Unwin, Charles	Toronto, 157 Bay st. D.L.S.
Ure, Frederick John	Woodstock. C.E.

LIST OF MEMBERS.

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NAME.	RESIDENCE, P.O. ADDRESS.
VanBuskirk, William Fraser	Stratford. Grad. R.M. Coll.
VanNostrand, Arthur J.	Toronto, Yonge St Arcade. D.L.S.
Wadsworth, Vernon Bayley	Toronto, 103 Bay st. D.L.S.
Walker, Alfred Paverley	Toronto, C.P.Ry, Eng. Office. A.M.C.S.C.E.
Wallace, Charles Hugh	Hamilton.
Warren, James	Walkerton. Depy. Registrar County of Bruce, A.M.C.S.C.E.
Watson, John McCormack	Orillia, P.O. Box 224.
†Weatherald, Thomas	Goderich, P.O. Box 273. D.L.S., C.E.
†Wheelock, Charles J.	Orangeville. D.L.S.
Wheelock, Charles Richard	Orangeville. Treasurer County of Dufferin.
Whitson, James Francis	Toronto, Crown Lands Dept.
Wicksteed, Henry King	Cobourg. D.L.S., C.E.
Wiggins, Thomas Henry	Brockville. Grad. S.P.S.
Wilde, John Absalom	Sault Ste. Marie.
Wilkie, Edward Thomson	Carleton Place. D.L.S.
Wilkins, Frederick William	Ottawa, Dept. of Interior. Dom. Topographical Surveyor.
Williams, David	Kingston. D.L.S.
Winter, Henry	Thornhurst. D.L.S., C.E.
*Wood, Henry O.	Billings' Bridge. D.L.S.
Yarnold, William Edward	Port Perry, P.O. Box 44. D.L.S.

REGISTERED AND WITHDRAWN.

The names of those who have become " Associates " under By-law No. 39 are marked *

NAME.	RESIDENCE, P.O. ADDRESS.
Apsey, John Fletcher.....	Baltimore, Md., 2125 N. Chas. st Grad. S.P.S.
Blake, Frank Lever.....	Toronto, Meteorological Office. D.L.S.
Bowman, Franklin Meyer.....	Berlin. Grad. S.P.S.
Burnet, Hugh.....	Victoria, B.C. P.L.S. (B.C.)
Cambie, Henry John.....	Vancouver, B.C. P.L.S. (B.C.)
Coleman, Richard Herbert.....	Toronto, 204 King st. e.
Drewry, William Stewart	Ottawa, Dept. of Interior.
Ducker, William A.....	Winnipeg, M., 314 McWilliam st. D.L.S.
Edwards, George.....	Thurso, Que.
Fowlie, Albert	Orillia. D.L.S.
Green, Thomas Daniel	Ottawa, Dept. of Indian Affairs.
Galbraith, John.....	Toronto, Sch. of Prac. Science. Prof. Engineering.
Gibson, George.....	St. Catharines. D.L.S.
Haskins, William.....	Hamilton, 45 Wellington st. s. M.I.C.E., D.L.S.
*Harris, John Walter.....	Winnipeg, Assm't. Com. Dept. P.L.S. (Man), D.L.S.
Hermon, Ernest Bolton.....	Vancouver, B.C. P.L.S. (B.C.), D.L.S.

LIST OF MEMBERS.

NAME.	RESIDENCE, P.O. ADDRESS
Irwin, James M	Peterborough, D.L.S.
Jephson, Richard Jermy	Calgary, Alta. P.L.S. (B.C.) D.L.S.
Kains, Tom	Victoria, B.C. Surveyor-General, B.C.
Lendrum, Robt. Watt	South Edmonton, Alta. D.L.S.
Livingstone, Thomas Chisholm	Winnipeg, Man. D.L.S.
MacLeod, Henry Augustus F	Ottawa, 340 Cooper st. C.E., D.L.S.
MacMillan, James A	Calgary, Alta. P.L.S. (B.C.)
*McFadden, Moses	Neepawa, Man. D.L.S.
Magrath, Charles Alexander	Lethbridge, Alta. B.A. Sc. (McGill), D.L.S.
Morris, Alfred Edmund	Perth.
Pearce, William	Calgary, Alta. Dom. Insp. of Mines.
Ponton, Archibald William	Regina, Assa. D.L.S.
Pope, Robert Tyndall	Ireland. C.E., D.L.S.
Reid, James Hales	Bowmanville, Box 35. C.E., F.G.S.
Rciffenstein James H	Ottawa, Dept. of Interior. D.L.S.
Rogers, Richard Birdsall	Peterborough. B. A. Sc. (McGill), D.L.S.
Ross, Joseph Edmund	New Westminster, B.C. P.L.S. (B.C.)

NAME.	RESIDENCE, P.O. ADDRESS.
Sanderson, Daniel Leavens	Coral, Mich.
Strathern, John	Vancouver, B.C. P.L.S. (B.C.), D.L.S.
Sherman, Ruyter Stinson	Vancouver, B.C. P.L.S. (B.C.).
*Silvester, George Ernest	Pittsburgh, Pa., Shiffler Bridge Co. Grad. S.P.S.
Simpson, George Albert	Winnipeg, Man., N. P. & M. R'y. C.E., D.L.S.
Spry, William	Toronto. C.E., D.L.S.
Stewart, Louis Beaufort	Toronto, Sch. of Prac. Science. Lect. in Surveying.
Thomson, Augustus Clifford	Kansas City, Mo. C.E., D.L.S.
Tracey, Thomas H	Vancouver, B.C. P.L.S. (B.C.), C.E., D.L.S.
Vicars, John Richard Odlum	Kamloops, B.C. P.L.S. (B.C.), D.L.S.
Weekes, Abel Seneca	Wetaskiwin, Alta. D.L.S.
Wheeler, Arthur Oliver	New Westminster, B.C. P.L.S. (B.C.), D.L.S.
Willson, Alfred	Toronto, 204 King st. e. D.L.S., Comm. Can. Co.

SUMMARY.

Active members subject to dues	195
Active members exempted from dues	21
Withdrawn from practice (including Associates)	45
Dead	4
Total number enrolled since incorporation	<u>265</u>

No. 11.

PROCEEDINGS

OF THE

ASSOCIATION

OF

Ontario Land Surveyors

At its Fourth Meeting since Incorporation

HELD AT

Toronto, 25th, 26th and 27th February

1896

Being the Eleventh Annual Meeting of the Association of Land Surveyors for Ontario.

The Fifth Annual Meeting (Twelfth Annual Meeting of the Association of Land Surveyors for Ontario) will be held in Toronto, commencing on Tuesday, 23rd of February, 1897.

PRINTED FOR THE ASSOCIATION BY

C. BLACKETT ROBINSON, 5 JORDAN STREET,
TORONTO

PATRONIZE OUR ADVERTISERS.

NOTICES.

The attention of members is called to the lists of Standing and Special Committees appearing on page 6, and in particular to the Committee on Legislation. The work to be done by this committee during the decennial revision of the Ontario Statutes (1897) being of vital importance, each member of the Association should be on the alert to render any assistance in his power.

Members and others can be supplied with copies of the Proceedings for 1886, 1887, 1888, 1889, 1891, 1892, 1893, 1894 or 1895, by remitting fifty cents to the Secretary for each copy required.

Extra copies of Mr. Esten's "Head Notes of Reported Land Cases" have been printed for the Association, and may be obtained from the Secretary at a cost of fifty cents.

The Appendix contains a general index, in alphabetical order, of the contents of this and the ten preceding Annual Reports.

Amongst the more valuable contributions to the Repository during the past year may be noted "Ye Compleat Surveyor," A.D. 1653, presented by Mr. Unwin; "Chart of the Oriental Ocean" (published in Paris in 1653), also "Carte Polaire Artique" (published in Paris, 1774), both presented by Mr. J. J. Francis; six large illustrated volumes of Engineering Works, presented by Mr. Gaviller; several ancient works on Mathematics, presented by Mr. Chipman; Hydrographic Charts of the Great Lakes, presented by Mr. Sankey; a number of pamphlets on Forestry and other matters, by Prof. Bell, of the Geological Survey Department, Ottawa; a pamphlet on Russian Forestry, translated by Mr. A. Kirkwood, of the Crown Lands Department of Ontario, besides a large number of contributions from other donors.

Published annually by the Association of Ontario Land Surveyors.

Edition 1,150 copies; price 75 cents.

PATRONIZE OUR ADVERTISERS.

PREFACE.

To the Members of the Association of Ontario Land Surveyors :

The Proceedings of the Association at its Fourth Annual Meeting since incorporation, together with valuable matter in the Appendix, are herewith presented.

We have again to congratulate ourselves upon having had active and earnest members on the various committees, and to express the hope that the current year may show an advance in that direction.

Respectfully submitted on behalf of the Council,

A. J. VANNOSTRAND,

Secretary.

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ASSOCIATION OF
ONTARIO LAND SURVEYORS

(Incorporated 1892).

ORGANIZED 23RD FEBRUARY, 1886.



Officers for 1896=97.

PRESIDENT.

Willis Chipman, O.L.S., Toronto.

VICE-PRESIDENT.

T. Harry Jones, O L.S., Brantford.

CHAIRMAN OF COUNCIL.

Villiers Sankey, O.L.S., Toronto.

SECRETARY-TREASURER.

A. J. VanNostrand, O.L.S., Toronto.

MEMBERS OF COUNCIL.

Hon. A. S. Hardy, Commissioner of Crown Lands.

Geo. B. Kirkpatrick, Toronto, } For 3 years.

Alex. Niven, Haliburton, } For 2 years.

P. S. Gibson, Willowdale, } For 2 years.

F. L. Foster, Toronto, } For 1 year.

Villiers Sankey, Toronto, } For 1 year.

Herbert J. Bowman, Berlin, } For 1 year.

AUDITORS.

A. P. Walker, Toronto.

Geo. Ross, Welland.

BANKERS.

Imperial Bank of Canada (Yonge Street Branch, Toronto).

BOARD OF EXAMINERS.

Villiers Sankey, Toronto, Chairman.
 M. J. Butler, Napanee, } Appointed by Lieut.-Gov.
 Geo. B. Kirkpatrick, Toronto, } in Council.
 P. S. Gibson, Willowdale, } For 2 years, appointed by
 Alex. Niven, Haliburton, } Council of Management.
 M. Gaviller, Collingwood, } For 1 year, appointed by
 R. Coad, Glencoe, } Council of Management.

STANDING COMMITTEES, 1896.

LAND SURVEYING.—J. L. Morris (Chairman), C. F. Aylsworth, Jun.,
 C. C. Fairchild, Wm. Galbraith, W. L. Innes, C. A. Jones,
 John McLatchie, John Roger, L. V. Rorke.

DRAINAGE.—B. J. Saunders (Chairman), C. A. Bigger, Lewis Bolton,
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 McGeorge, Jas. Robertson.

ENGINEERING.—Jos. DeGurse (Chairman), E. G. Barrow, T. O.
 Bolger, A. W. Campbell, W. M. Davis, Jas. Hutcheon, J. M.
 Moore, A. P. Walker.

ENTERTAINMENT.—T. B. Speight (Chairman), R. P. Fairbairn, W. E.
 McMullen, C. F. Miles, C. J. Murphy, Villiers Sankey, A. P.
 Walker.

PUBLICATION.—Killaly Gamble (Chairman), W. A. Browne, F. L.
 Foster, H. H. Gibson, C. J. Murphy.

TOPOGRAPHICAL SURVEY.—Otto J. Klotz (Chairman), G. B. Abrey,
 M. J. Butler, Thos. Fawcett, John McAree, L. B. Stewart,
 F. W. Wilkins.

SPECIAL COMMITTEES, 1896.

LEGISLATION.—Willis Chipman (Chairman), Herbert J. Bowman,
 Jos. DeGurse, F. L. Foster, P. S. Gibson, T. H. Jones, Geo.
 B. Kirkpatrick, Otto J. Klotz, J. L. Morris, A. Niven, Villiers
 Sankey, B. J. Saunders.

POLAR RESEARCH.—J. W. Tyrrell (Chairman), M. W. Hopkins, W.
 Ogilvie, J. A. Paterson, L. B. Stewart, Jas. Whitson.

STANDARD MEASURES OF LENGTH.—M. J. Butler (Chairman), Geo.
 B. Abrey, H. J. Browne, Villiers Sankey, L. B. Stewart, H. K.
 Wicksteed.

REPOSITORY AND BIOGRAPHY.—H. L. Esten (Chairman), W. R.
 Aylsworth, Walter Beatty, Geo. B. Kirkpatrick, F. H. Lynch-
 Staunton, Charles Unwin, V. B. Wadsworth.

EXPLORATION IN ONTARIO.—E. Stewart (Chairman), T. R. Deacon,
 R. W. DeMorest, James Dickson, A. Niven, H. B. Proudfoot,
 A. L. Russell.

RE CIVIL ENGINEERS' BILL.—Willis Chipman (Chairman), Herbert
 J. Bowman, M. J. Butler, A. W. Campbell, Jos. DeGurse, Geo.
 B. Kirkpatrick, Villiers Sankey, A. J. VanNostrand.

PROGRAMME OF THE
Association of Ontario Land Surveyors

(INCORPORATED),

AT ITS FOURTH ANNUAL MEETING HELD IN TORONTO,
FEBRUARY 25TH, 26TH AND 27TH, 1896.

PROGRAMME.

Tuesday, 25th February—Morning at 10 o'clock,

AT THE REPOSITORY, PARLIAMENT BUILDINGS.

Meeting of Council.
Meeting of Standing and Special Committees.

Afternoon at 2 o'clock.

Reading of Minutes of previous meeting.
Reading of Correspondence.
Report of Council of Management (including Reports of Board of Examiners and Secretary-Treasurer). V. Sankey, O.L.S., Chairman, Toronto.
Report of Committee on Publication. K. Gamble, O.L.S., Chairman, Toronto.
Report of Committee on Biography. Geo. B. Kirkpatrick, O.L.S., Chairman, Toronto.
Report of Committee on Polar Research. Willis Chipman, O.L.S., C.E., Chairman, Toronto.
President's Address.
Paper—"Artesian Wells." V. M. Roberts, O.L.S., C.E., St. Catharines.
Paper—"The Use of Concrete in Bridge Foundations." J. DeGurse, O.L.S., C.E., Windsor.
Paper—"Some Notes on Concrete and its application to various works." M. J. Butler, O.L.S., C.E., Napanee.
Paper—"The Maintenance of a Separate Sewerage System." T. Harry Jones, O.L.S., C.E., Brantford.

Evening at 8 o'clock.

AT THE SCHOOL OF PRACTICAL SCIENCE.

Paper—"The Engineering Field of America." A. R. Davis, O.L.S., C.E., Napanee.
Paper—"Notes on Some New Jersey Roads." T. B. Speight, O.L.S., Toronto.
Paper—"Road Metal." Herbert J. Bowman, O.L.S., C.E., Berlin.

Wednesday, 26th February—Morning at 10 o'clock.

AT THE CANADIAN INSTITUTE, 58 RICHMOND STREET EAST.

Report of Committee on Drainage, with Question Drawer. George Ross, O.L.S., C.E., Chairman, Welland.

Paper—"The Ditches and Water Courses Act of 1894." B. J. Saunders, O.L.S., C.E., Brockville.

Report of Committee on Topographical Surveying. Willis Chipman, O.L.S., C.E., Chairman, Toronto.

Paper—"Ontario Boundaries" A. Niven, O.L.S., Haliburton.

Paper—"Sectional Surveys." P. S. Gibson, O.L.S., C.E., Willowdale.

Afternoon at 2 o'clock.

Report of Committee on Land Surveying, with Question Drawer. T. B. Speight, O.L.S., Toronto, Chairman.

Paper—"Crown Surveys." James Dickson, O.L.S., Fenelon Falls.

Paper—"Natural Boundaries." A. P. Walker, O.L.S., C.E., Toronto.

Paper—"A Road or Not a Road." M. Gaviller, O.L.S., Collingwood.

Evening at 8 o'clock.

ANNUAL DINNER

AT McCONKEY'S.

H. D. Ellis, O.L.S., Chairman of Committee on Entertainment.

Thursday, 27th February—Morning at 10 o'clock.

Report of Auditors.

Report of Committee on Standard Measures. M. J. Butler, O.L.S., C.E., Chairman, Napanee.

Report of Committee on Engineering. Herbert J. Bowman, O.L.S., C.E., Chairman, Berlin.

Paper—"An Exploration Survey in the Barren Lands." J. W. Tyrrell, O.L.S., C.E., Hamilton.

Paper—"The Route of the Proposed Sault Ste. Marie and James' Bay Railway." Jos. Cozens, O.L.S., Sault Ste. Marie.

Paper—"Field Testing of Minerals, and the Value of a Course of Instruction." W. Hamilton Merritt, M.E., Toronto.

Afternoon at 2 o'clock.

Report of Committee on Entertainment. H. D. Ellis, O.L.S., C.E., Chairman, Toronto.

Ratification of New By-Laws.

Unfinished Business.

New Business.

Nomination of Officers (President, Vice-President, Two Members of Council, Secretary-Treasurer and Auditors).

Appointment of Scrutineers.

Adjournment.

Evening at 8 o'clock.

PEARY'S LECTURE.

At Association Hall, cor. Yonge and McGill Streets, Lecture by Lieut. R. E. Peary, the Arctic Explorer.

ASSOCIATION OF
ONTARIO LAND SURVEYORS

(INCORPORATED 1892).

MINUTES OF THE FOURTH ANNUAL MEETING

(Eleventh Annual Meeting of Provincial Land Surveyors of Ontario),

FEBRUARY 25th, 26th and 27th, 1896.

The meeting opened at the Repository of the Association, in the Parliament Buildings, at 2.30 o'clock p.m. ; the President, Mr. M. Gaviller, in the chair.

Among the members present there were : Messrs. G. B. Kirkpatrick, Toronto ; Mr. Gaviller, Collingwood ; H. DeQ. Sewell, Port Arthur ; K. Gamble, A. J. VanNostrand. H. W. Selby, Toronto ; A. Niven, Haliburton ; George Ross, Welland ; R. P. Fairbairn, Toronto ; J. W. Tyrrell, Hamilton ; G. B. Abrey, Toronto ; T. B. Speight, Toronto ; H. J. Bowman, Berlin ; J. Warren, Walkerton ; M. J. Butler, Napanee ; James Dickson, Fenelon Falls ; V. Sankey, Toronto.

It was moved and adopted that the Minutes of the previous meeting, as printed in the last Annual Report, be taken as read.

The Secretary-Treasurer's Report was presented by the Chairman of the Council, Mr. V. Sankey, who moved its adoption. Seconded by Mr. Niven and carried.

The Report of the Committee on Publication was presented by the Chairman of the Committee, Captain K. Gamble, who moved its adoption. Seconded by Mr. Niven and adopted.

The Report of the Committee on Biography was then read by the Chairman of the Committee, Mr. Kirkpatrick, who moved its adoption. Seconded by Mr. H. W. Selby and adopted.

The President read his address which was received with applause.

On motion of Mr. A. Niven, seconded by Mr. Sewell, a vote of thanks was tendered by the meeting to the President for his able address.

A paper on "Artesian Wells" by Mr. V. M. Roberts, C.E., of St. Catharines, was omitted in consequence of his indisposition.

"The Use of Concrete in Bridge Foundations" was the title of a paper presented by Mr. J. DeGurse, of Windsor, and read by Mr. Herbert J. Bowman, of Berlin.

It was moved by Mr. G. B. Abrey, seconded by Mr. Butler and carried, that the discussion on this paper be postponed until Mr. Butler's paper on "Some Notes on Concrete and its Application to Various Works," be read.

The Report of the Committee on Drainage was then presented to the Association by Mr. George Ross, of Welland. The Question Drawer was held over until the morning session.

Mr. Butler reported the work that had been accomplished by the Committee on Standard Measures, and read correspondence which had been received from various Departments in the Governments at Ottawa and Toronto.

Mr. Sankey moved that the Committee be asked to continue their work on the lines suggested by the mover in discussing the report of Mr. Butler. Seconded by Mr. George Ross and carried.

At 4:30 o'clock p.m. the meeting was adjourned until 8 p.m., to meet at the School of Practical Science.

At 8:30 o'clock p.m. the meeting re-opened; the President, Mr. Gaviller, in the chair.

"The Maintenance of a Separate Sewerage System" was the title of a paper read by Mr. T. Harry Jones, of Brantford.

Mr. M. J. Butler, of Napanee, then presented his paper on "Some Notes on Concrete and its Application to Various Works."

A paper on "Road Metal" was presented by Mr. Herbert J. Bowman, of Berlin.

At 10 p.m. the meeting adjourned.

SECOND DAY.

On 26th February, 1896, at 10 o'clock a.m., the meeting opened at the Canadian Institute, the President in the chair.

Among the members present there were: Messrs. M. J. Butler, Napanee; Peter S. Gibson, Willowdale; James Dickson, Fenelon

Falls; Willis Chipman, Toronto; George Ross, Welland; A. J. Van-
Nostrand, Toronto; K. Gamble, Toronto; H. DeQ. Sewell, Port
Arthur; T. B. Speight, Toronto; A. Niven, Haliburton; Mr. J. War-
ren, Walkerton; J. W. Tyrrell, Hamilton; G. B. Abrey, Toronto; H.
J. Bowman, Berlin; T. Harry Jones, Brantford; V. Sankey, and
others.

The President, Mr. Gaviller, announced the receipt of Report
No. 2 of the Association of P. L. S of British Columbia.

A paper, read by Mr. T. B. Speight, of Toronto, on "Notes on
some New Jersey Roads" was received with applause.

The Secretary was instructed to have extra copies made of this
paper.

The Report of the Committee on Drainage, with the Question
Drawer, was then taken up for discussion.

It was moved by Mr. P. S. Gibson, seconded by Mr. M. J. But-
ler, that the report be received. Carried.

The Report of the Committee on Topographical Surveying was
presented by Mr. M. J. Butler, who moved the adoption of the Report.
It was seconded by Mr. Niven, and carried.

At 12 o'clock noon the meeting adjourned until 2 o'clock p.m.

At 2 o'clock p.m. the meeting re-opened; the President, Mr.
Gaviller, in the chair.

Mr. A. Niven, of Haliburton, was then called upon to read his
paper on "Ontario Boundaries," which was received with great
applause.

"Sectional Surveys" was the subject of a paper presented by Mr.
P. S. Gibson, of Willowdale.

The Report of the Committee on Land Surveying was deferred
until Thursday morning.

The Report of the Committee on "Polar Research" was then
presented by Mr. Willis Chipman, of Toronto, who moved its adop-
tion. It was seconded by Mr. Niven and carried.

Report of the Council of Management, including Reports of
Board of Examiners and Secretary-Treasurer, presented by Mr. V.
Sankey, Chairman of Council, were received and adopted.

It was moved by Mr. V. Sankey, seconded by Mr. E. Stewart,
and adopted, that Captain K. Gamble act as Auditor in the place of
Mr. Proudfoot who is absent.

It was moved by Mr. G. B. Kirkpatrick, seconded by Mr. V. Sankey, and adopted, that the Rules of Order be suspended temporarily to allow of a discussion on the contemplated changes in the Act respecting Land Surveyors.

After some discussion the following motion was presented:—

Moved by Mr. Willis Chipman, seconded by Mr. Dickson, and resolved, that a Committee on Legislation composed of the Council for 1896, and the Chairmen of the standing Committees on Land Surveying, Drainage, Engineering and Topographical Surveying for 1896 be, and are, hereby appointed to take up the subject of the necessary amendments to the Survey Acts and other Acts, with powers to bring the same before the notice of the Government in order that the same may be passed at the next meeting of the Provincial Legislature, and that this Committee also have power to add to its numbers and to engage counsel if necessary.

The motion of Mr. Chipman was carried.

A discussion took place as to the admission of honorary members of the Association.

After some discussion it was moved by Mr. V. Sankey, seconded by Captain K. Gamble, and resolved, that the matter of Honorary Membership be referred to the Council, in order that the same may be considered and a report brought before the Association.

The Report of the Council was then received and adopted by the meeting.

Mr. James Dickson, of Fenelon Falls, read a paper on "Crown Surveys"

A paper on "The Ditches and Water Courses Act of 1894," written by Mr. B. J. Saunders, of Brockville, was read by Mr. George Ross, Mr. Saunders being too ill to attend.

At 5:30 p.m. the meeting adjourned to 10 a.m., 27th February, 1896.

THIRD DAY.

On 27th February, 1896, at 10 o'clock a.m., meeting re-opened; President Mr. M. Gaviller in the chair.

The paper of Mr. A. R. Davis, of Napanee, on "The Field of American Engineering," was read by Mr. H. DeQ. Sewell, Mr. Davis being unable to attend.

The Report of the Committee on Engineering was presented by Mr. Herbert J. Bowman, of Berlin, and, after some discussion, was received and adopted.

"Field Testing of Minerals, and the Value of a Course of Instruction" was the subject of a highly interesting paper delivered orally, accompanied with a test of some gold specimens, by Mr. Wm. Hamilton Merritt, M.E., of Toronto.

The thanks of the meeting were tendered to Mr. Merritt for the very instructive address delivered, on motion of Mr. A. Niven, seconded by Mr. Butler.

A paper written by the President, Mr. Gaviller, "A Road or Not a Road," was taken as read, the Secretary being instructed to publish it.

Messrs A. P. Walker and K. Gamble handed in the Report of Auditors, which was read by Mr. Walker, who moved its adoption. It was seconded by Mr. T. H. Jones and carried.

At 1 o'clock p.m. adjourned to 2 p.m.

At 2 o'clock p.m. the meeting resumed; the President, Mr. Gaviller, in the chair.

A paper on "Natural Boundaries" was read by Mr. A. P. Walker, of Toronto.

The Report of the Committee on Land Surveying, with Question Drawer, was presented by Mr. T. B. Speight, of Toronto.

After some discussion Mr. Speight moved the adoption of the Report, seconded by Mr. Dickson, and carried.

The Report of the Committee on Entertainment was taken as read, being presented by Mr. H. D. Ellis, of Toronto. On motion of Mr. Speight, seconded by Mr. W. A. Browne.

A paper on "An Exploration Survey in the Barren Lands," written by Mr. J. W. Tyrrell, of Hamilton, was read and received with great applause.

RATIFICATION OF NEW BY-LAWS.

Mr. V. Sankey read By-Laws 41 and 42, as referred to in the Report of Council.

Mr. H. DeQ. Sewell moved the ratification of the By-Laws. This was seconded by Mr. P. S. Gibson and carried.

NEW BUSINESS.

Mr. Niven referred to an interview he had had with Mr. Kirk, of Stratford, one of the promoters of the First Association and now in the eighty-seventh year of his age, who extended a very cordial

invitation to all members of the Association when in Stratford to call on him.

It was moved by Captain K. Gamble, seconded by Mr. Willis Chipman and resolved, that the Council be requested to change the name of the standing "Committee on Topographical Surveying" to that of the "Committee on Topographical Survey"

It was moved by Mr. Willis Chipman, seconded by Mr. J. W. Tyrrell and resolved, that the following special committees be appointed by the Council at the same time that the standing Committees are appointed :

- a. Polar Research.
- b. Exploration in Ontario.
- c. Repository.
- d. Legislation.

It was moved by Captain K. Gamble, seconded by Mr. P. S. Gibson and resolved, that any omissions or clerical errors in the records of the proceedings of this meeting, now in the hands of the Stenographer and the Secretary, be corrected by the Committee on Publication before publishing.

Mr. E. Stewart moved, seconded by Mr. G. B. Kirkpatrick and resolved, that a vote of thanks be tendered to all those who have furnished Papers to this Association at this meeting.

It was resolved, on motion of Mr. Butler, seconded by Mr. Willis Chipman, that the sum of \$150 be paid to the Secretary as a slight recognition of the very efficient manner in which he has discharged the duties of his office for the past year.

The Secretary, Mr. A. J. VanNostrand, responded to the resolution in fitting terms, expressing his gratitude for the recognition.

The President announced that the management of the Canadian Institute had extended a cordial invitation to the members of the Association to visit the Museum.

NOMINATION OF OFFICERS.

President.

Mr. Niven nominated Mr. Willis Chipman. Seconded by Captain K. Gamble. Carried unanimously.

Vice-President

Mr. E. Stewart nominated Mr. T. Harry Jones of Brantford. Seconded by Mr. Sankey and carried unanimously.

Council.

Mr. Dickson nominated Mr. Niven.

Mr. Sewell nominated Mr. Kirkpatrick.

Mr. Bowman nominated Mr. John Davis, of Alton. Mr. Davis withdrew his name.

Mr. Bowman nominated Mr. W. M. Davis, of Woodstock.

Mr. VanNostrand nominated Mr. A. P. Walker, of Toronto.

Mr. P. S. Gibson nominated Mr. James Dickson. Mr. Dickson withdrew his name.

Mr. Stewart nominated Mr. G. B. Abrey.

Mr. Chipman nominated Mr. B. J. Saunders, of Brockville.

Mr. Sankey nominated Mr. Charles R. Wheelock, of Orangeville.

Mr. Kirkpatrick nominated Mr. L. V. Rorke, of North Bay.

Mr. Bowman nominated W. F. VanBuskirk.

Mr. Bowman nominated Mr. A. W. Campbell, of St. Thomas.

Mr. Sankey nominated Mr. J. W. Tyrrell.

Secretary-Treasurer.

Mr. H. DeQ. Sewell proposed that the present Secretary-Treasurer be re-elected. It was seconded by Mr. P. S. Gibson, and carried unanimously.

Auditors.

Mr. Butler nominated Mr. George Ross, of Welland.

Mr. Sankey nominated Mr. Esten, of Toronto, who withdrew his name.

Mr. Chipman nominated Mr. Walker.

Messrs. Ross and Walker were declared elected unanimously.

Scrutineers.

The President appointed Captain K. Gamble and Mr. Harry J. Browne.

Mr. Speight read a letter from Mr. Arthur Harvey, Chairman of the Local Committee of the British Association for the Advancement of Science, the meeting of which is to be held at Toronto in 1897, expressing a desire for the co-operation of this Association in the different branches of science and scientific research.

The question of honorary membership was discussed very fully by the members, when it was on motion referred to the Council of Management to deal with the matter.

On motion of Mr. Butler Mr. Niven took the chair.

Mr. Willis Chipman expressed his pleasure at being elected President as follows :—

Gentlemen, I wish to express to the members of the Association my appreciation of the honour conferred upon me by being elected without opposition to the office of President. It is an honour any member should feel proud of. I will endeavour during the coming year to do my duty to the Association.

I may be permitted to say that this year will be an important one for us. We have set the ball rolling in the way of a topographical survey of this Province, and I have hopes that in another year we will be able to report substantial progress. This is the most important work the Association has in hand.

Another important plank in our platform is the exploration and development of the north half of this Province, of which even we surveyors know little or nothing. There is no more known to-day of this area than was known two hundred years ago. I think those two planks in our platform will alone give sufficient work for several committees.

Another matter I may be permitted to touch upon is the printing of papers before the meeting. This is a step in the right direction, but I believe that these papers when printed should not be read at the Annual Meeting of the Association. Nothing is necessary when a paper is printed but merely to comment upon it. Too much time is now spent in the reading of papers, that could be better devoted to discussion. I thank you most heartily for the honour you have done me.

Mr. Butler moved that a hearty vote of thanks be tendered by this Association to Mr. M. Gaviller for the very efficient manner in which he has performed the duties of President during the past year. It was seconded by Mr. Kirkpatrick and carried unanimously.

Mr. Gaviller in reply to the resolution thanked the meeting as follows :—

Gentlemen, in reply to your very kind motion, I have on several occasions, I think, thanked you for electing me President, and now it only remains for me to thank you for the very good behaviour shown at the meetings we have had during the past few days. We have never had any trouble. I hope my successors will never have any more than I have had. Those who have occupied the office and been through one step to another should be quite content to retire, and go into the committees, and still to work and help along the Association which I hope to do.

At 4:45 p m., the meeting adjourned.

MEMBERS IN ATTENDANCE AT THE FOURTH
ANNUAL MEETING.

Abrey, G. B.	Gamble, K.	Rorke, L. V.
Bolton, L.	Gaviller, M.	Ross, G.
Bowman, H. J.	Gibson, H. H.	Sankey, V.
Browne, H. J.	Gibson, P. S.	Selby, H. W.
Browne, W. A.	James, S.	Sewell, H. DeQ.
Butler, M. J.	Johnson, R. T.	Speight, T. B.
Chipman, W.	Jones, T. H.	Spry, W.
Cozens, J.	Kirkpatrick, G. B.	Stewart, E.
Davis, J.	Laird, R.	Stewart, L. B.
Dickson, J.	McFarlen, G. W.	Tyrrell, J. W.
Ellis, H. D.	McKay, O.	VanNostrand, A. J.
Esten, H. L.	McMullen, W. E.	Walker, A. P.
Fairbairn, R. P.	Miles, C. F.	Warren, J.
Fitton, C. E.	Murphy, C. J.	Wheelock, C. R.
Galbraith, J.	Niven, A.	Whitson, J. F.

RESULT OF ELECTIONS.

President Willis Chipman (by acclamation).
Vice-President T. Harry Jones (by acclamation).
Secretary-Treasurer A. J. VanNostrand (by acclamation).

Members of Council of Management elected for ensuing three years.

G. B. Kirkpatrick, A. Niven.

Auditors for ensuing year.

Geo. Ross and A. P. Walker (by acclamation).

I hereby declare the above-named members of Council of Management elected.

A. J. VANNOSTRAND,
Secretary-Treasurer.

Certified correct.

H. J. BROWNE,
 KILLALY GAMBLE,
Scrutineers of Ballots.

REPORT OF COUNCIL OF MANAGEMENT FOR 1895-6.

The Council held its regular meetings in April and November, and one special meeting on the 19th of July.

At the April meeting By-laws Nos. 41 and 42 were passed and are now reported to the Association for ratification under the authority of By-law No. 33. Mr. Sankey was again elected Chairman of the Council and Messrs. Gibson and Niven were appointed on the Board of Examiners. The several standing and special committees were also nominated.

In the matter of unlicensed practitioners the Council has had several cases reported, but in most of these the evidence was not strong enough to warrant proceedings being instituted. In one, however, in the northern part of the Province, proceedings are now being taken and the result will be reported on a future occasion.

The Council has given very serious attention to the matter of arrears of dues, and after much consideration decided that a scale of discounts should be offered to those surveyors who were in arrears for more than the current year, on condition of prompt payment. Before doing so, however, the advice of a solicitor was taken as to the legality of this step, the result being that fourteen surveyors have availed themselves of this privilege which the Council considers is an evidence of the wisdom of its action. It may be mentioned that in some of these cases the surveyors apparently did not thoroughly understand that they were liable to be sued for unpaid dues. There are a few who are still in arrears, but the Council hopes that it will not be driven to the necessity of bringing these cases into court, which will be its unpleasant duty if the dues are not shortly settled.

The Hon. A. S. Hardy, Commissioner of Crown Lands, attended the November meeting, and several matters of importance were discussed with him. His attention having been drawn to the fact that the fees paid by candidates for examination, together with the grant made by the Government, do not cover the expenses, he expressed his willingness to assist in meeting this deficit by an increased grant, which, it is hoped, will be received this year.

Mr. M. J. Butler was re-appointed in November by His Honor the Lieutenant-Governor to the Board of Examiners for a period of three years.

The papers given at the April examination are published in the Report for 1895.

The Repository in the Parliament Buildings has been opened and furnished, and many contributions have already been received. There is, however, no lack of room for more.

The Council has had under consideration the advisability of providing for the admission as honorary members to the Association of

men distinguished in branches of learning or science, and would ask the members of the Association for an expression of opinion on the subject.

In view of the fact that the Statutes of Ontario will be revised in 1897, the Council would suggest that a special committee be appointed to deal with this matter, having power to bring the proposed legislation before the Government. In conclusion, it may be stated that \$200 has been transferred from the current account to the Savings Bank account.

Respectfully submitted,

VILLIERS SANKEY,

Chairman of Council.

REPORT OF THE BOARD OF EXAMINERS, 1895-6.

The Board held its regular meetings in April and November.

At the April meeting no candidates presented themselves for preliminary examination; there were five, however, for final

The following gentlemen passed and were sworn in:—Alfred Ernest Farncomb, London; John Vicar Munro, London.

Passed supplemental: Andrew Lane, Toronto Junction.

One candidate failed in Survey Act and one in Survey Act and Descriptions

At the November meeting, two candidates presented themselves for preliminary examination:—Wm Howard Fairchild, Brantford; John Edward Schwitzer (B.A. Sc., McGill), Ottawa, and both passed.

For final examination, the following gentlemen passed and were sworn in:—Douglas John Gillon (grad. R.I.E.C., Cooper's Hill), Fort Frances; George Albert McCubbin, St. Thomas; Sydney Munnings Johnson (B.A. Sc., Toronto), Stratford.

Passed supplemental: Ellsworth Doan Bolton (B.A. Sc., McGill), Listowel.

One candidate failed in Descriptions and the Survey Act.

The following bonds were submitted and approved by the Board:—

APRIL SESSION, 1895.

ALLAN, JOHN RICHARD.

NOVEMBER SESSION, 1895.

LANE, ANDREW.

MUNRO, JOHN VICAR.

FARNCOMB, ALFRED ERNEST.

The appended list shows the articles filed during the year:—

ASSOCIATION OF ONTARIO LAND SURVEYORS.

LIST OF ARTICLED PUPILS.

NAME OF PUPIL.	NAME OF SURVEYOR.	RESIDENCE.	DATE OF ARTICLES.	TERM.
Charlesworth, Lionel Clare	Stewart, Eithu	Collingwood	1st April, 1895	One year.
Boswell, Elias John	Bowman, Herbert J	Berlin	1st June, 1895	One year
Margach, William Innes	Proudfoot, Hume Blake	Toronto	23rd May, 1895	Three years.
Taylor, William Verner	Beatty, David	Farry Sound	1st August, 1895	One year.
Schwitzer, John Edward	Mountain, George A	Otawa	15th November, 1895 ..	One year.
Fairchild, William Howard	Jones, Thomas Henry.	Brantford	6th November, 1895 ...	Three years.

The Board desire to state that good results are already apparent from the printing of the examination papers; the candidates at the latter examinations being more accurately prepared than those previously. The following subjects, however, do not, as yet, receive the attention from candidates that they should, namely, Survey Act, Descriptions, Mensuration and Dividing Land, Astronomy and Spherical Trigonometry. In the preliminary subjects, Orthography, Penmanship, Logarithms and Algebra.

Certificates of service in conformity with the requirements of the statute have been printed, and can be had from the Secretary on application by those apprentices whose time has expired. Suitable forms of Articles of Apprenticeship would have been printed for last year's reports, but it was expected that the new edition of "Acts, Orders and Regulations of the Crown Lands Department" would have been issued in 1895.

REPORT OF THE SECRETARY-TREASURER.

MR. CHAIRMAN.—I beg leave to submit the following report of the official business of the Association transacted by my department between February 25th, 1895, and February 24th, 1896:

The following circulars were issued :

No. 20. Ballot for 1895 96.	225 copies.
" 21. Explanation of Ballot, with names of candidates.	225 "
" 22. Request for Contributions to the Repository.	250 "
" 23. To Withdrawn Members, <i>re</i> Associate Membership.	45 "
" 24. To Unregistered Ontario Land Surveyors.	30 "
" 25. To Members in arrears for more than one year.	35 "
" 26. To Members in Rainy River and Thunder Bay Districts, <i>re</i> alleged unprofessional conduct.	16
" 27. To Members in Arrears for Current Association Year.	70
" 28. Announcement of Fourth Annual Meeting.	250
" 29. Programme for Fourth Annual Meeting.	350
Letters and Accounts sent from Secretary's Office.	710
Post Cards.	67
Letters and Post Cards received.	485
Reports and Exchanges sent to Members and Others.	1650
Reports shipped to Exchanges.	770

The Register stands as follows :

Active Members subject to dues.	199
Active Members exempted from dues.	21
Withdrawn from practice.	47
Dead.	5
Total number of Registrations.	272

I am glad to be able to report that, notwithstanding current pessimistic rumors regarding the condition of financial affairs in our country, there are fewer members now in arrears than at any annual meeting since incorporation.

Arrangements for exchanging reports with the Societies of the School of Practical Science, Michigan, Illinois, Iowa, Ohio and Indiana were continued, and the reports of all those societies have been distributed during the year, with the exception of the two latter, which will probably be received and sent out within a short time.

Our mailing list is constantly receiving additions, as the work of the Association becomes more widely known, and in nearly all cases reports or other works of value are received in return for our report.

It is very gratifying to note the growing activity of the several standing and special committees. In spite of the usual difficulty which nearly every chairman necessarily meets with in securing a quorum, and thereby a general expression of opinion from the members of his committee, the reports this year shew that each committee has devoted much care and attention to the interests of its department.

Our collection of books, maps, instruments, etc., for the Repository has received many interesting, useful and valuable additions during the year, and now contains 70 bound volumes (including a set of the reports of the United States Coast and Geodetic Survey), 177 books and pamphlets unbound (including a set of reports of the Geological Survey Department of Canada), 46 maps and charts, 14 photographs, 2 ancient surveyor's compasses and 1 compass corrector. When the fittings now being prepared have been put in place, this room will be most convenient for members to make use of for reading, drafting, etc. In the meantime, will each member contribute to the collection as opportunity occurs?

The thanks of the Secretary are due to those members who, upon receiving a somewhat late appeal for papers for the present meeting, cheerfully responded, with the result that a meagre programme of half-a-dozen papers received an impetus which brought it to its present dimensions.

It will be observed that, as yet, only three "withdrawn" members have availed themselves of the advantages of Associate membership, but it is probable that the list of Associates will steadily increase.

The total cost of extra copies of the American exchanges will be about the same as last year.

Accompanying this report is a statement of the receipts and expenditures for the Association during the past year.

All of which is respectfully submitted.

A. J. VAN NOSTRAND,

Secretary-Treasurer.

Toronto, 24th February, 1896.

REPORT OF COUNCIL OF MANAGEMENT.

23

STATEMENT OF RECEIPTS AND EXPENDITURES BETWEEN 25TH FEBRUARY, 1895, AND 24TH FEBRUARY, 1896.

1895-6.		RECEIPTS.	
To balance on hand 25th February, 1895.....			\$1,032 63
" Amounts collected from advertisements in 1894 Report....	\$ 15 50		
" " " " 1895 " " " "	89 00		
" " " " Proceedings sold			104 50
" 15 Registration fees.....	\$ 1 00	15 00	
" 3 Full Annual Dues for 1st Association year.....	4 00	12 00	
" 4 " " " 2nd " " " "	4 00	16 00	
" 10 " " " 3rd " " " "	4 00	40 00	
" 147 " " " 4th " " " "	4 00	588 00	
" 3 " " " 5th " " " "	4 00	12 00	
" 2 Commuted Arrears, 1st to 4th " (inclusive) 10 00		20 00	
" 1 " " " 1st to 4th " " " "	9 00	9 00	
" 7 " " " 2nd to 4th " " " "	8 00	56 00	
" 4 " " " 3rd to 4th " " " "	7 00	28 00	
" 1 Associate Dues for 3rd " " " "	2 00	2 00	
" 2 " " " 4th " " " "	2 00	4 00	
" 1 Balance of Associate Dues 1st to 4th Association year..		5 00	
			807 00
" Accrued Interest on Deposit in Savings Account			23 39
" Receipts in Board of Examiners' Account, including Government Grant of \$150 00.....			492 00

		EXPENDITURES.	
By Postage.....	\$ 76 76		\$2,460 53
" Bank collections		45	
" Printing circulars, wrappers, stationery, blank forms, etc..		55 15	
" Publishing Proceedings of 1895 meeting.....		279 35	
" Freight on Exchanges received.....		2 75	
" Customs brokerage.....		2 50	
" Amount paid to Secretary-Treasurer for 1894-5.....		120 00	
" " " Stenographer for 1895 meeting.....		35 00	
" " " paid for Rent of Rooms		10 00	
" " " Rubber stamp		30	
" " " Furniture and map mounting for Repository		13 50	
" " " Extra copies of '94 exchanges		13 00	
" " " " " '95 " " " "		23 87	
" " " Expenses of Council Meetings.....		12 00	
" " " Express charges on map, instrument, etc..		1 65	
" " " Lithographing for Entertainment Com'tee.		6 75	
" " " Office sundries.....		45	
" " " Typewriting		2 45	
" " " Cartage		1 65	
" " " Back Nos. Michigan Engineers' Annual... ..		4 50	
" " " Customs duty on electro.....		34	
" " " Solicitor's opinion <i>re</i> O.L.S. Act.....		20 00	
" " " Binding Reports and Exchanges.....		7 80	
			\$ 690 22
" " " Disbursements in Board Examiners' account.....			579 37
" Balance cash on hand.....	\$ 20		
" " on hand in Savings account Feb. 24 1896	752 48		
" " " Current " " " " " "	438 26		
			1,190 94
Total.....			\$2,460 53

A. P. WALKER, }
 KILLALY GAMBLE, } *Auditors.*

A. J. VANNOSTRAND,
Secretary-Treasurer.

REPORT OF AUDITORS.

To the Association of Ontario Land Surveyors.

We hereby certify that we have examined the accounts of the Secretary Treasurer and vouchers therefor for the year ending 24th February, 1896, as well as the financial statement, and have found them correct.

A. P. WALKER, }
KILLALY GAMBLE, } *Auditors.*

Toronto, 27th February, 1896.

DISCUSSION.

Mr. Butler—Twice during the last year I was written to for information with reference to a little paper I had contributed to last year's proceedings, one from the Superintendent of Schools in New York asking where that book could be purchased which I recommended in my paper, and another enquiry came from the neighborhood of California showing that our proceedings are not only travelling afar but they are being read and studied. One other thing I was going to suggest, as included in the suggestions thrown out by the Report of the Board, I think we should ask for an amendment to our Act so that the words "mechanics" and "mensuration of solids" may be added to the subjects in the final examination.

Mr. Chipman—If this is the proper time to discuss the future of this Association I would like to refer to a subject that perhaps would come under the head of new business.

In 1897 the Acts of the Province are to be consolidated and revised and whatever legislation we deem it best to advance our interests, and the interests of the public, should be carefully drawn up between now and then. There are a great many things I think we could get added to our Act if we would only look after it carefully.

Mr. Sankey—The Council has drawn attention to that matter and has suggested that a special committee be appointed. If that does not meet the views of the Association some other action will have to be taken. It appeared to the Council that that would be a better way than to leave this entirely to the Committee on Surveys. It is a matter of very great importance, as our Vice-President has just said, and the Council is of opinion that a special committee should be appointed. It is not a matter that probably we would succeed in discussing and finishing at a meeting like this. It would be necessary to have some committee specially appointed which would receive all suggestions, no matter how trivial they may be. Everyone who has a suggestion to make should, I think, make it, and let this committee we speak of judge as to whether it should be brought before the Government. A year will be none too long to discuss this matter and work

it up. We could not bring anything before the present session of the Legislature, but we should have what we want to bring in a concise and definite form by next meeting.

The President—I think when we commence discussing this subject of changes in the Act we might go on for a week and come to nothing. I think those most interested would not mind putting their opinions on paper and sending them in to this Committee.

Mr. Butler—Once we get away from the meeting other duties intervene and one forgets it until the next meeting. A good many of the surveyors are here now and an expression of opinion is easily got from them and the committee will go away and digest the matter.

Mr. Kirkpatrick—I fear it would be too late at the next meeting of this Association to discuss amendments. The amendments would have to be introduced on the authority you give the Committee to prepare them, because the Government would have to be approached and everything to be in order, before the meeting of the House. The House met late this year. It would certainly be too late to initiate any legislation. So anything we think of doing the Committee should be authorized to lay before the Government early in the fall, or at least in the early winter, and of course I think the only way that that could be done would be by correspondence with Members concerning any important change, asking them their opinion.

Mr. Chipman—Is this the proper time to discuss this matter ?

Mr. Kirkpatrick—We can suspend the rules of order if it be thought necessary. I would move that the rules of order be suspended for a little to allow of a discussion on the contemplated changes in the Act. Seconded by Mr. Sankey. Carried.

Mr. Chipman—The members of the Association may not be aware that the Canadian Society of Civil Engineers is looking towards incorporation. The draft bill I have here. It was afterwards amended, at their last meeting, and they intend to bring it before the Legislature of Ontario at as early a date as possible. That Act is framed somewhat similar to our own, to form a comparatively close corporation. I understood from the Secretary of the Local Committee in Toronto that they would have a deputation of engineers to meet the land surveyors. I fully expected it, but for some reason unknown to me they have not done so. Their object was to see if they could not amalgamate in some way with this Association, or change the Constitution of this Association, or get legislation to alter it, so as to make this Association the Association of Canadian Society of Civil Engineers, either the one or the other. These are matters that will come up before this committee that will be appointed. I don't think it has come officially before the Association, but I attended a meeting of the Toronto members of the Canadian Society of Civil Engineers when this matter was discussed.

Up to the present time the Canadian Society has ignored the existence of this Association, I believe, and anything that has been said by us. Some few members belong to both, and at the annual meeting of the Canadian Society it was shown what was done.

Mr. Sankey—I rise to a point of order. I do not think this matter is properly before us. The point I understand to be discussed is the question the Council has brought up, the amendments to our own Act. I have no objection at all to the other question being brought up here—I am very much in sympathy with it, personally—but I think the amendments we require in our own Act should come before us first. I do not wish Mr. Chipman to feel I am antagonistic to what he is saying, for I am not.

In regard to our fees and dues and all that, our present Act is not quite in the way it might reasonably be. These are matters of very great importance to ourselves. I believe there are other matters in connection with the Survey Act, pure and simple, that require amendment, that is, an amendment to a section here and a section there. What our Vice-President is talking about is a new Act. I do not think the members of the Association have any hostility to the Engineers, and I hope we will some day or other meet each other on common ground, but at the present time our own matters come first I think.

Mr. Chipman—Yes. I think we can cut this short by appointing a committee. I would move that a committee on legislation be appointed to consist of the Council of the coming year and the chairman of the committees on land surveying, drainage, engineering, and topographical surveying. Seconded by Mr. Dickson.

Mr. Walker—I would move in amendment that the committee to be appointed be named by the President for the purpose of taking these points into consideration. This may not be a very representative committee and probably a difficult one to get together. I think a committee that would be named by the President would be better; a small committee.

Mr. Sankey—I think in this matter a committee of this kind should be elected by the whole Association. The committee suggested by Mr. Chipman is one which is elective by the whole Association whether they are here to-day or whether they are not, and, owing to the importance of the committee, I think it is one that should be appointed in that way. I have no doubt at all that our President would name a very suitable committee, but I think that the onus should not rest on his shoulders.

The President—I would far rather not be made responsible.

Mr. Sankey—I think the committee at large should take the responsibility on themselves as to these matters. I think the committee named by the Vice-President is the best way of getting this

done. He names a committee of the Council or next year, which is elective, and, the Council being elective, appoints the various other committees. There can be no chance of our missing the best men that we want as an Association, and I think that we are perfectly safe in their hands. But in the near future, what we want is information on the points and subjects that the committee must discuss. It is not wise to appoint a committee and give them general powers. Let the Association give them points, bring up as many as you can, and let the committee discuss those points and come to some definite understanding as to what is to be done about them. I might perhaps be allowed to say that if, as the Vice-President has said, the Engineers' Association or Society are proposing an Act on this line, it may be wise for us to appoint a special committee, in case they do so, between now and next year, with powers to meet and discuss anything with them, and give them powers this coming year.

Mr. E. Stewart--I think it would be almost impossible for any of us here to name the amendments that we know are necessary in the Act. There are so many of them that will occur in going over the Act, that any person here, in the limited time at our disposal, will not be able to name. The committee that is named would be, I think, satisfactory.

Mr. Kirkpatrick--One point, I think, wants amendment, and it touches a good many surveyors very closely, and that is, some amendment which will render municipal surveys when performed incapable of being upset by the courts after having been confirmed. We brought that before the Commissioner of Crown Lands at the meeting of the Council and he was favourable to it. He said if the Association would draft some proper scheme he would be able to get it approved. There is no question that it is a thing that touches my branch of the department very closely. We have had municipal surveys which have been confirmed and have been perhaps ten years undisputed. Some man who finds himself aggrieved comes to court, and the evidence is not the same produced in court as before the surveyor. The judge upsets that instrument. He does not propose any remedy but simply upsets it. A monument has been planted carefully, and it has stood undisputed, for ten or twenty years, after due notice and everything else, and a man gets up, perhaps a grandson of the original owner, and tries to upset it. There are dozens of such cases all over the country, and a scheme should be evolved which would meet with the approval of the House when brought before it. We know the House is composed of a great many different types of men, but I think that with judicious care it could be introduced and pointed out to them that it was more for their benefit than for the benefit of the surveyors who made the survey. This should be final. We always thought that the Act decreed, in as strong words as it could, that the surveys made under the Municipal Act, under instructions from the Commissioner, should be final. The Act says that the survey would be to all intents and purposes what-

soever equal to the original, and then the courts upset that, and say it shall not be. What I want to get at is some word or some proposal by which it shall be impossible to rake up new evidence, and my idea was simply that the survey after being received by the department and examined should be advertised in the local papers of the county in which it was, calling upon all persons who have any evidence which was not submitted, to submit it forthwith, giving them a certain date; if after that date no evidence was given, that the survey should be confirmed absolutely and irrevocably. If any evidence is given, the Commissioner of Crown Lands will hear it. We had a case like that in the township of Chinguacousy in which Speight & Van Nostrand made a survey. They did the best they could, but of course they could not satisfy all parties. Very well. The Commissioner notifies all parties to attend, and they do attend, but there is no new evidence brought out. It was a hard case, but it was absolutely impossible that anything else could have been done than was done, because here was a fence which had been fifty years on that spot and the road was narrow and the Council wanted to open it up sixteen feet wider. This man thought it was very unfair it should come off him, and that man thought it was very unfair it should come off him, for the fences had stood there fifty years. But fifty years would not count against the Crown. And that was confirmed, and we have had no protest since.

Mr. Dickson—Another point to be brought up is the matter of descriptions. I do not think there is anything that has led to more trouble than parties writing descriptions who do not know how to do it. I had a case last Fall of a description dividing a lot which was drawn up by a lawyer. I made the survey three or four years ago, and there was "Hail Columbia" to pay for it. Another surveyor went through, and of course he was right and I was wrong. I think there should be some clause in the Act making it imperative to have all descriptions drawn by some person who will be responsible for it.

REPORT OF PUBLICATION COMMITTEE.

MR. PRESIDENT,—This Committee has had but little to occupy it save the usual routine of business.

Eleven hundred and fifty copies of the Report of the Proceedings were printed by the Presbyterian Printing & Publishing Company, at a cost of \$279.35, being a trifle less than last year.

We continue to exchange our Reports with other Societies as in the past.

Members sending in "papers" for publication are requested to have the accompanying diagrams accurately drawn on a scale suitable for insertion in the Report.

It is most desirable that all members of our Association would endeavour to forward the interests of our advertisers in every way in their power.

EXCHANGES SENT TO

Iowa Civil Engineers' and Surveyors' Society.....	50 copies.
Illinois Society of Engineers and Surveyors.....	130 "
Michigan Engineering Society	130 "
Ohio Society of Surveyors and Civil Engineers.....	130 "
Indiana Engineering Society	130 "
School of Practical Science Engineering Society	200 "

Respectfully submitted,

KILLALY GAMBLE,
Chairman.

REPORT OF COMMITTEE ON BIOGRAPHY.

Your Committee has received up to date about thirty sketches of the lives of early Surveyors, including those of Augustus Jones, John Stegman, S. Wilmot, P. Carroll, Samuel Rykman, A. Greeley, T. N. Molesworth, Richard Birdsall, and others, which will be published from time to time as we have room in the Proceedings of the Association. Many of these furnish interesting reading, illustrating as they do the altered condition of men and manners in this century now drawing to its close.

Your Committee ventures to express the hope that the members of the Association will bear in mind this useful feature in our work of self-improvement. In addition to the biographies of some of the old pioneers of our profession now passed away, we have also received, from some of our "active members," sketches of their lives, with photos accompanying, for which our thanks are due. We hope to receive many more such during next year.

Respectfully submitted,

GEO. B. KIRKPATRICK,
Chairman.

Toronto, February 25th, 1896.

REPORT OF COMMITTEE ON POLAR RESEARCH.

MR. PRESIDENT,—The past year has not been without interest to Arctic Geographers.

In April, Peary again crossed the "Great Ice" of North Greenland, from Inglefield Gulf to Independence Bay, thus repeating his trip of 1892. Owing to scarcity of alcohol and pemmican he was obliged to return, suffering untold hardships on the way back. He returned to the United States via St. John's, Nfld., in September last. His lecture on Thursday evening next will no doubt be of the greatest interest to all the members of the Association.

Dr. Fridtjof Nansen's attempt to reach the Pole by following DeLong's intended route, may be successful, but the rumours from Northern Siberia that he has discovered the land around the Pole and is returning by about the same route by which he entered the "unknown North" is exceedingly doubtful. It is probable that he will be heard from within a few months.

The map exhibited at the last meeting of the Association has been reduced, and is now being lithographed. This map shows at a glance the relation of our Province to the Arctic Regions, the territory not yet fully explored, and the vast field open for examination at least.

The country around James' Bay has a rich soil, a climate more equable than Winnipeg; it is well timbered and well watered, and should support a thriving population. The whale and other fisheries of the north should prove profitable to residents of a seaport on James' Bay, and, as stated in our report of last year, it has yet to be proven that merchantable coal does not exist in Northern Ontario.

The present is no time to spend public money on railways and canals, that cannot pay a substantial dividend, but this period of depression may be advantageously employed in carefully studying these problems, and in exploring the undeveloped country thoroughly. A railway to James' Bay from Toronto is a project worthy of support, but the schemes now advocated are solid enough, in fact immovable at one end, but the other is free to vibrate in any and every direction. Anchor the other end by substantial facts and reasons and the railway will be built.

Until an opportunity offers, the Committee can do nothing towards active arctic exploration, but upon the organization of the next British or American Expedition some of our members should volunteer for the service.

We believe, however, that the Committee should be continued from year to year, as our Association is probably the only Geographic Society in Ontario.

The following table of highest latitudes known to have been attained by man should have appeared in the last Report of the Proceedings:

<i>Explorer.</i>	<i>Expedition.</i>	<i>Country.</i>	<i>Date.</i>	<i>Latitude.</i>
Lockwood.....	Greeley Exp'n	United States..	1882....	83° 24'
C. Markham.....	Nares Exp'n..	Great Britain..	1876....	83° 20½'
E. Parry.....	"	"	1827....	82° 45'
C. F. Hall.....	Polaris.....	United States..	1871....	82° 15'
Weyprecht & Payer.....	"	Austria.....	1874....	82° 05'
R. E. Peary.....	Private.....	United States..	1895....	81° 47'
Scoresby.....	"	"	1806....	81° 30'
H. Hudson.....	"	Great Britain..	1607....	81° 30'
B. Leigh Smith.....	Private.....	"	1873....	81° 14'
Dr. Hayes.....	"	United States..	1861....	81° (?)
Dr. Kane.....	"	"	1854....	80° 30'
Koldeway.....	"	Germany.....	1868....	80° 13'

WILLIS CHIPMAN,

Chairman.

REPORT OF COMMITTEE ON DRAINAGE.

MR. PRESIDENT,—Your Committee on Drainage begs to report as follows :

The Drainage Act of 1894 and the Ditches and Watercourses Act of 1894 have now been in operation two seasons, and though both were the children of promise, and brought into existence by an exhaustive amount of investigation, discussion, thought, and labour, many faults have already been discovered in them and many are the suggestions made for their improvement. At the last session of the Legislative Assembly of Ontario, an amendment of some value was made in Sec. 7 of the Ditches and Watercourses Act, which provides for a party taking proceedings under the Act, and failing to file the declaration of ownership, to do so upon such terms and conditions as the judge may direct. Sec. 36 was also amended as regarding the eastern part of the Province. One or two amendments were also made in the Drainage Act of 1894. The volume of change and amendment will no doubt increase year by year, and by the end of the next decade the drainage laws will have become as obscure and complicated as they were in 1893. The distinction between the assessment for outlet and injuring liability is still a vexed question, and the general impression is that the injuring assessment should be done away with. In this, your Committee concurs. Sec. 16 of the Drainage Act, requiring ten days' notice of the date of the meeting of the Council, at which the engineers' report is to be considered, should be amended by changing the ten days to, say, six, and the amount of the assessment should not be required in the notice. The drainage season is comparatively short, and about two weeks time could be gained by these changes, which would be a matter of much importance.

The term "sufficient outlet" has caused a great amount of trouble in both Acts, and should be more clearly defined. In regard to this, Mr. Halford, C.E., of Windsor, quotes the case of "Mongin v. Tilbury West," "where the Engineer in charge carried the work to the edge of the marsh or the water level of the St. Clair River, the marsh being entirely submerged. Suit was brought against the township for nominal damages, and an application for a mandamus to compel the township to carry the water from the drain to a proper outlet. Strange as it may appear, the plaintiff succeeded, and an order was issued against the township, requiring it to extend the drain. This was done, a canal was dredged through the marsh into five feet of water, and a solid bank built on each side, so as to confine and retain the waters in the drain."

Sec. 5 of the Ditches and Watercourses Act, which restricts a drain to seven original township lots, in many cases acts quite satisfactorily; in others, where the lots are very narrow, a great injustice is done, and where the drain does not exceed 200 chains in length, the number of lots should not be limited.

The limit of 75 rods in Sec. 6 detracts from the value of the Act, and should be extended to about 120 rods.

The 12 days required for notice of preliminary meeting in Sec. 8 should be cut down to about 6 days

Sec. 14, which requires the Engineer to fix a date from ten to sixteen days after he receives the requisition, would meet with more general approval from Engineers if the limit were changed to from six to twenty days.

The fifteen days allowed for appeal in Sec. 22 should be cut down to ten days at least.

With regard to trials under the Ditches and Watercourses Act, the Engineer is often placed at a disadvantage, the municipality taking no action; and the party filing the requisition is unrepresented by counsel, the engineer is left to fight the matter alone. No provision is made for paying him witness' fees, and he may even be deprived of his fees and charges for making the award

These and other defects call for remedy; but, as previously intimated, the continual tinkering and patching up of the Drainage Acts is undesirable.

Complaint is also made that qualified Land Surveyors work under the Drainage Acts for less than \$5.00 per day, and it is suggested that members doing so should be suspended.

Some notes on decided cases are hereto appended, but cases not appealed are unreported, and members should send in a full report on all cases of importance in which they are interested. A judgment under the Ditches and Watercourses Act of much value is given in full.

Several cases have been tried by the Drainage Referee, some of great importance; and members interested should forward a copy of the Referee's Report. One is given herewith.

The amount of drainage work constructed in 1895 is generally reported to be very much below the average of previous years; but this is probably owing to the dry seasons and short crops of the past two years.

In the Township of Raleigh, County of Kent, however, Mr. Augustine McDonell reports that he has under construction a large drain, 8 miles long, 90 feet wide at the mouth and 50 feet at the head, and averaging 8 feet deep, which will be completed by midsummer at a cost of about \$60,000.

He has also reported the successful completion of an embankment scheme under his superintendence in the Township of Tilbury, County of Kent, whereby upwards of 2,200 acres of submerged land has been drained and brought under cultivation at a cost of \$28,000. The whole area can be pumped dry in four hours.

Some amendments to the Drainage and Ditches and Watercourses Acts of 1894, adopted by the County Council of Perth and approved by the County Council of Essex, are also appended.

All of which is respectfully submitted.

GEO. ROSS,
Chairman.

*Canada Law Times.*FITZGERALD *v.* CITY OF OTTAWA.

Vol. 15, No. 1, p. 7.

Queen's Bench Division, Boyd, C., 23rd October, 1894.

When plaintiff's land was part of a township, he and his neighbours had, with the permission of the township authorities, constructed a box drain in the highway, to carry off surface water therefrom. After the locality had become part of the defendants' territory, this drain collapsed, and the earth-covering of it acted as a dam, which penned back the water on the plaintiff's land. The defendants' engineer then made a cut which carried away the water for a time. This, however, became filled up, and the water came on the plaintiff's land. He notified the defendants, but they did not remedy the matter till after substantial injury was done.

Held, that they were liable. (See appeal on page 34).

Vol. 15, No. 2, p. 23.

Court of Appeal, 15th January, 1895.

GARFIELD *v.* CITY OF TORONTO.

When a sewer, built without any structural defect, is of sufficient capacity to answer all ordinary needs, the Corporation is not liable for damages caused, as a result of an extraordinary rainfall, by water backing into the cellar of a person compelled by by-law to use the sewer for drainage purposes.

Judgment of the Queen's Bench Division reversed.

Vol. 15, No. 2, p. 49

Street, J., 19th November, 1894.

OLIVER *v.* LOCKIE.

The rule is that when an owner creates an artificial watercourse discharging surplus water upon a neighbour's land, he obtains, at the end of the statutory period, a right to continue to discharge it; but the neighbour acquires no right to insist upon the continuance of the flow. The easement arises for the benefit of the dominant tenement. The owner of such a servient tenement is not a "person claiming a right thereto" within Sec. 35 of R.S.O., c. 111.

A defined channel is an essential part of a stream.

Vol. 15, No. 7, p. 171.

Court of Appeal, 14th May, 1895.

CANADIAN PACIFIC RAILWAY COMPANY *v.* TOWNSHIP OF CHATHAM.

Where drainage works for the benefit of lands in two townships prove, as originally initiated and constructed, insufficient, an addition thereto, costing more than \$200, must be authorized by petition and by law under the Act, and a contract entered into under seal by one township binding itself to pay the cost of the additional work, cannot, even after completion and acceptance of the work, be enforced.

Judgment of the Common Pleas Division, 25 O.R., 465, affirmed; Osler, J. A., dissenting.

This decision was reversed by the Supreme Court.

Vol. 15, No. 7, p. 172.

Court of Appeal, 14th May, 1895.

FITZGERALD *v.* CITY OF OTTAWA.

Where a municipality makes alterations in, and thus adopts as part of its own drainage system a drain existing in territory acquired from another municipality, it is liable for damages caused by subsequent neglect to keep the drain in repair.

Judgment of Boyd, C., 25 O.R., 658, affirmed; MacLennan, J. A., dissenting.

Vol. 15, No. 10, p. 251.

Supreme Court of Canada, 11th March, 1895.

YORK *v.* TOWNSHIP OF OSGOODE.

This case was referred to in our report last year, page 32.
Decision of Court of Appeal confirmed.

Vol. 15, No. 10, p. 256.

Queen's Bench Division, Divisional Court, 27th May, 1895.

IN *re* M'FARLANE AND MILLER.

On an application for prohibition to restrain proceedings on an appeal under the Ditches and Watercourses Act, 57 V., c. 55, on the ground that the appeal had not been heard and determined within two months, under the provisions of Sec. 22, Sub-Sec. 6;

Held, that the provisions of that Section are merely directory, and not imperative;

Held, also, that there is no sufficient declaration in that Statute of an intention to change the law from what it was in R.S.O., c. 220, Sec. 11, Sub-Sec. 5, and prohibition was refused.

Decision of Robertson, J., confirmed

Vol. 15, No. 12, p. 292.

The Divisional Court, 13th July, 1885.

Where a township municipality has passed a by-law, purporting to be under Sec. 585 of the Consolidated Municipal Act, 1892, for the purpose of making certain alterations and improvements in a drain, and has served an adjoining municipality which is to be benefited by the work with a copy of the engineer's report, etc., showing the sum required to be contributed by the latter as directed by Sec. 579, and the by-law of the initiating township, is as a fact irregular and invalid :—

Held, per Rose, J., that the contributory township cannot be required to pass a by-law raising its share till the initiating township has passed a valid by-law adopting the report providing for the doing of the work, including the raising of its proportion of the funds. But in this case the portion of the by-law of the initiating township adopting the engineer's report and directing the construction of the work might properly have been sustained on motion to quash by a ratepayer of that township, and an order quashing have been confined to the portion providing for raising the funds, as to which an amending by-law might have been passed; and therefore the contributory township might well proceed, relying on the good faith of the initiating township to make all necessary amendments.

Held, per Meredith, C. J., that the contributory township is nevertheless not only entitled but bound, within the four months prescribed by Sec. 580, to pass the necessary by-law to raise its share of the estimated cost.

Semle, per MacMahon, J., that the contributory township had no power to pass a by-law to raise its share of the proposed expenditure until the initiating municipality had passed its by-law for the construction of the works.

Vol. 15, No. 14, p. 327.

Supreme Court of Canada, 6th May, 1895.

LEWIS v. ALEXANDER.

Ratepayers of a township petitioned under Sec. 570 of the Municipal Act of Ontario for a drain to be constructed "for draining the property" described in the petition. The township was afterwards annexed to the adjoining city and the drain was thereafter used as a common sewer, it being, as constructed, fit for such use. An action was brought against a householder, who had connected the sewage

from his house with the drain, to recover damages for a nuisance resulting therefrom at its outlet.

Held, affirming the decision of the Court of Appeal, 21 A. R. 613, 14 Occ. N. 499, Taschereau and Gwynne, J. J., dissenting, that Sec. 570 empowered the township to construct a drain not only for draining off surface water but sewage generally, and the householder was not responsible for the consequences of connecting his house with the drain by permission of the city

Held, also, that where a by-law provided that no connection should be made with a sewer, except by permission of the city engineer, a resolution of the city council granting an application for such connection on terms which were complied with and the connection made, was a sufficient compliance with the by-law.

Reports of Supreme Court, Vol. 24, No. 5, p. 622.

Supreme Court of Canada, 22nd, 23rd March, 26th June, 1896.

THE MUNICIPAL CORPORATION OF THE TOWNSHIP OF COLCHESTER
SOUTH (DEFENDANTS) APPELLANTS AND DOMINIQUE VALID (PLAIN-
TIF) RESPONDENT.

An appeal from the Court of Appeal for Ontario.

In an action by V. against a municipality for damages from injury to property by the negligent construction of a drain, a referee was ordered to an official referee "for injury and report pursuant to Sec. 101 of the Judicature Act and rule 552 of the High Court of Justice." The referee reported that the drain was improperly constructed and that V. was entitled to \$600 damages. The municipality appealed to the Div. Court from the report, and the court held that the appeal was too late, no notice having been given within the time required by Cons., Rule 848, and refused to extend the time for appealing. A motion for judgment on the report was also made by Valid to the court, on which it was claimed on behalf of the municipality, that the whole case should be gone into upon the evidence, which the court refused to do.

Held, affirming the decision of the Court of Appeal, that the appeal not having been brought within one month from date of the report as required by Cons., Rule 848, it was too late; that the report had to be filed by the party appealing before the appeal could be brought, but the time could not be enlarged by his delay in filing it; and that the refusal to extend the time was an exercise of judicial discretion with which this Court could not interfere.

Held, also, Gwynne, J., dissenting, that the report having been confirmed by lapse of time and not appealed against, the court on the motion for judgment was not at liberty to go into the whole case upon

the evidence, but was bound to adopt the referee's findings and to give the judgment which those findings called for. (*Freeborn v. Vandusen*) 15 Ont. P. R. 264, approved of and followed.

Vol. 24. No. 5, p. 707.

GIBSON *v.* TOWNSHIP OF NORTH EASTHOPE.

22nd March, 1895.

Appeal from the Court of Appeal for Ontario reversing the judgment of the Divisional Court and restoring that of the trial judge in favor of the Corporation.

The action was brought by Gibson to have a by-law of the Corporation quashed, or, in the alternative, for damages for injury to his property resulting from improper construction and want of repair of a drain made under said by-law. The ground upon which said by-law was attacked was that the plaintiff had withdrawn from the petition and there were not sufficient names on without him.

The trial judge held that the plaintiff had not withdrawn from the petition and refused to quash the by-law. He also held that the plaintiff had failed to prove his allegations in the statement of claim on which his right to damages was founded. The Divisional Court reversed this decision on the first ground and held the by-law invalid. The Court of Appeal restored the original judgment.

The Supreme Court, after hearing counsel for the respective parties, dismissed the appeal with costs.

2ND. D. C. PERTH, PLAINTIFF, *v.* CORPORATION OF FULLARTON, AND MR. ROGER, ENGINEER OF SAID TOWNSHIP, DEFENDANTS.

Mr. Goodeve for Plaintiffs; Mr. McPherson for the Corporation; Mr. Thompson for Mr. Roger.

Although the amount involved in this case is not large, yet there are several points of interest raised, and contrary to my usual custom in the Division Court I reserved the case for the purpose of giving a written judgment.

The plaintiff sues for work done by him under contract let by the engineer under Sec. 28 of the D. and W. Act, 57 Vic., Chap. 55, Sec. 28 *et seq.*, the person who was ordered by the original award to do the work having failed to do so, the engineer having been duly required by written notice of a party interested to inspect and proceed under that Section, I should have thought that on this short statement the plaintiff was entitled to recover against the Corporation (See Sec. 30), the award never having been moved against; and that if the plaintiff acted properly and in good faith (and there is no suggestion to the contrary), that even if there were difficulties arising from circumstances not then present to the minds of the parties, it would be more equitable and just that the loss (if any) should fall

upon the township at large rather than on the plaintiff who had performed the work and was acting *bond fide*. To hold otherwise would be a severe blow to local drainage and render anyone chary of taking a contract under the Act.

The council for the Corporation suggested and argued as a defence, two grounds:—

1st. That the Engineer had not carried the water to a sufficient outlet, and—

2nd. That the ditch or drain passed through or into more than seven original township lots. The Council must, upon a petition of two-thirds of the owners of all the lands to be affected by the ditch, pass a resolution authorizing the work, etc. (See Sec. 5), before it can proceed.

The facts are that the new ditch or drain, moved for by the promoter, is almost entirely confined to one lot, when it connects with an old award ditch which crosses three or four lots where it enters still another old award ditch which carries the waters to a stream or river. The Engineer directed the second named award ditch to be enlarged and deepened, and apportioned the work of enlargement between the promoter of ditch No. 1 and the different parties along the line of ditch No. 2, and found that the point of debouchement into the drain thirdly mentioned was a sufficient outlet.

As to the first mentioned point the award was not, as I have said, moved against, and I apprehend that under Sec. 24 of the Act the award is now "valid and binding to all intents and purposes," and that it is not open to me in a suit of this kind to hear evidence upon the point raised, which could only be properly raised on an appeal under the Act.

Then, on the other point, the argument was certainly ingenious. It was this: All the persons owning land, even on the third ditch, are "affected" by the ditch, inasmuch as a certain, although it may be comparatively insignificant, additional quantity of water is brought upon them, and so thereby they were all entitled to notice, and as the extent in that case is much more than seven original lots, the Council must pass the resolution before the work can proceed (See Sec. 5). If this is so, then the owner of a farm requiring drainage and requiring only 50 or 100 yards of a drain, to connect with a series of drains, constructed under the Act, say, five miles long, must give notice to all the owners right to the river outlet before he can get any drainage works done and run his risk of getting the resolution of the Council. I cannot assent to any such proposition. Sec. 3 (the interpretation part of the Act) defines the meaning of the word ditch. That clause, read with Sec. 5 and other Sections, seems to me to confine the matter to the particular ground and lands covered by the ditch confined to and mentioned in the award.

Sec. 32 may give rise to some little difficulty. It evidently contemplates that a new applicant shall not make use of an established ditch except upon some equitable basis. It seems to me the scope of that Section might be enlarged to meet certain conceivable cases,

but here I think no such difficulty arises. The Engineer has found that the entrance to what I have called ditch No 3, is a sufficient outlet and he has apportioned the work between the promoter of the new ditch and those owners along ditch No. 2 for enlargement thereof, to take the extra water occasioned by the new ditch ; presumably taking into account the amount of work (if any) which those owners along ditch No. 2 may have originally been obliged to contribute to ditch No. 3. He is now enabled to deal with such a matter more at large by reason of the increased powers under the new Act. As to apportioning the maintenance, I presume he has considered all these points and acted accordingly, and it seems highly improbable that even if the promoter had been a party to the original scheme his work would even have been taken lower than the entrance to drain No. 3. At any rate, the award was not appealed from, and I think this matter, too, is concluded by Sec. 24. The person who is understood to be objecting is on drain No 2. An appeal was open to him of which he did not avail himself. I do not think he (who it is to be observed must have been aware of all these proceedings) or the Corporation on his behalf, can be now heard as a volunteer protector of those living on drain No. 3. I suppose they are able to take care of themselves. It may be that the latter, if wronged, have a remedy by way of injunction or mandamus, but with that I have nothing to do except that, I may say, that I have little sympathy (except in extraordinary cases) with the talk about the "additional" water brought down. If judges and judicial officers would, in ditch cases, take the trouble to visit the places where those controversies arise and judge for themselves, there would be a great diminution of law costs in respect thereof, and a large increase in the important work of drainage.

The Engineer is in no sense a contractor, neither does the Statute impose any obligation on him as it does on the Corporation by Sec. 30. He should not, unless expressly charged with fraud or misconduct, or negligence amounting to fraud, have been made a party. There is nothing of the kind ; he seems to have acted in good faith. Besides, as a public officer, acting within the scope of his duty, he was entitled to notice of action, which was not given. The Corporation have endeavored to "unload," as it were, upon the Engineer, and, therefore, in addition to directing judgment for plaintiff for the amount claimed with costs, I further direct [if I have power to do so, as to which the parties had better examine (See *Goldie v. Johns*, 16 A. R. 129)] that the Corporation also pay the costs incurred by Roger in his defence.

May 13th, 1895.

JAMES P. WOODS, J.

In the matter of the Drainage Act of 1894 and the Point Abino Marsh Drain, and in the matter of appeal by

THE MUNICIPALITY OF THE TOWNSHIP OF BERTIE v. THE MUNICIPALITY
OF THE TOWNSHIP OF HUMBERSTONE.

This is an appeal by the Municipality of the Township of Bertie against the Municipality of the Township of Humberstone from the report, plans, specifications, assessments and estimates of George Ross, Esquire, dated the 18th day of August, A.D. 1894, in reference to the Point Abino Marsh Drain.

Pursuant to my appointment, the matter came on before me at the Town Hall, in the village of Bertie, on the 27th day of November, A.D. 1894.

W. M. German, Esquire, appeared for the appellant,

and

R. G. Cox., Esquire, Q.C., and T. D. Cowper appeared for the respondents.

Having heard the evidence and arguments of counsel, I reserved my decision, and now, having fully considered the same, I make this my report, and give my reasons therefor as follows:—

According to the report appealed from, this drain, in reference to which the assessment is now placed upon the lands and roads in Bertie, has been completed in accordance with the profile, plans and specifications prepared by the same engineer, dated the 28th day of June, 1892.

The work was projected, begun and completed prior to the Drainage Act of 1894.

The cost of the entire work was \$2,072.38.

The cost of the work in Humberstone, the initiating municipality, was \$423.15.

The assessment against Bertie, the appealing municipality, is \$1,302.

The report states that this drain is an outlet for seven hundred acres of swamp land and twelve hundred acres of high land in the township of Bertie, and the whole assessment placed upon lands and roads in Bertie is placed there as an outlet liability under section 3, sub-section 4 of the Drainage Act of 1894. The report does not state that these lands so assessed use this drain as an outlet, but it does state that the amount placed upon these lands and roads is for the construction of the drainage work providing an improved outlet. Upon the evidence some of the lands do use this drain as an outlet.

Upon the report of 28th June, 1892, under which this drain was constructed, its estimated cost was \$1,848, and that report stated

that seven hundred and fifty acres of low or swamp land in Bertie would be benefited, and that this drain would be an outlet for one thousand and fifty high land in Bertie; but the assessment upon the whole eighteen hundred acres in Bertie was an assessment to the amount of \$1,018 for benefit, and there was the further assessment of \$250 for benefit upon roads of Bertie, making a total assessment for benefit upon Bertie of \$1,268, or within \$34 of the amount of the present assessment for outlet.

This report of June, 1892, was made at the instance of Humberstone, in consequence of a petition by W. Davidson, N. C. Michael and others asking for it. Some of the petitioners reside in Humberstone and some in Bertie; and on the 16th July, 1892, a by-law was provisionally passed by Humberstone adopting this report, etc. Bertie was served but did not appeal. A Court of Revision for Bertie was established and met on the 5th November, 1892. There were many appeals, but no decision was ever given by this Court of Revision, and Bertie did not within the time limited by section 580 of the Act of 1892 pass a by-law to raise the \$1,268, nor has it since done so.

The Township of Humberstone took no proceedings to enforce the raising by Bertie of this sum of \$1,268, pursuant to said report.

After the passing of the Drainage Act 1894, the Township of Humberstone sent their engineer again—the same engineer, George Ross—and he made the report which is now appealed from.

The objections to the report and assessment are:—

1st. That as the drain was constructed under the Act of 1892, the present report and assessment cannot stand, and that whatever is done by Humberstone must be done only under the Act of 1892.

2nd. That the Township of Humberstone has no right to make this assessment under either Act of 1892 or 1894.

3rd. That upon the facts in evidence there is no improved outlet provided, and there is no user by the lands assessed of this drain as an outlet.

In disposing of the appeal, I do not assume any jurisdiction as to the petition on the report and assessment of 1892, which was not appealed from, or as to anything else done or attempted by either township in the original construction of the drain in question or in reference thereto; and this my report is entirely without prejudice to the rights, if any, which Humberstone has against Bertie by reason of the engineer's report and assessment of 1892 and the construction of the drain pursuant to that report, but the facts in reference to that assessment are material in considering the report of 1894, objected to in this appeal.

The questions presented are difficult ones as questions of law, upon what are in the main undisputed facts.

This drain must be considered as a drain completed by the

Township of Humberstone, and, giving effect to the words of sub-section 4 of section 3 of the Drainage Act 1894, that township, if the facts warrant it, has jurisdiction and may assess. The words of sub-section 4, section 3, are, as applicable to this case—

(1) If the lands of any individual use this drain as an outlet ;
or (2) If this drain provides an improved outlet for the lands of individuals, such lands may be assessed and charged for construction and maintenance. No petition is necessary.

Section 3, sub-section 1, authorizes the Council of Humberstone, and without the petition in the cases provided for by sub-section 4, to procure an engineer or O.L.S. to make an examination of the area to be drained, etc., and to prepare a report, plans, etc., and to make an assessment within the area to be benefited, and of any other lands and roads liable to be assessed as hereinafter provided, i.e., for "injuring liability" or for "outlet liability."

There must be, to give the Council jurisdiction, an area to be benefited and lands assessed for benefit, and then, as incidental to this, and as necessary to do complete justice, the engineer is at liberty to assess other lands liable to be assessed for "injuring or outlet liability."

The instructions given to the engineer by the Township of Humberstone are not in evidence, but the report starts as if the instructions were only to find out Bertie's supposed liability. That may have been, and no doubt was, the object ; but, to do this, the engineer must first find out the liability of the lands and roads to be benefited within the area to be benefited. In the absence of evidence to the contrary, I shall assume that the instructions by Humberstone to the engineer were simply to proceed under the statute and do as therein directed, and that the engineer has done so. It is true that the report is silent as to any lands benefited, but there was not put in evidence the assessment of 1894 placed upon lands and roads in Humberstone, and as Humberstone is the initiating municipality, and this appeal is only as to assessment of lands and roads in Bertie, I must assume that the engineer has, as to the lands and roads in Humberstone, done what the statute requires.

I am therefore of opinion, and so report, that, as to this drain, the Act of 1894 applies, and the Township of Humberstone could, under section 3, sub-section 4, send on the engineer and make the assessment as therein directed.

I find, and so report, that an improved outlet has been provided for the water from the lands and roads in Bertie.

The amount seems to me very large. I would be much better satisfied with a smaller amount, but, as Mr. Cox argued, there is no evidence before me upon which I could make, with any such certainty as would satisfy myself, any different apportionment. Were I to

make the attempt it would be only by going over the whole assessment parcel by parcel, and practically doing the work of the Court of Revision, and this the statute expressly says I shall not do—see sec. 89, sub-sec. 3.

The scheme does provide an improved outlet. It may not provide a sufficient outlet for the draining of the marsh lands in Bertie. If that is to be done it can only be done by a work much more extensive and costly than the present, and that can be done by the Township of Bertie upon the petition of the majority of owners of lands to be benefited in the described area. If, in doing such a work, other lands are benefited, or if lands should be charged for “injuring liability” or for “outlet liability,” the engineer will bring them in. Upon the evidence, even that of the engineer called by the Appellant, I cannot say that this work should be carried to an outlet in the initiating municipality or elsewhere.

To carry it to an outlet in Humberstone, on the west side of Point Abino, would be an expensive work, and it would be very difficult to keep open owing to the action of the prevailing south-west winds and storms upon the sands of the shore on that side of the Point. No evidence was given of the cost of carrying the work to “Nigger Head,” and no sufficient evidence that the result of taking this drain there would be more beneficial.

In this case it is important to notice that according to evidence of George Ross, who was engineer for both townships, many people in Bertie who are now assessed were anxious to have this drain made and they signed the petition to Humberstone for that purpose. It is true that some of these signers say they did not suppose the outlet would be where it now is, but that is not important. The outlet was for the engineer to find. These persons who signed the petition for the work, and who got the benefit of it, much or little, by way of improved outlet, now that the work is done, ought not to object. They knew that Humberstone was doing the work, and probably knew that Bertie was not appealing against the report of 1892.

Humberstone went on in perfect good faith with the work.

It is not suggested by Appellant that this work was done at the instance of a few in Humberstone for the purpose of getting any advantage over Bertie, so I do not regret that, although the case presents many difficult questions, I am able to satisfy myself that the report and assessment should be sustained.

In saying this about the petition I am not pronouncing upon its validity or otherwise; I am dealing with the action of the Municipality of Humberstone as upon a completed drain, and upon an assessment as against lands whose outlet is improved.

I report and order that the appeal should be dismissed for reasons given herein. I do not think it is a case in which costs should be given against the appellants.

I report, order and direct that the report of George Ross, engineer, dated the 18th day of August, A.D. 1894, and the assessments made

by him upon lands and roads in the Township of Bertie for an improved outlet be confirmed.

I report and order that each party shall bear and pay its own costs of this appeal.

I direct that the sum of four dollars shall be paid in stamps to be affixed to this my report by the Township of Humberstone.

All of which I report and certify.

Dated at Kingston this eighteenth day of February, A.D. 1895.

(Signed)

B. M. BRITTON,

Referee.

STRATFORD, OCT. 31ST, 1895.

DEAR SIR,—

At the last meeting of the County Council of the County of Perth, certain amendments to The Ditches and Water Courses Act and to The Drainage Act, 1894, were discussed, and a committee was appointed to draft amendments to these Acts in accordance with the resolutions of the Council with instructions to forward the amendments to the different County Councils in the Province for their consideration.

I enclose you a copy of each amendment for the consideration of your Council, and ask you to lay the same before them with the request that if the amendments are in the opinion of your Council thought desirable that the members in the Local House representing your County may be instructed or requested by your Council to assist in the Legislature in having the proposed amendments carried through.

In reference to the proposed amendments of section 3, of The Ditches and Water Courses Act, the reason for this amendment is the difficulty now experienced in determining who is or who is not the owner. Under the Municipal Drainage Act an assessed owner whose name appears as such on the last revised assessment roll counts for or against a petition. Why should not the same simple mode apply to ascertain who is the owner under The Ditches and Water Courses Act?

The reasons given for the amendments to section 5, of the Ditches and Water Courses Act, are that numerous drainage schemes have been burked by reason of the 7 lot clause. The Municipal Council should certainly be capable of determining whether or no a ditch should be allowed to go beyond 7 lots.

As to the Municipal Drainage Act of 1894, the amendments to sections 16 and 17 proposed are to set at rest doubts raised as to the necessity of the notice to consider the report in cases where the proceedings are to repair a drain already constructed.

The amendment to section 56 is intended to give finality to a by-

law and put the by-law beyond the reach of the Courts to quash it after the municipality has incurred financial obligations.

The other amendments as to matters of procedure and the last amendment to section 101 is, as you will observe, intended to curtail the number of appeals now possible.

WILLIAM DAVIDSON,
Clerk.

AN ACT TO AMEND THE DITCHES AND WATER COURSES ACT, 1894.

Her Majesty, by and with the advice and consent of the Legislative Assembly of the Province of Ontario, enacts as follows :

1. Section 3 of The Ditches and Water Courses Act, 1894, is amended by striking out the 8th to the 14th lines thereof, inclusive, and inserting in lieu thereof the following words: " Owner " shall mean and include the owner as appears by the last revised assessment roll, any person authorized in writing by such owner to sell, convey, manage or lease the lands, and a Municipal Corporation as regards any highways under its jurisdiction, but if the owner appearing as such by said roll be dead, or has ceased to be owner, then in case the actual owner file with the clerk of the Municipality a Statutory Declaration that he owns the lands, or in case the executor or executors or administrator of such deceased owner file with the Clerk of the Municipality, a Statutory Declaration of such death, then " owner " shall in such case mean the actual owner or executor, executors or administrator making such declaration instead of the owner as appears by the roll.

2. Section 5 of the said Act is amended by inserting after the word " ditch " in the sixth line thereof, the words, " or after at least three clear days' written notice has been given to the owners of all the lands to be affected by the ditch, of intention to apply to the Council for such authorization."

3. Section 6, Sub.-Sec 1, is amended by inserting after the word " ditch " in the fourth line thereof the words " or such greater distance as the Council on application of the Engineer after notice to all concerned shall sanction."

AN ACT TO AMEND THE DRAINAGE ACT, 1894.

Her Majesty, by and with the advice and consent of the Legislative Assembly of the Province of Ontario, enacts as follows :

1. Section 16 of the Drainage Act 1894 is amended by striking out the words " within the area described in the petition " in the second line thereof.

2. Section 17 is amended by inserting after the word "and" in the fourth line the words "if there be a petition."

3. Section 56 is amended by striking out the words "notwithstanding the by-law be afterwards quashed or declared illegal in any proceeding" in the last three lines thereof, and inserting in lieu thereof the words "or be made unsuccessfully in whole or in part, and after the issue and sale of such debentures the by-law for the construction or repair of such drainage work shall not be quashed or set aside on any ground whatever."

5. The following sub-sections are added to section 61 :—

(2) After the Council of the initiating municipality has finally passed its by-law for the construction of the drainage work and the ten days limited for giving notice of intention to make application to quash the same has expired, and no such notice has been given, or, if the notice has been given and the application be not made or be made unsuccessfully, the Council of the initiating municipality shall serve the head of the municipality, upon whom the said report, plans, specifications, assessments, and estimates have been served, with a copy of the by-law of the initiating municipality, together with a certificate of the clerk of the initiating municipality that no notice of intention to move to quash the said by-law had been served within ten days after the final passing thereof, or if served that no application was made or was made unsuccessfully as the case may be.

(3) The head of the municipality so served shall forthwith cause a meeting of the Council of his municipality to be called to hear the report read and considered, and the Clerk of the municipality shall notify all parties assessed within the municipality by mailing to the owner of every parcel of land within the municipality assessed therein for the drainage work a circular or post card, upon which shall be stated that a report and assessment has been served on the head of the municipality assessing the lands of the owner to whom such circular or post card has been sent and the date of the Council meeting at which the report will be read and considered, which shall not be less than seven days after the mailing of the last of such circulars or post cards.

6. Section 62 is amended by striking out the word "four" in the seventh line and inserting in lieu thereof the word "two," and inserting in the eighth line after the word "service" the words "of such copy of by-law and certificate."

7. The following sub-sections are added to section 61 :—

(2) There shall be no appeal to a divisional court from any judgment, decision or verdict rendered in any court in any action for damages or compensation or for an injunction or for any cause of action arising by reason of anything done or to be done or omitted to be done in respect of drainage under this Act, but such appeal shall

be to the Court of Appeal for Ontario, and no appeal shall be allowed from the Court of Appeal.

(3) In case of appeal no printed copy or copies of appeal books shall be necessary or allowed, but type-written copies of the appeal case, as in appeals from the County Court to the Court of Appeal, shall be used instead of printed appeal books.

REPORT OF COMMITTEE ON TOPOGRAPHICAL SURVEYING.

MR. PRESIDENT,—In the Report presented by this Committee a year ago, the Association was informed of the letter of enquiry sent out to the different nations of Europe and to the United States requesting each to give briefly the advantages of having proper topographic maps from a commercial and from an agricultural standpoint. Replies have been received during the year from the United States, Great Britain, Norway and Sweden, Russia, and Germany.

Some of these replies are of little value, while others are important. They are herewith laid before you.

It was found impossible to convene a meeting of the Committee until about a month ago when a draft memorandum was decided upon, and a sub-committee appointed to present it to the Commissioner of Crown Lands.

On February 11th this Committee had an interview with the Commissioner, and laid before him some facts respecting the work done, and being done, by other civilized nations in mapping their respective countries.

We also pointed out the fact that the maps of Ontario now issued by the Department of Crown Lands, and the other Government Departments, were a disgrace to the Province, and not equal in accuracy or in their general cartography to those issued by the Governments of the other Provinces, a large share of which disgrace falls unfortunately upon the Surveyors of this Province, and therefore upon this Association.

The Commissioner was requested to look into the matter, and if possible to urge the Dominion Government to at once proceed with the Primary Triangulation work in this Province, as Ontario would be ready to proceed with the Topographic Survey as soon as the Triangulation work had been commenced.

Ontario is the most important Province in the Dominion, and it should be the first to reap the advantage of a geodetic survey as a basis for Topographic work.

The Committee and the Association are deeply indebted to the Director of the United States Geological Survey Department, Washington, D.C., for a number of sheets, representing portions of the States of New York, Vermont, Pennsylvania, New Jersey and Con-

necticut ; all varieties of topography being shewn in mountainous, level, rural, suburban, and urban districts.

A proper Topographical Survey can be made of our Province on a scale of about one mile to an inch, for less than ten dollars per square mile, this sum including Primary Triangulation work and lithographing. Primary Triangulation work would cost about two dollars per square mile, leaving eight dollars per square mile for topographic work and mapping.

Each member of the Association should constitute himself a standing committee to educate the legislators representing his constituency, the members of County Councils, and the general thinking public, on this important matter.

Half-civilized Japan has now inaugurated such a survey, and we should make every effort not to be the last civilized nation to delineate properly our glorious birthright.

WILLIS CHIPMAN,
Chairman.

REPORT OF THE LAND SURVEYING COMMITTEE.

Your Committee begs to report as follows :—

We regret to say that very few questions, this year, were sent in to the "Question Drawer" for solution ; and, as a result, the work has been inconsiderable. The questions and the answers to them are annexed hereto. We would again try to impress upon our members the importance of giving all the facts obtainable about the questions which are submitted to this Committee, or intelligent answers cannot be expected.

We are glad that a special committee has been formed to look after the required amendments to the "Survey Act," etc., at the next Revision of the Statutes of the Province in 1897.

Respectfully submitted,

T. B. SPEIGHT,
Chairman.

QUESTION DRAWER.

Question 1.—What part of a post and board fence should be the division line between lots ?

Answer.—"Held that a boundary fence, under R S.O., Ch. 219, should be so placed that when completed the vertical centre of the board wall will coincide with the limit between the lands of the parties, each owner being bound to support it by appliances placed on his own land."

Question 2.—Is there any “legal ruling” defining what particular part of fence a Surveyor shall take in such a case?

Answer.—Cook vs. Tate (Chancery Division), Part III., Vol. XXVI., pages 403, 1895.

Question 3.—Twenty years ago last November I was called upon to run the line between lots 5 and 6, in the first concession of _____ Township. The line was to run from west to east. There was no post to start from; but the owner of lot 5 showed me a post between 4 and 5 which he said was where the original post had stood. He was an old settler. There was no dispute about the post, and I did not feel that I ought to raise any question of its accuracy. There was also an original line between lots 6 and 7. I made an equal division of the two lots, and ran the line between 5 and 6. The concession is 66.67 chains deep. About 20 chains of the west end of the line was through a clearing; and when I entered the woods I found I was on an old line which mine followed to the rear, when I struck what was evidently an original post, and the line between the same lots running from it in Concession 11.

The accuracy of the post between lots 4 and 5 was never questioned till last October, when another Surveyor was employed to run that line.

Both the man who employed me and all the other original settlers are dead, and there is now no one to testify to any original post in the locality; and, because there was no one now to swear to the post, the Surveyor went a lot further south and divided lots 4, 5, and 6, moving the post between 4 and 5 nearly one chain north on to lot 5, and ran between 4 and 5.

I was sent for since, and ran the line from where I had made the survey twenty years ago. The owner of lot 4 now threatens the owner of 5 with a suit. Which is correct?

Answer.—The first survey was probably correct, but the decision of courts is uncertain.

DISCUSSION.

Question 2.—Mr. VanNostrand—The judge held in this particular case each owner had to build half the fence. The man who built the front half, would put the centre of the boards on the line and the posts, or whatever means there was of holding it up, all on himself, and the case would be reversed at the rear half. But the centre of the boards was taken.

Question 3.—Mr. Dickson—Whenever I go to make a survey I do not think it is my duty to travel all over that concession line if I find any dispute. If I find the parties say, “There is where the post stood,” I take it at once as being correct, and I do not think the law requires me to take affidavits. In this case I accepted the post as correct and there has never been any question since that survey until last season, when another surveyor was brought along, and no person now could swear that the post stood there.

REPORT OF THE COMMITTEE ON STANDARD MEASURES.

— — —

GENTLEMEN,—Your Committee on Standard Measures begs to report as follows: During the past year the Chairman addressed a memorandum to the Inland Revenue Department, setting forth the various difficulties under which the question of a working standard at present rests. A reply was received from Mr. Miall, the Commissioner of Inland Revenue, in which an acknowledgment of the difficulty was made, and asking for data as to the most suitable form for a remedy of the trouble. Capt. Deville, the Surveyor-General of Dominion Lands, very kindly explained the procedure in connection with the furnishing of Certified Standards to Dominion Land Surveyors. We shall have to ask that we be continued for another year, as we find that, among other things, we will have to secure a change in the Dominion Act respecting weights and measures.

We have much pleasure in acknowledging the courtesy extended to us by Mr. Miall and Capt. Deville.

Respectfully submitted,

M. J. BUTLER,

Chairman.

When handing in the Report of the Committee on Standard Measures, Mr. Butler said: I feel it is the duty of this Committee to ask the Association to continue their appointment, because they have rather a serious task ahead of them, inasmuch as they will have to ask the Dominion Government to amend an Act of Parliament in order to bring the measure to a rational basis. I was in Montreal two weeks ago in connection with the Committee on Standard Measures which has been appointed by the Canadian Society of Engineers, and examined, at McGill College, a Comparator, made for the express purpose of comparing standards up to 50 feet in length. It is simply a travelling slide mathematically exact, and in perfect line and level with a travelling microscope, so that it is possible to compare, with the true standard, to a tenth, hundredth, or one-thousandth part of an inch continuously from one end of a tape to the other. I do not think any similar instrument is to be found in Canada. Certainly the method described by Capt. Deville is rough in the extreme when compared to that. It, therefore, seemed to me that if in McGill College such an accurate machine is to be had, it is a pity the country should lose the benefit of it, and that the work that could be done is of no use without bearing the stamp of the Government on it. And the same way in Toronto University a good deal of the work has been done. Piers have been put up for a great many years, and they are in a permanent condition in the School of Practical Science. I understand

the University authorities intend to complete that standard 100 feet measure, and mount microscopes and correctly mark and stamp measures. It seems to me we ought to be able to take our measures here in our own Province and at our own University, and have a legally correct stamped measure instead of having to send for our tapes down to Ottawa.

DISCUSSION.

Mr. Sankey—I am very much pleased indeed with the work this Committee has done. Some years ago I looked into the matter myself with regard more to the standards of measures than to the correcting of surveyors' tapes. The information obtained by this Committee is most valuable. I would like to ask Mr. Butler if he has any idea what the expense of this testing machine or comparator, as he calls it, in McGill College was.

Mr. Butler—It is put up there at the expense of the University, and they would be very glad indeed to do the work at a very trifling sum.

Mr. Sankey—My object in asking the question was because the Examining Board of our Association is at home in this building, and it is here our meetings are held. And I consider the Board of Examiners or some official of our Association would be the proper authority to grant the certificate. I think, in connection with the School of Practical Science, it would be very easy to make arrangements whereby the tapes that already belong to Surveyors could be examined; or, on the Surveyor receiving his diploma, he should bring a suitable tape and have it tested, and a reasonable fee should be charged. A man should take as much care about possessing a properly graduated or stamped tape, as in having a good theodolite. I do not think it is a hardship on any person entering the profession to pay a suitable fee for testing his tape. As far as I am concerned, I would like to insist on getting this standard here in Toronto, either in the School of Practical Science or in connection with the University. The Examining Board of the Ontario Land Surveyors should have access to this for the purpose of testing the tapes. It might be advisable that the Ontario Land Surveyors' Association should apply to our own Government here in Ontario and get a grant, and perhaps the University authorities would also assist; and in that way we can very soon establish a good testing apparatus, and whatever fees may be charged would pay expenses. I would like to hear some expression of opinion from the members present, or later on during the meeting, on this subject.

Mr. Abrey—Some years ago I went to see the Inland Revenue Inspector and had the same conversation with him then that I have had now. At that time he did not think it was his duty to inspect the Surveyors' instruments in any way. However, when this question came up Mr. Butler wrote to me and I went to see Mr. Miall

again, but he has never made any tests of Surveyors' instruments. They stamp steel tapes down here at the Inspection Office. They do not stamp cotton tapes but they stamp those that have wires running through them the same as steel tapes. Have they the right to do so under the Inland Revenue Act? They stamp all lengths. And the only means they have there is a wooden bar something like that furnished the Surveyors here by the Board of Examiners, and they have also one 10 feet long, simply the same thing, only it is a little longer, and the assistant down there stamps everything that comes before him except Surveyors' instruments. The assistant seemed to think Surveyors ought to go there and get them stamped. Speaking with Mr. Miall he did not think so. He suggested I should write to him and he would formally deliver the letter to the Commissioner, and I wrote to him, and the answer I got from the Commissioner Mr. Butler has read. I made several suggestions very much in the line of Mr. Butler's, and although the answers came a little different from what he got yet they were very much the same.

Mr. Sankey—I would move the Committee be asked to continue somewhat on the lines I have suggested. I think it is for us to take the initiative, and whatever proceedings the committee feels inclined to recommend the Association should try to carry out.

Mr. Butler—The only thing is this, it is, in itself, a delicate operation requiring a certain amount of care and it is handling a delicate mathematical instrument, the comparator. I thought if the secretary, for instance, by his mere presence saw that the professor in the college, who has charge of the particular instrument, did his work, though he himself should not touch the screws or attempt to handle it, but to look through the microscope and see the standard there, and he might spend a sufficient time verifying with the college authorities, the basis of standard, and thus his mere presence ought to be sufficient, and the work would be done in the college itself. That is the practical way of doing it. You cannot take and fasten a tape down at one end and the other and then measure it and say that tape is correct or it is not correct. It is well to know, with so many pounds on it, and at such a temperature, what is the exact length of the tape. It seems to me the standard measure ought to be uniform from one end of Canada to the other, without any variation.

Mr. Sankey—I would suggest also that when these details are thoroughly discussed and in proper shape it would be good for candidates who pass the examination, when they get their standard tapes, to be instructed either at the school or wherever the testing apparatus is, as to the proper mode of conducting a comparison between the subsidiary standard and the working tape. This is a matter that can be easily brought before their notice then. A good many of our candidates now are graduates of that school, and it is a matter which I think might come up very properly as a suggestion from this committee.

Mr. George Ross seconded the motion of Mr. Sankey to continue the committee. In doing so he said: I might give a little account of how they do it on the other side of the line. During Christmas holidays I happened to be in the office of the City Engineer in Niagara Falls, New York, and he showed me a standard tape that he had for testing his working chains and so on, his working tapes. This standard tape, 50 feet long, was furnished him by the man who made his working tapes free of charge. To all his customers he sends a little standard tape, and then the Engineer sends this tape to Washington and has it tested by the Department there having charge of that matter, and they send him back the tape which perhaps has a number on it, and a certificate giving the shortage or overplus in the tape. It seems to me if that is done in the United States, we certainly would not be burdening the employees of the Inland Revenue Department at Ottawa by sending down our tapes and having them tested free of charge. It seems to me the machinery is provided now; all we have to do is to insist on their having the standard down there to test these with. It would be much better on going into court to have them stamped by the authorities.

Mr. Sankey—The older tapes of old surveyors have in many cases been broken and have been mended, and a tape of that kind I do not suppose they would attempt to give you a certificate on. You want to have an unbroken 50 foot tape at the very least.

Mr. Abrey—I do not think it would be well to have a small and larger one, but I think the tape should be a new one without a flaw, and handles on it if you wish, and graduated at certain points.

At 4:30 o'clock p.m. adjourned to 8 p.m. at the School of Practical Science.

REPORT OF THE ENGINEERING COMMITTEE.

To the President and Members, Association of Ontario Land Surveyors:

GENTLEMEN,—Your Committee on Engineering begs to report as follows:—

That whereas our Corporation was formed as the Association of Ontario Land Surveyors and protects its members and the public from unqualified persons attempting to practise as Land Surveyors; and whereas the examination for admission to practice already requires a wider knowledge of Engineering than simply that which appertains to surveying of lands; and whereas many of the members of our Association are now acting as Engineers to various county, township, village, town and city municipalities; and whereas, at the present time, any person, whether qualified or not, may represent himself to be a civil engineer and attempt to perform the duties of the engineer under The Ditches and Water Courses Act, The Drainage Act, The Municipal Act, and other Acts of the Ontario Legislature;

and whereas there is no provision in the Municipal Act requiring municipal councils to have an Engineer report upon the necessity for and advisability of any work proposed to be constructed, but said Act requires that estimates of the intended expenditure for certain public works, as, for instance, water-works, shall be published before the passing of a by-law authorizing the construction of the same, and no provision is made that these estimates shall be prepared by a competent person.

Your Committee therefore recommends the consideration of the advisability of enlarging the scope of the Association so as to include all Municipal Engineering, and that your Committee be authorized to enter into such correspondence and take such further action upon the matter as may appear necessary and report to the Association at the next annual meeting.

All of which is respectfully submitted.

HERBERT J. BOWMAN,
Chairman.

Toronto, Feb. 27th, 1896.

In moving the adoption of the report Mr. Bowman said :

In regard to the principal thing referred to, the advisability of some action being taken to improve the standing of the Municipal Engineers in this Province, it of course must be understood that any action taken must not be such that would endanger the standing of our present Association. That, as far as land surveying is concerned, may be considered perfect, but we know that at the present time there is a movement on behalf of the National Engineering Society to gain some official standing throughout the different Provinces of the Dominion, and it seems to me that our Association has already the ground work of an organization to protect the whole of the engineering profession. It has been said that Civil Engineering includes everything except military engineering. Well, it would be manifestly impossible to secure a close corporation to protect, under one class, all the civil engineers, mechanical engineers, electrical engineers, hydraulic engineers, sanitary engineers, and so on, by one association, and it does not seem necessary that that protection should be secured for engineers working for private corporations. Private corporations have their practically permanent heads, and are competent to look out for themselves, to secure men of ability, whereas municipal corporations are not. Their affairs are administered by men who are changed from year to year, and often by an entirely new set of officials, and they are not in a position to guard the interests of the municipalities which they serve. All that is required is some protection for those practising as municipal engineers; that is, in the construction of water works, sewerage works, road improvements and works of like nature which are paid for out of the taxation of

the different municipalities, and this field could be easily covered by an extension of our Land Surveyors' Association. A great many of the members of our Association now depend to a large extent on their engineering practice. In looking round at the members, we see there are very few indeed who live by their surveying practice alone. In most cases, but a very small proportion of their income is derived from the survey of lands, and it seems to me that the interests of its members both now and still more in the future will be benefited by an extension of the scope of our Association to take in municipal engineering, and secure to municipalities competent men to design and construct the different works. Seconded by Mr. T. Harry Jones.

Mr. Butler—I used to be a member of the Council of the Civil Engineers and one of the Special Committee entrusted with laying before the Ontario Government the proposed Bill for the Canadian Society of Civil Engineers. The purpose they have in view is, of course, to form a somewhat similar corporation to what this now is. That is, that they may be able to control examinations and to proscribe the practicing of unqualified persons as Civil Engineers. There is no immediate intention of asking for a bill. One has been prepared which it is intended to submit to the members of the Government to get their views as to whether such a Bill would be acceptable or not, and this is all that has been done, or is proposed to be done, during the current year in Ontario and in Quebec. I may say that so far as I could gather at the meeting in Montreal nearly all the members present were afraid of it. They felt that engineering is not a profession that is limited to any one Province, or any one country, and what is good engineering in Ontario is good engineering in India, and only the little peculiarities of local knowledge alone would influence a man in practising here or in any other part of the world. It is different from land surveying. Land surveying is purely and simply a local profession. Engineering is not, and it was felt, by the members at any rate, that it was an extremely dangerous thing, that perhaps Ontario would pass one Act, Quebec another, Manitoba another, and it would debar the consulting engineers from acting out of their own Province, and I think perhaps when submitted to a vote, it would be thrown out even in the Society itself, but in the meantime the purpose of it is to acquire some notion as to the feeling the Government has towards such a measure. It seems to me it is an extremely troublesome time to approach the Legislature for anything in the shape of a sweeping change in our Act, but by an addition of three or four words the object might be effected. I have had some experience before the Legislature two or three times in getting Bills through, and sometimes a word or two can be altered without difficulty. If we could get the word "mechanics" and perhaps one or two other words added to our Act for the final examination we will take care of the rest. We can send up from our Board of Examiners men who are qualified for the office, but I do not believe the Legislature ought to, nor do I believe they can, be compelled to force municipalities to

employ one particular man. I had occasion last year to go into the Slides Act very carefully. The Government provides proper machinery for the working of the Act, but there is no provision for enforcing it. I see no reason why our surveyors should not become a similar body to what is known as the Borough Surveyors in England. The institution there embodies every practising engineer of any ability in the country. The fact of the matter is, that the Society there, while it is not a close corporation, is such that a man who is not a member of the Society cannot earn a day's living, but the Borough Surveyors have to pass a stringent examination, somewhat similar to ours, and they are to-day doing all the railroad work in England, and sanitary work even in large cities like Liverpool and Manchester.

The President stated he had been requested to inform the meeting that the widow of Mr. Francis Bolger, an old member of the Association, was anxious to dispose of some instruments. He also stated that Mr. Esten had been requested at the last annual meeting to compile some cases that had been in court. Mr. Esten had done so and had taken a great deal of trouble. He had sent in a report of a good many cases, and he proposed that they should be printed as an appendix to the proceedings, and that the thanks of the Association be given to Mr. Esten for his work. The President also referred to the opinion held by the Hon. Sir Oliver Mowat on the Bill relating to Boundary Commissioners presented to him. He could not agree with its provisions in every point, and thought it was rather a dangerous thing to refer to one surveyor alone, but at the third reading it might be put into some shape to make it workable.

REPORT OF ENTERTAINMENT COMMITTEE.

MR. PRESIDENT,—Your Committee on Entertainment for this year has to submit the following report:—

An invitation having been received from the Secretary of the School of Practical Science to hold one or more of the sessions of this annual meeting in the School of Science building, and the Repository of the Association having been sufficiently furnished for a small session, arrangements were made, with the consent of the Council of Management, to hold the committee meetings and the first session at the Repository, the second at the School of Practical Science, and the remaining sessions at the Canadian Institute as usual.

This arrangement was, we believe, satisfactory and served every purpose, giving the members the benefit of the attractions at the two former places of meeting and at the same time allowed the business sessions to be held in the most central part.

The attendance at the annual dinner, held at McConkey's, suffered somewhat from the counter attraction of the Peary lecture, but all present appeared convinced that this enjoyable feature of the annual meeting of our Association should not be omitted unless for urgent reasons.

The chair was occupied by the President, Mr. M. Gaviller, and the vice-chair by Mr. Willis Chipman, Vice President. The invited guests present were: Messrs. Aubrey White, Assistant Commissioner of Crown Lands; A. Blue, Director of Mines; Kivas Tully, Government Architect; Prof. Coleman, Geologist for Ontario Government; Mr. G. M. Campbell, President of the Engineering Society of the School of Practical Science; Mr. Willison, of *The Globe*; Mr. McKeshnie, of *The Mail and Empire*; and Mr. Canniff, of *The Buffalo Express*.

Letters of regret at their inability to accept the invitation of the Association were received from the Hon. A. S. Hardy, Commissioner of Crown Lands; Messrs. Walter Beatty, M.P.P., E. A. Little, M.P.P., Robt. Paton, M.P.P., Thos. Monro, Past President of the Canadian Society of Civil Engineers; H. B. Gordon, President of the Ontario Society of Architects; Henry Montgomery, Professor of Science, Trinity University; Dr. Parkin, Principal of Upper Canada College, and Mr. E. H. Keating, City Engineer, Toronto.

Due appreciation of the bill of fare provided by our host was succeeded by the following programme:—

Toast, "The Queen," proposed by the Chairman.

Toast, "Canada," proposed by the Chairman, responded to by Mr. Kirkpatrick.

Toast, "Ontario Legislature," proposed by the Chairman, responded to by Messrs. White and Blue.

Toast, "Engineering Societies," proposed by the Chairman, responded to by Mr. Kivas Tully, Prof. Galbraith, Dr. Coleman and Mr. Campbell.

Recitation, "My Boys," by Mr. T. Harry Jones, Vice-President elect.

Toast, "Our Association," proposed by the Vice-Chairman, responded to by Mr. Sankey, Chairman of Council, Messrs. Niven and Butler, Past Presidents, and Mr. VanNostrand, Secretary.

Song, "Bonnie Dundee," by Mr. Niven.

Volunteer Toast, "The Inspector of Surveys, Mr. Dickson," proposed by Prof. Galbraith, responded to by Mr. Dickson.

Volunteer Toast, "The Polar Committee," proposed by Mr. VanNostrand, responded to by Mr. Chipman.

Volunteer Toast, "The Entertainment Committee," proposed by Mr. Butler, responded to by Messrs. Ellis, Walker and Murphy.

Toast, "The Ladies," proposed by the Vice-Chairman, responded to by Messrs. Whitson and McMullen.

Chorus, "Auld Lang Syne," closed the evening's entertainment.

Your Committee takes this opportunity of expressing thanks to the "Peary Lecture" Committee for a donation of \$24.00 towards defraying the extra expenses in connection with the dinner.

A statement shewing receipts and expenditure of this Committee, together with vouchers, has been filed with the Secretary of the Association, where they may be examined by any member.

All of which is respectfully submitted.

H. D. ELLIS,
Chairman.

PRESIDENT'S ADDRESS.

GENTLEMEN,—It is my pleasant duty, whilst welcoming you to our fifth annual meeting since incorporation, to congratulate the Association on its satisfactory progress, as to increased membership, financial condition, and the activity of the individual members. We have to regret the removal by death, during the past year, of two of our fraternity—Leander M. Bowman (a withdrawn member) and Francis Bolger. A tribute to their memory will be found in our obituary notices.

Whilst the prosperity and fellowship of an association such as ours depends largely upon the judgment shown by the executive ; its life and development depend, if anything, still more upon the activity of the different committees.

The importance of sending in questions to the Land Surveying Committee for decision must be patent to all, as most useful both to the old and new members of the profession.

The effect of the several Drainage Acts being now in a workable form instead of chaos, has resulted in their being better understood by the township councils and applicants for drainage. This is a great help to the township engineer, and also reduces the chance of appeal from awards made in these cases.

The importance of having a topographical survey of our Province made has now become pretty generally understood. Your committee having the promotion of this work in hand have taken steps to advance the project, and their report may be looked forward to with interest. Steps have been taken by your Committee on Standard Measures to have the apparent conflict of regulations as to this matter settled.

The Committee on Polar Research, from recent dispatches, may be forestalled in being the first to arrive at their long-looked-for destination, but undoubtedly, even should this prove to be the case, they will still find many and useful developments to instil continued warmth into their laudable desire for research. That the efforts of your other committees have been successful is best manifested by the increased interest shown in our annual dinner, by the attractive and improving pages of our Annual Association Report, and the several reports submitted

And now a word as to the Board of Examiners. The report and published examination papers give all information as to examinations, number of applicants, and expenses incurred, but it should, I think, be better understood that there is an important difference between the duties of your examiners and those holding a similar office at other public examinations : in that the papers for an O.L.S.'s examination have to be all looked over and reported upon, and each candidate's standing decided, during the term of the examination ; whilst other examiners, as a rule, have several weeks in which to

perform this duty. This entails the attendance of a quorum of the Board during the progress of the written and oral examinations and gives constant work during their continuance. It is most satisfactory to bear record to the high qualifications of the candidates for admission to our profession.

Would it not be as well for us to add to our Special Committees one to compile "cases" connected with our profession that have been decided in court? A number of such cases are kept on record by the older members, and these, if collected and published, would be most useful to the profession generally.

Our biographical researches record what a land surveyor was in bygone times, and what were his experiences. Does not the trend of the papers published in our Annual Report, and the prominent positions now occupied throughout the Dominion by members of our Association, bring clearly before us the subject of evolution as applied to the land surveyor? This popular topic now being studied in connection with so many different subjects, and the principle of change and advancement being so universally recognized, we cannot but find it an interesting subject for consideration in connection with the development of the O.L.S. of the future. Of their loyalty to their Queen and country, land surveyors have in the past given ample assurance. May we, whether it be to define or defend our boundaries, be all found faithful at the post of duty.

M. GAVILLER.

P A P E R S .

[*This Association is not responsible as a body for any opinions expressed in its Papers by Members.*]

THE USE OF CONCRETE FOR BRIDGE FOUNDATIONS.

BY J. DE GURSE, C.E., O.L.S.

Windsor.

THE great value of concrete as a sub-stratum for stone masonry in foundations upon damp and yielding soils, and where foundations are built in water, has been universally recognized; but many Engineers are now using concrete for the entire foundation of bridges, such as piers, bridge seats, copings, etc.

When properly made it possesses the qualities of strength and hardness, in an almost equal degree with the best stone masonry, and is superior to second class masonry in these respects, while it has been known to stand the disintegrating effects of the atmosphere, and the abrasion of running water, much better than some of the harder specimens of stone.

The prejudice against the extensive use of concrete for foundations that so generally prevails has doubtless been due to failures caused by improper mixing and handling, or to lack of care in the selection and proportioning of the ingredients.

In bridge foundations the concrete is composed of cement, either native or Portland, and the aggregate which is usually sand and broken stone or gravel.

“Trautwine states, that in a heap of stone piled loosely or in dry sharp sand the voids occupy from thirty to fifty per cent of its mass. To get the best results from concrete the voids in the aggregate should be slightly more than filled. A proportion very generally recommended by text books, is one volume of cement, three of sand and five of broken stone or gravel. But in most cases and especially where the concrete is exposed and is above the surface of the ground I would recommend an increased quantity of cement.

Owing to the limited number of quarries in Western Ontario, where suitable stone for bridge masonry can be procured, the owners of which, practically control prices for such work, and in accordance with their likes and dislikes of the Engineer employed, are tempted to fix the prices arbitrarily for stone masonry. I therefore believe

that the Engineers of Ontario owe it as a duty to their clients to study carefully the merits of properly made concrete, and to apply it in place of stone masonry wherever it is possible. If this practice was followed it would only be a short time before the owners of quarries would recognize the fact that strong competition lay within reach of every Engineer. At present the price is at least thirty per cent lower than the masonry. And if once convinced that it is as good for all practical purposes, it should require no further argument to induce Engineers to use it.

During the summer of 1895 I was requested to prepare plans and specifications for three steel viaduct bridges on the London and Port Stanley Railway.

No. 1, over Kettle Creek, consisted of fifteen plate girder spans, each thirty-six feet in length, excepting the two end spans, which were twenty-eight feet in length, and one truss span of eighty-five feet over the Creek. The girders rested on columns braced together transversely to form bents, each pair of which was braced together to form towers, the bents varying in height from sixteen to sixty-two feet.

No. 2 was over Mill Creek, south of St. Thomas, similar to No. 1, but had no truss span.

No. 3 was over Zavitt's Pond, near Port Stanley, and has a total length of 228 feet.

The sub-structure for each of these bridges consisted of a masonry abutment at either end, and a pier or pedestal under each column. The abutments were composed of stone masonry to the depth of ten feet beneath the bridge seat, resting on a bed of concrete of sufficient depth to reach a hard clay foundation.

Each of the pedestals was composed of concrete surmounted by a stone cap four feet by eighteen inches in depth, and pierced with two anchor bolts one and one-eighth inches in diameter, and four to five feet long.

I should have preferred to have dispensed with the stone cap, but had to give way somewhat to prevailing prejudice. The concrete pedestals varied in depth from five to nine and one-half feet, and were in the shape of a frustrum of a pyramid with a batter of one in six, the surface under the stone cap being three feet nine inches, by three feet nine in all cases, except those on either-side of Kettle Creek, which were larger, likewise the stone cap surmounting them.

The pedestals were made as follows:

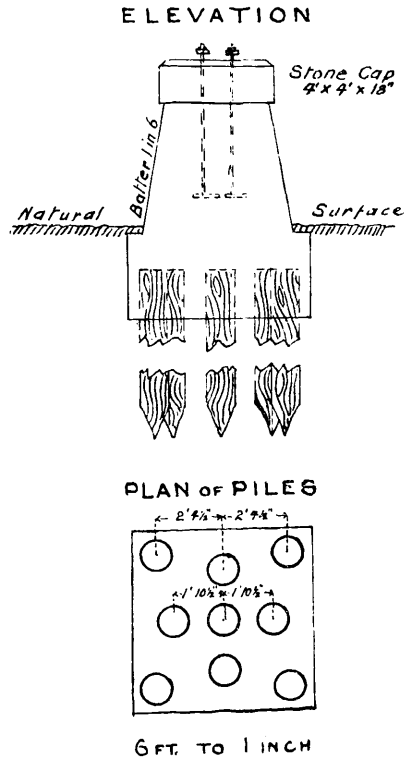
The ground was excavated to the required depth to reach a hard clay or gravel foundation, when a strong box having the required batter and proper dimensions was lowered into the excavation, securely braced and properly centered. The concrete after being mixed was shovelled into the box and rammed.

As soon as sufficiently set, the box was removed, after which the concrete was kept wet for about a week, and until no further damage was anticipated from the outer layer drying too quickly and robbing the mortar of moisture which is so essential to crystallization. After which a mortar bed, composed of one part of cement to two parts of

THE USE OF CONCRETE FOR BRIDGE FOUNDATIONS.

sharp sand, was placed, of sufficient depth to receive the stone cap, and bring it to the proper elevation.

The concrete used in the pedestals and beneath the stone abutments was composed of one part Portland cement, two parts of sand and three parts of broken stone. The cement specified for the work was star brand Napanee Portland, but on account of the great demand for this brand, the contractors, except in the case of the



latter bridge, were unable to secure this cement, and imported brands were used.

The specifications required that there should not be more than 5% residue on a sieve of 1,000, and that the tensile strength at the end of 7 days, one day being in air should be 350 lbs. per sq. inch. That the sand used should be clean, sharp, and on the coarse side, free from loam, and of a silicious nature. That the stone should be good hard limestone, broken so as to pass through a two, inch ring-

and just before being used, sprinkled with sufficient water to remove all dust and thoroughly wet the entire surface.

The mode of preparing the concrete was as follows:—

Two barrows full of sand were spread evenly over a platform twelve feet by twelve feet, on this one barrel of cement was evenly spread, when the two were turned over at least three or four times while dry, enough water was then added to form a stiff paste; after being levelled the three barrels of broken stone were evenly spread over it, and repeatedly turned over until the ingredients were thoroughly incorporated; it was then put in place as quickly as possible and evenly and sufficiently rammed.

In Bridge No. 3 six of the pedestals were found over quicksand foundation, and with these I proceeded as follows:—

I procured nine piles of sufficient length and spaced as per annexed sketch for each pedestal, had them driven to a refusal with a 2,000 pound hammer, and sawed off two feet below the surface of the ground. Instead of following the more general practice of capping and flooring, I had the soil excavated, from two to three feet below the top of piles, and had the concrete rammed between, around, and on top of the piles until sufficient height had been obtained to receive the cap stone.

By this method the bearing power of the soil between the piles was utilized, as well as the bearing power of the piles themselves, and the whole formed a monolithic mass which cannot fail in part.

With reference to the durability and resistance of concrete to abrasion, I may refer you to a paper by C. D. Purdon, Esq., A.M., Soc.C.E., in *Engineering News*, Vol. 19, page 413, where the writer, after referring to the mode in which the concrete piers were built, adds:

“On May 7th, I had an opportunity of inspecting them after a most extraordinary flood in the river, caused by a water-spout, in which flood the river rose one and four-tenth feet above the highest water known, the current being estimated at from eight to nine miles per hour with large quantities of drift running. Among the drift were cotton wood trees two feet to three feet in diameter, many of which I am informed broke on the piers from the force of the current. No damage whatever was done to the piers, and no greater marks left by the drift than could be made by a stick held in the hand and dragged across the surface.

“It was the opinion of the Bridge Inspectors of the St. Louis and San Francisco R. R., who watched the bridge during the flood, and who were men of considerable experience, that had the piers been built of masonry of such stone as could have been obtained, they would not have been able to withstand the drift and the bridge would have been destroyed.

The testimony of many other Engineers who have had large experience might be added, but would be altogether outside the sphere of this short paper, which is written with the sole object of provoking discussion and bringing out the views of the members of the Association present.

[This Association is not responsible as a body for any opinions expressed in its Papers by Members.]

SOME NOTES ON PORTLAND CEMENT CONCRETE.

BY M. J. BUTLER, O.L.S., C.E.

Napanee.

IN that quaintly written book, "Scamping Tricks," by John Newman, under "Concrete," occurs the following:—

"Have you managed to squeeze any extra profit on the quiet out of Concrete?"

"Yes; twenty or thirty years ago, but there is not much to be got now since a few engineers took to writing upon the subject. They have reminded or informed others pretty well what to look after, but there were not many thirty years back that knew how it ought to be made, and you see, although one receives the materials, the Concrete has to be made with them, manufactured, as it were, on the works, and you can spoil the best Portland Cement that is, was, or ever will be made, in the proportioning, mixing and blending it with bad sand and gravel, or dirty broken rock."

With the above quotation for a text, it will be attempted to show what good concrete is, how it is made, and to what work it is peculiarly adapted: The first essential is to secure good Portland Cement. It is believed that the following specification will insure good Cement.

SPECIFICATION FOR PORTLAND CEMENT.

1st.—*Fineness*: Not more than 10% residue will be retained on a sieve of 1,000 holes to the square inch, nor more than 25% on the silk sieve of 2,500 meshes per square inch. Other things being equal, the finer the Cement is the better. The residue on the 2,500 sieve has no cementitious value.

2nd.—*Specific Gravity* shall not be less than 3.09 for freshly burned Cement (it should be 3.13). This is the only known reliable test for density and proper burning of the Clinker. Weight per bushel is unreliable and misleading, as a very slight or imperceptible difference in method of filling the measure seriously alters the result.

3rd.—*Hot Bath Test*: For the purpose of testing the soundness of a Cement, unsoundness being caused by the presence of an excess of Caustic Lime, samples are taken and made into thin pats on glass or other impervious material (as per samples submitted herewith). These samples are left in the air from three to six hours or

until set. They are then placed in a covered tank on a rack over water so as to be enveloped in hot vapor for from 6 to 12 hours, after which they are immersed in hot water at a temperature of 110° to 130° F., and allowed to remain for periods of from 12 to 24 hours. Sound samples will not crack or leave the glass. Note, if the sample is prepared with a large excess of water it is quite common to find a crack at the top of the little ridge, due to the evaporation of the excess of water while in the air.

4th.—*Tensile Strength*: Usually this test is the one which receives the greatest attention, and unless taken in connection with the preceding ones is apt to be misleading. The usual plan being to test Neat Cement; samples are prepared by carefully weighing out a sufficient quantity to make five briquettes (about 26 ozs.) to which is added 25 to 30% of its weight of water. The Cement having been placed on a slab of glass or slate, it is then rapidly worked up into a plastic mortar and the moulds are rapidly filled, taking care to press the mortar in carefully with the fingers so as to exclude the air. The briquettes are then struck off evenly with the trowel, and are then left in the air until set, usually 24 hours, covered with a damp cloth to check evaporation. They are then carefully removed from the moulds and should be immediately placed in the water until the period for breaking arrives. It is of more importance that a proportionate increase of strength be shewn at periods of three and seven days than that a high test be secured at short periods. It is now an easy matter to secure Portland Cement that will stand 400 lbs. per square inch at the end of seven days, provided the operator understands the work of testing, for it is by no means the easy simple task it appears; to properly test a Cement, it requires experience and care. It is usual and necessary that the temperature of the room and water be kept as nearly uniform as possible, say 70° F., in order that comparable results may be had. Professor Unwin, in a recent paper, questions the utility of such rigorous conditions, claiming that Cement is subjected to all sorts of conditions in work and that the test ought to conform to the use to which it is to be subjected. Other able men have doubted the benefit of the hot water test. It is obvious that usually Cement will not be used where hot water is flowing freely, hence the query naturally arises, why test Cement with it. The answer is: That hot water accelerates the weak points in developing, that what would require several weeks, or months, to be learned from cold water can be had from 24 to 36 hours by using hot water. Further: In this country it is frequently necessary to use hot water and heated sand in building during the winter months. The extraneous conditions affect small samples to a greater degree than in the large masses in works and, after all, tests are merely for comparison, it being rightly considered that the best samples will give the best results on a large scale. Other points, such as color, etc., have really no significance. Here are two samples of the same Cement, and a slight difference in treatment has produced a marked difference in

the color. One was immersed in a vapor bath immediately after mixing, the other was first allowed to set in the air before being placed in the vapor bath ; the first one is very light and the other quite dark.

Sand : The second ingredient of Concrete is sand, and it is quite as important to use good sand as good Cement ; it should be clean, sharp and of varying sizes of grain, largely silicious, excluding rigorously Mica, Pyrities, Loam or other soft friable material. Calcareous sands are seldom or never fit for concrete.

Gravel : May be clean, pit gravel, or lake shore pebbles, or better, broken syenite, trap, granite or hard limestone. The principal point requiring care is to have the materials clean and that the size shall not be larger than what will pass a ring of $2\frac{1}{4}$ to 3 inches in diameter for the largest pieces and from that size down to the size of a pea or lima bean. A varying sized aggregate will give a more economical and denser Concrete

DESCRIPTION OF PROCESS IN CONCRETE MAKING.

The Concrete described below is such as is advised for bridge piers, abutments, chimney foundations, engine beds, etc. Proportions to be, by measure : One part Portland Cement, two parts clean sharp sand, and five parts broken stone or clean gravel. The *modus operandi* found to give successful results has been as follows : Spread evenly on boards or in a water-tight box, two barrels of sand ; on this spread one barrel of Cement ; mix thoroughly by turning over the sand and cement at least three or four times, do not heap it ; then add water, mixing as you do so. It is best to use a Rose in putting on the water, until enough is present to make the mortar such that it will retain the impress of the hand when rolled into a ball. Spread into an even layer, then add the gravel by spreading it as evenly as possible. Turn the whole mass at least three times ; it is not well to heap it to the centre as is usually done, the larger stones always work to the into side and do not receive the proper complement of mortar. Load into barrows or sacks and place in position as quickly as possible ; now ram thoroughly to place ; if the concrete is too wet it will work up around the rammer and will not pack. The proper test is that after being well rammed it should jelly, better have it too dry than too wet, as it can be easily wet down. The coping course should generally be made of richer material, one part of cement to two parts of sand giving good results. Usually the coping course is from two inches to four inches thick, depending upon the whim of the Engineer in charge.

During the past season the writer constructed two bridge abutments as follows : First, piles were driven, the tops being cut off four feet below low water mark. The piles were then capped with 10x12 hemlock and rag bolted to each pile with three-quarters inch square by 20 inches long iron rag bolts, running transversely with the cap-

ping ; a floor of hemlock 10 inches was laid, the floor being fully rag bolted to the caps ; curbing was then built on the floor to temporarily retain the concrete ; corner pieces were 4x6 inches, studding 2x6 inches, spaced two feet centres ; the whole being lined with two-inch plank at the corner, 6-inch strips were nailed in to give a bevel corner, and at the coping a bevel piece was nailed to the sheeting so as to leave a wash edge ; the abutments were 4 feet 6 inches thick by 20 feet long and 5 feet high to the bridge seat ; a ballast wall, 5 feet high by 18 inches thick, completing the abutment. Three days after the coping was laid on the abutment a heavy steel bridge was placed upon it, and ten days later it was crossed with a work train. A second example was an old abutment which had to be renewed. It was scoured out in places three feet below the stone work ; the work of repairing was first to carefully build a strong curb about two feet away from the abutment ; an effort was made to deaden the current with puddle ; bag after bag of Concrete was then carefully lowered into the holes and pushed to place, the bags were slitted and in a short time it became a homogeneous mass ; a toe was then formed to the curb, and it is believed all possibility of future scouring had been checked.

A third example was as a foundation for a brick chimney ; no curbing being required, the side of the excavation serving the purpose of a curb. The concrete work merely stood one day when the brick work was immediately started. Although the completed chimney weighs some 200,000 lbs., giving a pressure of about 4,900 lbs. per square foot, and has been subjected to some very high windstorms, it has given a very satisfactory job, not a crack or appearance of settlement having occurred.

Another example of the advantage to be had from Concrete is in engine beds or foundation for generators in electric power and light work, a number of which have been built under the writer's supervision. In fact, wherever stone or gravel can be had Concrete can be economically made. It is peculiarly adapted to trying and difficult locations, as in bridge piers, abutments, chimney caps, foundations under water, for dams, docks, wharves, etc. A less section can generally be taken than is required for stone from the fact of its monolithic character, greater weight and strength. A principle for guidance is to so design the work as to never leave a sharp or thin corner.

In conclusion, a description of a recent test made under the writer's direction will be given as a proof of its unsuitability for fire-proofing. A small slab of first-class concrete 2 feet wide, 3 feet long and 3 inches thick, was very carefully made about ten months ago ; the slab has been kept in an office since it was built and was therefore very hard and dry ; for the purpose of the test a small chamber was built of terra cotta blocks with three closed sides and an ordinary stovepipe chimney. The slab was used for a cover. A slow easy fire was kept going for about three hours, when the slab had grown quite warm, say about 130° F. It was then fired hard with

dry pine for about twenty minutes, when three or four pails of water were thrown on the under side of the slab. The result was a great many cracks appeared in the slab ; it was then carefully turned over when it broke into a great many pieces. Upon further drenching each piece again broke up into smaller ones, which would go to show that Concrete is an unsafe and unreliable material where it is liable to be heated and then drenched with water, as would be the case in any building where a fire might occur. Within the past two years a good many buildings have been " fireproofed " with Concrete, and it would seem that it is a dangerous material for such service. Further experiments on a larger scale and with the usual conditions incidental to city buildings are required before much faith should be given to Concrete as a fireproof material. It merely remains to be said that the cost of Concrete is much less than good stone or brick work ; requires little or no mechanical skill in the work, one expert mason for a foreman, the rest of the work being done with common labor.

The items that go to make up the cost of a cubic yard of Concrete are as follows :

$\frac{1}{4}$ bbls. Portland Cement, average cost in car lots \$2.30 per barrel.....	\$2 87 $\frac{1}{2}$
$\frac{1}{2}$ cubic yard of sand (average conditions) say.. .. .	37 $\frac{1}{2}$
1 cubic yard of gravel or broken stone (average conditions) say.....	75
Labor—Common labor \$1.25 per day, foreman \$3.00, 10 men in gang.....	1 50
Curbing, ordinary simple work as in Highway or Railway Bridges, without specially difficult foundations etc., per cubic yard of Cement.	72
Total	\$6 22

The writer has had piers and abutments erected complete in place at as low a cost as \$5.00 per cubic yard and as high as \$6.50, local conditions affecting the cost slightly.

DISCUSSION.

Mr. Chipman—I have used during the past five or six years a good many thousand barrels of cement, and the greatest portion of it was English Portland. It is gratifying to learn that Canadians are making as good a cement as can be imported. But it would not have paid me in the beginning of my professional career to have experimented, as we are not paid highly enough for our services to warrant the necessary experiments. When in Nova Scotia and New Brunswick two years ago, and again early this winter, I was surprised to find that they used there concrete to a much greater extent than we do here, and the climate is certainly as severe there as it is here. They are using concrete for bridge piers, abutments, copings, parapets, retaining walls, and for sewer construction ; and in places where they are using it generally there, here it is scarcely ever used in those structures ; and I saw some work there that had been up for many years, stood several severe winters, and was apparently as good to-day as when put up. I could see no crack or defect in it,

and the cement that was used, was, I am told, not equal to what we can get here to-day.

Mr. Warren—I have had a good deal to do with concrete. The proportions given here may be slightly different from what we use. We do not put in as much broken stone as referred to here. We mix it just the same, and there should be great care taken in mixing it. A great many make it too wet. It is better to mix it rather under, than over, and then the pounding or ramming it well will tend to bring the water out and make it more homogenous.

Mr. Bowman—In the specification for asphalt pavement, it struck me the kind of screen used was much smaller than it was in this case—that is, in Niagara Falls, N.Y. American Portland Cement was used of very excellent quality, and I believe that first rate cement is now made in this country. This concrete was formed of one part of cement, five parts of sand, and with that was mixed ten parts of broken stone, and the Engineer has taken that up and is perfectly satisfied with it. The concrete resulting from that admixture, he says, is superior to that made by using one part of cement and two parts of sand to a considerably less quantity of broken stone. They have tested the two, and that is their standard specification—one part of cement, five parts of sand, and ten parts of broken stone.

Prof. Wright—Mr. Chairman, unfortunately I have not heard all of Mr. Butler's paper; but, judging from the part I had the pleasure of listening to, and the reception given to some of the remarks made, it would seem that to some of you it is a surprise to find that we have a good Portland cement manufactured in Ontario. As far as the laboratory results at the School of Practical Science are concerned, I should like to say that the best cement we have had in the laboratory during the past three years has been of Canadian manufacture. (Hear, hear !) The samples I refer to are those which have been selected from stock on the market by parties who were not interested in its manufacture, and came from all parts of the Province. I would like to say further that I believe the reason why we have not a still better article manufactured in Ontario is largely the fault of the engineering and architectural professions. You will insist on specifying an inferior article, and you cannot blame the manufacturer for making as cheap an article as the specification will allow. Not only are you satisfied with a very low specification, but in many cases you will not even take the trouble to see that the cement is up to your standard. When an unscrupulous agent is aware that cement is being used untested, he is only too anxious to unload his storehouse of the worst stuff he may have or be able to find in the market. This failure to test cement before using it occurs not only on small work but on jobs using very large quantities. I happen to know of one case at least during the last season, using thousands of barrels when no attempt was made to examine the cement. The only safeguard they

have in this work is the fact that the cement was of home production. The reason that under these conditions our home production is better than foreign, is obviously that its reputation will rise or fall according to its value on the work. It is an easy matter to trace the difficulty home when the cement is of Canadian manufacture, whereas it is impossible to hurt the name of the imported material among the many different brands, and there the cement may have been adulterated by any or all of the several middlemen. On account of this difficulty agents are more ready to sell an article which is certainly very inferior if not worthless than they would if it were of home manufacture. In this connection I should like to say that within the last season I have had samples from four large shipments worse than worthless, absolutely injurious to any work they were used on—three of them were German and one of English cements—or at least were so reported. These were all condemned on the particular works they were intended for, but there is no doubt that they have been worked in somewhere, somebody has used this cement and there is a weak job somewhere.

I have seen several specifications stating that "the cement to be used shall be good Portland cement of English manufacture," as you will observe specifying directly against home production, when if the engineer had noticed carefully the record in the different works throughout the Province for the last three years, and at the same time wished to do the best for his client, the specification should read of Canadian manufacture. In any case the clause ought at least to be left out of any reasonable specification. I suppose that the main reason why many engineers never think of making tests of the cement they are using is that they consider an extensive laboratory, with a large equipment of apparatus, a necessity, but while this may be desirable, it is not an absolute necessity in order to make a much needed improvement. If you will, instead of writing an elaborate specification—and never again looking at either it or the cement—make your requirements simple, and then see that the material is fully up to them, you will have made a very great improvement, and encourage the honest manufacturer. First of all be sure to determine the grinding of the cement, and as most of you call for a No. 50 sieve, *i. e.*, 2,500 meshes per square inch, I would say that the residue should not be greater than 5 per cent. This means that certainly 5 per cent, and most likely considerably more of the material, is inert and no better than sand. If the specification calls for not more than 5 per cent. of a residue, a cement which contains 5.5 per cent. ought to be rejected, because it is not properly ground even if the cement is sound in every other particular. Secondly, you should make the hot water test for blowing, but as you are all familiar with the method of making the test, I shall not repeat it here. Both of these determinations can be made by anybody without requiring any extensive apparatus, and if applied by every engineer in Ontario, it would save many a weak, inferior piece of work. If in addition to the sieve and scales necessary for the above experiments, you have an opportunity to make tests for tensile strength, etc., I would refer you to the suggestions of

the Canadian Society of Civil Engineers. In any case, however, you are in duty bound to your clients to do the best you can to see that good material is used throughout the work in your charge.

Of late a great deal has been said in favor of using Portland cement as a fireproof covering, and in order to determine the value of it in this connection we have made a very careful set of experiments during the year in the school. The work has been done by Mr. Dobie, who is taking a post graduate course, and the results will be of interest to most of you. We made elaborate preparations in the way of constructing special apparatus to determine the condition of the concrete while hot, but this was not a success on account of the early failure of the concrete. You will find a short report of the tests in the report of the Engineering Society of the School.

[*This Association is not responsible as a body for any opinions expressed in its Papers by Members.*]

MAINTENANCE OF A SEPARATE SYSTEM OF SEWERS.

By T. HARRY JONES, O.L.S.

City Engineer, Brantford.

THE Brantford Sewerage System was designed by Willis Chipman, Civil and Sanitary Engineer, Toronto, in 1889, and constructed in 1890, 1891 and 1892, Mr. Chipman being the Chief Engineer, and the writer Resident Engineer.

During the past three years, the system has been in charge of the writer as City Engineer, and all work in connection with the extension and maintenance of the system has been performed by the City by day labour.

The following summary will give an idea of the extent of the system :

Population of the City of Brantford.....	16,314
Assessed Value.....	\$5,760,410
Total expenditure on sewers, including cost of steel portion of house sewers and maintenance to end of 1895.....	\$137,314
Total length of main sewer 15in. to 24in. in diameter.....	2.1 miles.
Total length of sub-mains and laterals, 9in. to 15in. in diameter..	11.2 "
House sewers. On streets 4.3 miles. On property 5.1 miles. Total..	9.4 "
About 1 per ct. of the above is of 6in. pipe and the balance 4in.	
Number of connections with sewers.....	497
Population using sewers.....	3,000
Average annual increase of population using sewers.....	500
Number of manholes.....	168
Number of lamp-holes.....	75
Number of flush tanks.....	52

The general character of the soil is sand and gravel, with clay and quicksand in a few sections.

FLUSH-TANKS.

Of the 52 flush-tanks in use, 9 are the Van Vranken and the remainder a compound of the Field and Van Vranken, consisting of the Field syphon and the Van Vranken tilting tank. The best results we have obtained from the Van Vranken.

Monthly inspections are necessary in order that they may be kept properly working, it being generally found that on each visit two or three require some slight attention, such as regulating the water or giving air. We have found that during the year some three or four

need repairing, the chief difficulty arising from the rusting and catching of the tilting tank

Each tank holds about 200 gallons of water and is set to discharge once a day.

FLUSHING.

The flush-tanks are generally found sufficient to keep the 9-inch sewers clear, although it is occasionally found advisable to turn the water in the flush-tanks on to the full extent.

It has been found necessary to pass the plunger, through only two of the 9-inch sewers during the past three years, each of these sewers having been flushed once in this manner.

There are two of the 12-inch sewers which require flushing about once in every three months. In one of these the sewage backs up owing to a fungous growth becoming attached to the pipes. The other 12 inch sewer—known as the Clarence Street sewer—was constructed under great difficulties, being laid for a distance of 2,300 feet in running sand, and at an average depth of 12 feet below the ground and 5 feet below the water level, and running parallel to and about 15 feet distant from a line of railway.

In addition to the fungous growth above mentioned, the leakage of sand into the pipes has helped to cause this sewer to back up.

Excepting the 18-inch iron syphon under the canal, through which the plunger is passed twice during the year, none of the sewers above 12 inches in diameter have yet required special treatment in this way.

FLUSHING APPARATUS.

Instead of using the ordinary copper or wooden spherical "pill" which has a diameter 2 inches less than that of the sewer to be flushed, we have found the following apparatus to be much more effective.

It consists of a reel or plunger, formed of two rubber discs of the same diameter as the sewer to be flushed, cut from $\frac{1}{4}$ inch rubber belting. These are backed by wooden discs, from $1\frac{1}{4}$ to $1\frac{1}{2}$ inches in thickness and from 2 to 3 inches less in diameter than the sewer. These discs are strung about 8 inches apart on a $\frac{1}{2}$ inch iron rod, and are kept apart by a piece of gas pipe sliding on the rod, and are held in position by a collar near one end of the rod and a nut at the other end. The rod is provided with an eye at one end, and a swivel at the other end, for attaching the ropes, which are each some 25 feet longer than the distance between the manholes.

METHOD OF FLUSHING.

In flushing a sewer the plunger is usually put through twice. The sewer is first flushed block by block, beginning with the lowest block on the sewer, and using the plunger suitable for a smaller pipe. Then the sewer is flushed straight through from the upper end, using the plunger which fits the pipe.

Beginning at the upper manhole of the block of sewer to be flushed, the leading rope is passed through the pipe to the manhole below. Then the plunger follows, and is taken through principally by the pressure of water backed up behind, the trailing rope serving to keep the plunger from going too fast, while the leading rope is serviceable if the plunger is inclined to stick. The usual method of passing the leading rope from manhole to manhole, by means of a float with a string attached, having been found to cause so much delay, we adopted the following plan: Elm strips—2 inches wide, $\frac{1}{2}$ inch thick, and 12 feet in length—are bolted together end to end by two iron straps and four stove bolts to each joint, the straps being 1 inch by $\frac{1}{8}$ inch by $6\frac{1}{2}$ inches and the bolts 1 inch by $\frac{3}{16}$ th of an inch.

These form practically one long slat which will reach from manhole to manhole, and will bend readily, and can be pushed down the manhole and through the sewer. To this the rope is attached

These strips can easily be pushed 400 feet through a 9-inch pipe, and 100 feet through a 4-inch pipe, and are of great service in locating faults and stoppages.

RATE OF FLUSHING.

A gang of three men will flush about 700 feet in a day.

HOUSE SEWERS.

The sewer assessment adopted by this city of $79\frac{1}{10}$ cents per foot frontage or 4 cents per foot for 40 years, covers also the cost of the construction of the house sewers by the city to the street line. The lot portion of the house sewer is usually put in by the plumber, but all under city inspection. We have found that in street mains 10 feet in depth or over, that T junctions laid on the back with stand pipes carried straight up, are preferable to the Y junctions, as the house sewer can then be carried out to the main on its ordinary grade, and connected with the stand pipe by a T junction. When bends are used to make connection with the main, it is important to see that they have not become contracted or flattened in burning.

STOPPAGES IN HOUSE SEWERS.

These generally occur at the junction with the main, which formerly had commonly been made with a bend, and are usually caused by foreign substances from the buildings having been allowed to enter the sewer.

In two or three instances stoppages have occurred from the roots of trees having forced themselves through the joints. We have found that the roots of soft maple, elm, poplar, and willow are inclined to follow the sewer on account of the dampness, and will work through any joint not well cemented. When even almost invisible root fibres once find an entrance into the sewer, they will spread rapidly and soon completely fill the pipe.

One 9-inch sewer, which was laid in a shallow trench, became

completely blocked by the roots of trees, some of which stood forty feet from the sewer. If all joints are well made with good cement, the pipe being clean before the joint is made, there can be no trouble from this cause, and when it occurs the only remedy is to re-lay the pipes.

We have had on an average about fifteen stoppages per year, and the cost of removal has been about \$4.25 each.

In the great majority of cases the cost of this work has been repaid the city, the householders having been shown to be at fault.

INSPECTION.

The more important manholes are inspected every fortnight, and the iron gratings placed at the foot of the sewers from the Ontario Institution for the Blind, the Hospital, and Grand Trunk Railway station are cleaned every two weeks. The flush-tanks are inspected monthly, and the whole system twice a year.

RECORDS.

Plumbing plans are filed by licensed plumbers, and the plumbing tested before connection is allowed with the sewers, a fee of \$2.00 being paid with each plan. A working and final plan of each sewer is prepared.

Permits are issued for each connection with the sewer, and a plan of each connection entered in a specially prepared book. Complete plans and records are kept of all work done.

MAINTENANCE ACCOUNT.

	1893	1894	1895
	\$	\$	\$
Stoppage in house sewers.....	30	25	33
Flushing with the plunger.....	127	97	68
Repairs.....	128	130	144
General maintenance.....	225	223	224
	<u>510</u>	<u>475</u>	<u>469</u>

About 50 per cent. of the cost of flushing and repairs is chargeable to the Clarence Street sewer.

The rate of wages paid has been \$1.60 for a working foreman, and \$1.25 per day for the men.

The prices given in the above table do not include any allowance for engineering or inspection.

The following notes from construction account in connection with the extension of the system by the city may be of interest :

9 inch sewer—dry trench—average depth 9 ft.	cost 63 cts. per lin. ft.
Manholes, including iron frame and cover, depth 10 ft.,	cost \$33.
Flush tanks " " " " " "	9 ft. " \$65.
Lamp holes " " " " " "	9 ft. " \$9.
4 inch street portion of house sewers	7 ft. " 23 cts. per lin. ft.
6 " " " " " " " "	7 ft. " 28 " "

DISCUSSION.

Mr. Butler—This is an exceedingly interesting paper. In it is a lot of valuable data no one else in the Province could furnish, so far as I know, except those from Brockville. It is the only place which is wholly sewered by this system, and the best person to hear from on this subject would be Mr. Chipman, who first introduced the system into Canada. I think Mr. Jones is deserving of our thanks for his interesting paper.

Mr. Abrey—I may say Toronto Junction has been sewered in the same way, under the same circumstances, and Mr. Chipman was Chief Engineer of that. I would like to ask Mr. Jones if they used the agricultural drain tiles alongside the mains.

Mr. Jones—Yes. The ordinary agricultural drain tiles were used, and the glazed tile substituted for them in places where there was any likelihood of the drain tiles being choked up with sand. I might say, however, that in Brantford there have been very few connections with the drain tile. We have a gravelly soil there and we have found where it has been necessary to use the drain tiles we have had no difficulty with them whatever.

Mr. Abrey—You have not had them stopped up ?

Mr. Jones—No.

Mr. Abrey—Our main sewers in the Junction have stood first rate, but we have had some trouble with some portions of the system. Perhaps it has not been attended to as it should be. Our town has about 4,500 of a population and we have had a good many connections made, I think as many in proportion as in Brantford, but everything has answered first-rate except those small agricultural drain tiles. From our experience there I do not think they have proved altogether a success, and that is the reason I was anxious to hear from Mr. Jones how they worked in Brantford. The soil there seems to be very similar to what we have. In the Junction we have largely abandoned them. We have made a good many cellar connections for the sake of getting rid of the surface and ground water. My own idea would be to use socketted pipes ; I do not care whether they are glazed or not, so that they can keep them better in position. In trying to clean them we have perhaps damaged them in having men that are not skilled, but to a certain extent they have been misplaced, and in plenty of places they have been found full of sand, in places where the soil was quite firm where they were laid.

Mr. Jones—When I referred to glazed pipes it was the ordinary sewer pipe with a socket, as a substitution.

Mr. Abrey—With the glazed pipe socketted it is not necessary that they should be fastened. In reference to the agricultural drain tile, one of the difficulties we have had is through inexperienced persons getting at them with the hose, and the result is the water breaks

them between the tiles, and forms a sort of cesspool and washes away the sand. From what I have seen in the Junction in such soil as we have I think it would have been better to have used the socketted pipes universally.

Mr. Warren—In Walkerton last summer we had something like that, but unfortunately we could not get the people to accept the separate system. I was very much pleased with the way Mr. Jones suggests of flushing out with these rubber discs, and that is really very valuable information. The flushing out should be attended to very regularly. Unless it is done there is danger of these stoppages, and there is a difficulty too, sometimes, in finding out where the stoppages are. Our system was only opened up last February, and everything has gone right so far, and the tank that has been used is the same as Mr. Jones referred to, the Van Vranken Tank, and has worked very well, and we flush out; it runs up every three days, I think. And in connection with the gaol and courthouse the system empties out into the tank, and a 9-inch pipe connects with the main. It goes down to the main sewer and that is an 18-inch pipe. I was very much interested in the paper as there are a great many practical points in it.

Mr. Chipman—How many miles of mains have you in Walkerton, and how many flush tanks?

Mr. Warren—We have only about four or five thousand feet altogether as yet. Of this there is 2,000 feet of 18-inch pipe laid on the main street, with the intention of extending it by-and-by with a 15 or 12 inch pipe, and one side street with a 9-inch pipe running in.

Mr. Chipman—It afforded me much pleasure, indeed, to listen to Mr. Jones' paper. I had the honor of introducing the Separate System of sewerage into Canada in 1887. Before that there was not a town sewerage according to that system. There appears to me to be a popular misunderstanding of the meaning of the term, "Separate System." I find many Engineers also think it means two separate pipes, one for sewage and one for cellar drainage. That is not the distinction between the "Separate" and "Combined System." The term is used to show that the "Separate System" was for conveying the storm water and the sewage in separate pipes; it did not refer at all to cellar drainage. That is one mistake that I find is very common in the popular mind. The Brockville System was the first one constructed in Canada, and was commenced in 1887 and practically completed in 1891 or early in 1892. There was something over eight miles and a half, I think, built under my superintendence there, and we adopted the Warring method of draining the cellars, laying agricultural drain tiles beside the pipes for the drainage of cellars and the lowering of sub-soil water. There we had every variety of soil, I think, that was ever found in any town, from granite rock to running quicksand, clay, loam, boulders, everything that you could name, I believe. I am sorry the Town Engineer is not here, as he could

vouch for what I say. They have practically had no trouble with these small pipes. In the first two years we found two sections that we were obliged to abandon in the running quicksand; two sections in the whole town, I believe. All the remaining small pipes have worked successfully from that time to this.

The next town to adopt the Separate System was Cornwall, which I designed, and the third, I think, was Brantford. In Brantford we adopted the same system as in Brockville, but we used larger drain tiles for sub-soil drainage, and we used, to a greater extent, socketted pipes instead of the porous farm tile pipes. The next town was Barrie. In that town we used the same system exactly as in Brantford, and I have heard of no complaint, whatever, from Barrie, and I have endeavored to keep posted on the action of these drain tiles in the different places, as they have been most unfavorably criticized when the people saw them going into the ground. The average ratepayer thinks the drain tile is of no use.

The next place to adopt this system, I believe, was Toronto Junction, and in that town we made a further concession to the popular prejudice. We put in a larger quantity of glazed pipe, substituting them for the unglazed, and we introduced there a socket over the joint of the porous pipe. But, unfortunately, the contractors could not furnish them rapidly enough, and in a great many instances they were omitted. I am pleased to find Mr. Jones in his experience in Brantford has found the maintenance account so low; in fact, it is remarkably low. I think it is lower than in any town on which I have designed the system. In Toronto Junction the drain pipes have not been so successful as in the other places, but I think if the matter were fully investigated by a competent tribunal of Engineers they would find that a great portion of the fault rests with those who had the sewers in charge; in fact, they were left to take care of themselves for about a year, with no superintendence worthy of the name, and worse than that, men were employed who knew nothing whatever about the system and were not in sympathy with it; in fact, they were opposed to it, opposed to the introduction of the system in the first place, and opposed to any system. And it was natural they would make it appear as bad as possible. The amount charged in Brockville for maintenance, repairs, etc., has been, I think, slightly greater in proportion to the extent of the system than in Brantford. I think they have between twelve and thirteen miles now, but the City Engineer of Brockville writes to me that everything has been working perfectly during the last year or two, since he has been in charge, and that the amount for repairs is practically nothing.

The "Separate System" when introduced into Canada was not looked upon with favor. It was supposed the flush tanks might freeze up and the slush on the streets could not be taken care of through this system; that it might do for Memphis or some of the cities in the Southern States, but not for Canada. I think the success that has attended it in Ontario is evidence that it is quite well suited for this climate if properly designed, and we take advantage of the

experience of the towns where it has been put in. In my opinion there is no greater objection to connecting cellars directly with the sewer under the "Separate System" than in the "Combined System."

Mr. Jones—We have extended the system somewhat since it was originally constructed, and we are not putting in any pipes for cellar drainage. Probably we might do so if we had wet cellars, but they have been practically dry, and I think in such cases the difficulty could be got over by using iron traps and connecting with the main sewer.

Mr. Abrey—I might say in connection with this that Toronto Junction soil scarcely requires any cellar drainage, but when they first commenced to make the house services they were put in all the same. Since then they have not been putting them in, but a year ago or more a by-law was changed and we have since, when required, been connecting directly with the main sewer. There is not much difficulty about it.

[*This Association is not responsible as a body for any opinions expressed in its Papers by Members.*]

THE FIELD OF AMERICAN ENGINEERING.

By ALLAN ROSS DAVIS, C.E., O.L.S.

Napanee.

THE rapid growth in wealth and population, and the remarkable expansion of the trade and commerce of this north half of the American Continent, in past years, have been unprecedented in the history of nations.

Our engineers have always taken a prominent part in the development of the resources of the country. In the various departments of the engineering profession they have faithfully performed the duties devolving upon them. To their wisdom and devotion to the problem of guiding the potent forces of capital and labor may be ascribed, in no small or stinted measure, the honor due for the degree of success that has been attained.

In the early Colonial days the land surveyor was the most important personage identified with the profession of engineering. When the Atlantic States became too small for the demands of settlement, the interior, the Great West and the wilderness north of the St. Lawrence and the Lakes, opened wide their doors for the sturdy pioneers.

Foremost amongst the latter were the Government Surveyors, who, boldly pushing their blazed lines through interminable forests, opened the pathway for the entrance of the varied influences of civilization. Other engineers superintended the building of highways and bridges, and structures of various kinds. Considerable attention was given to the improving of navigation in the harbors, lakes and rivers, and to the building of vessels. Afterwards the introduction of steam as a motive power gave a wonderful impetus to the engineering profession. Mechanical engineers were employed in increasing numbers to design an infinite variety of machinery demanded on every hand. Civil engineers, in addition to the work already in hand, found a broad avenue opening up in railroad location and construction. Mining engineers responded to the call of capitalists to open up the hidden wealth of nature, when steam power rendered the task of boring into the bowels of the earth comparatively simple and inexpensive. Chemists were called into requisition by the manufacturers, and have become indispensable adjuncts of the great hives of industry of this vast country in general, and of the New England States in particular. The demand for architects gradually increased from decade to decade, until the science of architecture in America

to-day is developed to such an extent that it commands the respect of European countries whose architectural monuments are the products of many centuries of the most careful and intelligent study.

Bridge building developed into a special department of engineering in recent years as an offshoot from railroad construction.

Electrical engineering is a department of the profession as yet in its infancy. Although most wonderful progress has been made in the application of the subtle force of electricity to meet the varied demands of our people, electricians confess their inability to thoroughly understand the force, or to measure the possibilities of its future development. However, a large number of engineers are engaged in electrical work at the present time

Thus we find that in the departments of engineering alluded to, as well as in several kindred departments, not enumerated, there has been a continuous expansion, demanding the employment of increasing numbers of engineers throughout the continent in past years. While this has been most satisfactory in a general way, still the excessive demand for engineers in certain departments, at certain periods, led to injurious results to the engineering profession from which it has not recovered, nor is likely to recover from for a considerable period

It is quite well understood that engineering has not been a closed profession similar to law or medicine. In the latter, members can enter only through the front door by passing specified examinations and obtaining duly authenticated certificates. In the former, however, members have flocked in through the back door, with no theoretical knowledge of the profession; which, unfortunately, still continues to leave its rear door unbolted.

Especially has this been the case in railroad construction, one of the largest engineering departments in this country for fifty years. Rodmen, chainmen and even axemen, with scarcely an ordinary public school education, earning from one dollar to a dollar and a half per day, rapidly succeeded to positions of levellers, draftsmen, transitmen and engineers in charge of a party without seeing the inner walls of a college or passing a single examination. They took the place of college-bred engineers and immediately commanded salaries equally as large as the latter. The practical knowledge of the subject obtained during apprenticeship in the various spheres of work enabled them to perform their duties quite satisfactorily when placed in charge. Pocket Field-Books, supplied by enterprising publishers, gave the general principles governing location and construction and the adjustment of instruments. Illustrations and formulæ for laying out simple, compound and reversed curves were given. Tables in abundance, the theory of staking out work and calculating cuts and fills, how to locate a turnout, crossings, frogs and switches,—all these and other subjects, *ad infinitum*, were compressed into small pocket books, compared with which "Trautwine," the present standard engineering field book, is of giant proportions. Such books were convenient and useful in their place, facilitating calculations and expediting field work; but

their contents afforded a meagre stock in trade to a man wholly dependent thereon for his knowledge of railroading.

The ordinary salary of \$75.00 to \$100.00 per month and expenses was a veritable godsend to men who had earned wages since entering the field, had been subject to no expenditure, and were honored, or at least honored themselves with the title of engineers.

We cannot but admire the pluck, application and ambition of many of these men who have risen to distinction in various departments of engineering, despite the fact of having received no university preparation for the work; but while doing so we lament the other fact of vital importance to the profession, that the latter is overcrowded and the scale of remuneration for faithful services lowered, owing, in part, to the admission of unqualified members.

Moreover, a certain degree of opprobrium is attached to the profession, not only because men are privileged to call themselves engineers who possess but little knowledge thereof, but also because the work performed by such has frequently proven unsatisfactory. There are several other causes for the overcrowded condition of engineering at the present time:

(1) The general financial depression we have recently passed through led to the abandonment, for the time being, of numerous enterprises in all sections of the United States and Canada. New projects were simply out of the question during a period of stringency in the money market. While all professions and trades were influenced by the hard times, yet there is no doubt that projects upon which engineers depend for a livelihood are more sensitive to the chilling influences of a financial crisis than are the regular trades and professions. We are recovering rapidly from the severe shock, it is true, but it may be some time before the engineering world becomes restored to its wonted activity.

(2) Diminution of railroad construction has materially affected engineering. The bustle and strife of competing railroads gridironing the interior of the country or throwing their mighty systems across the continent has gradually died away. Those who witnessed the herculean efforts of the "Santa Fe," the "Great Northern" or the "C. P. R." in recent years, when building several thousand miles over expansive plains and through rugged mountain passes to the Pacific, have formed some adequate conception of the work performed and the number of engineers employed. When we remember that nearly 200,000 miles of railroads have been built in the United States and Canada, and that the "Santa Fe" alone, during one period of its construction, employed one thousand engineers, we begin to comprehend the magnitude of this department of engineering. But railroad construction has reached its meridian in this country. Its decline began upon the completion of the systems of railroads alluded to above and is perceptibly diminishing from year to year.

The result is that railroad engineers are forced to roam from "Dan to Beersheba" to-day in quest of employment, while many very competent men find little or nothing to do.

(3) Surveying of public and private lands is likewise decreasing from year to year in proportions. Surveyors were in great demand when the granaries of the Great North-West opened for settlement. The subdivision of public lands in the United States and Canada has been a lucrative field for a large number of surveyors in Government employ. These opened the way for a still larger number whose employment, in a private capacity, has been required for a variety of purposes in every community. But the public lands are now, practically, all sub-divided; and the boundaries of private properties are so well defined, both in urban and rural districts, that the service of one surveyor answers to-day where several were required in former times. Many are consequently compelled to enter other engineering fields, or to combine other branches, such as drainage, irrigation, sewerage, etc., with surveying, in order to make a livelihood.

(4) Government work in general, such as canal construction, harbor improvements, geodetical and geological surveying, etc., is not affording the employment to engineers and surveyors to-day on this continent that it should. There still remains an abundance of work to do by our Governments along these lines; but the excessive cost of public works in the past, combined with the many demands elsewhere upon the revenue annually collected, act as deterrents to the liberal grants demanded from time to time for such purposes.

(5) Municipal work has not only diminished in the line of surveying, but in the other ordinary branches of engineering as well. The highways, as a rule, no longer receive the attention of engineers. The bridges are supplied by bridge companies, which, employing comparatively few engineers, are nevertheless capable of catering to the demands of an extensive area. The City Engineer, with a small staff, is now enabled to plan and superintend all the engineering work of our largest cities with comparative ease.

Thus we find the demand for engineers perceptibly declining in several departments of the field owing to a cause over which they have no control, viz., the partial completion of the aggregate of engineering work. But this alone does not account for the overcrowded state of the profession.

More engineers are entering the field to-day than ever before in our history. This is due to three causes: (1) the increasing popularity of the profession; (2) the very excellent provision made by our universities for the training of engineers thoroughly, in practice as well as theory, in the several departments; (3) the broadening of the profession along new avenues as fresh discoveries in the realm of science are made. Several hundred young men graduate in engineering annually from our universities to swell the membership of the profession. The number is increasing from year to year, and there is no prospect of any diminution in the near future. Our universities are worthy of the very best commendation for their enterprise in meeting the demands of this progressive, scientific age.

What of future engineering possibilities on this continent? We look forward with bright anticipations if certain conditions be com-

plied with by the membership of the profession, and by the universities through which such membership is attained. The present is doubtless a prominent turning point in the history of American engineering.

Owing to causes referred to above, many capable engineers, in the prime of life, or in more advanced years, will be compelled to enter some other field of engineering than that in which they have been engaged, or to leave the profession entirely.

New fields are opening their doors in this extremely elastic profession, but sufficient time has not yet elapsed however to adjust old matters to the new order or condition of things generally in the engineering world. It would be as easy for a leopard to change his spots as for an engineer who had done nothing but build railroads, or a surveyor who had always been engaged in running meridians and base lines, to turn about in a day and construct a dynamo, or make an accurate chemical analysis of some article of commerce.

Reference has been made to several departments—mining, mechanical, bridge, chemistry, electrical—that are continually expanding in dimensions and in all probability will continue so to do for a considerable time in the future. Structural iron work is likewise developing into a department of considerable magnitude, the future possibilities of which are simply illimitable.

The standard of architecture will doubtless continue to be elevated higher and higher; and as the population and wealth of the country increases, architects, in increasing numbers, will find a more profitable field for employment.

As the construction of steam railroads decreases in proportions, it is safe to assume, from the tendency of to-day, that electric railroads will be brought more and more into requisition.

Aerial navigation offers a field for the development of the ingenuity of engineers. While the subject of flying air ships frequently provokes derisive smiles and jests from the thoughtless, the scientific mind will continue to investigate and experiment and finally solve the problem.

Other prospective departments in the field of engineering could be cited to prove that while contraction is taking place in some quarters, expansion is going on in others, but these must suffice for the present. Certain it is there will continue to be a wide field for engineering enterprise in this country for many years.

Our young men need not hesitate to enter the engineering faculties of the universities fearing there will be nothing for them to do after graduation. The universities need not relax their splendid efforts to turn out men thoroughly grounded in the principles of the engineering profession. Even should the supply exceed the demand, the world is wide; new fields are opening in the numerous states of the southern half of this continent, in Africa and China, for ambitious young men. An engineer in the vigor of manhood and free from family ties, with the transportation facilities of to-day, thinks nothing of traveling several thousand miles to find employment. He can do

so and still not be subject to a tittle of the dangers attending engineers in the earlier history of our country in going a few hundred miles from home. Still the adage "a rolling stone gathers no moss," is applicable to engineering as well as to other professions and trades.

A young graduate in engineering may be forced to wander far from the familiar roof tree to start in life; but in order to attain success he must not continue to wander. He should settle down in his chosen field of work and remain steadfast and immovable until he acquires a strong grasp upon his future calling, making remuneration for services a secondary, instead of—as is too frequently the case—a prime consideration. Wandering to and fro over the Continent, in the employ of one corporation one year and another the following year, has been the bane of many an engineer's life. Railroad construction, especially, in this way, has kept many an engineer poor, although at times receiving a large salary.

This leads to the vital point we wish to emphasize, viz., that the authorities of our universities and the engineering student in attendance should invariably select some particular branch of engineering out of the general course, which best suits his inclination and for which he is best adapted, and thereafter make a specialty of that line of work. The professions understand the necessity for this far better than the inexperienced student. After selecting a certain department for his life work the student should be impressed with the fact that he must follow that line of work, and that alone, after leaving college. Moreover, he should be made to realize that any humble position in the employ of a firm or corporation at a merely nominal salary in his chosen line of work, will be far more beneficial ultimately, than receiving a good salary at the beginning at something he knows but little about. Possibly, our universities could do considerably more than they are doing towards assisting their graduates in engineering, to secure employment when going out from the halls of their "Alma Mater." The fact is well known that many engineers leave college with no fixed idea of what line of work they purpose following. Frequently they roam about for several years doing little or nothing, losing their inspiration and enthusiasm in a fruitless search for employment at a salary becoming the dignity of engineers. Some fatherly advice from their professors, along the line indicated above, would doubtless have proved invaluable to many of such.

Finally, in order to make the engineering profession on this continent a grander success in the future, those entering the various departments should join those already employed in such departments in an association for mutual protection and assistance. It is true there are many societies and associations connected with engineering such as the "American Society of Civil Engineers," the "Canadian Society of Civil Engineers," etc., all doing excellent work in disseminating a technical knowledge of useful subjects and cultivating an *esprit de corps* among the members. But *all* the practising members of any one department of engineering do not belong, at present,

to any such society or association. Herein lies the weakness of the engineering profession, as already stated above. We should endeavor to close up our ranks so that none may be permitted to practise who are not members. Our surveyors of Canada have thus closed their ranks. Even a graduate in engineering must pass a preliminary and final examination prior and subsequent to a year's apprenticeship before he is allowed to practise as a surveyor. Anyone presuming to do so without the legal certificate becomes amenable to a most stringent law of fine and imprisonment.

We do not cite this as a model for other societies to adopt, but as a move in the right direction. What we require generally is a law governing every department of engineering, rendering it necessary for every practitioner in that department to be a duly qualified member thereof. Such an arrangement, although including the membership of the societies now in existence, need not interfere with the latter in any respect. Doubtless, it would eventually help the existing societies, by encouraging many to join them who have not hitherto been persuaded so to do.

The standard of engineering has been perceptibly raised during the past decade, and everything points towards a higher elevation thereof, as well as a broader field in which to operate before the close of the century.

An organization combining all the forces of engineering, such as that outlined above, but which space forbids to enlarge upon, would, without doubt, materially contribute towards placing the profession of engineering upon that elevated plane that every man worthy of a place within its membership should be proud to see it occupy.

DISCUSSION.

Mr Butler—I think this is an extremely well written paper. It is perhaps not purely a technical paper, it is more a literary paper, suitable for a magazine, than such as we have in the proceedings of our Society. However, it touches on a matter of considerable importance, in my judgment, and Mr. Davis has seen fit to hold out, I might say, some encouragement for the young men that are crowding into the colleges; I fear he is quite unwarranted in doing so by the present position of the profession in America. It seems that notwithstanding the fact that there are perhaps between two and three hundred engineers in Ontario, without a day's work ahead to them, and no place to go to for employment, nevertheless the colleges are turning out hundreds more into the already overcrowded field. Great progress has been made in electricity, but there is nothing mysterious in it any more than in light and heat. Who can define what light is? It is vibration, wave lengths. Electricity, light and heat have been identified as manifestations of the same thing, but with different wave lengths only. I think in a technical paper like this we should not give currency to such words as "subtle force" because we do know what electricity is. It is a manifestation of the force of energy, and we

know as much of it as of what constitutes light and heat. With reference to the rising practical man in the field of electricity it is admitted that some of the most able men in the world have arisen without the aid of a college education. It must not be forgotten that a college education is not essential for the purpose of educating engineers. It is true that valuable instruction is given in colleges, but the real education which develops the man's energies and abilities is got in practical work in the field and not in studying books. The most learned scholars who fill the highest positions in the colleges, as a rule, are complete failures when at practical work in the field. With reference to the other point I have nothing to say except to compliment Mr. Davis on preparing for us an exceedingly interesting and instructive article, and I therefore think it should be received and published in our transactions.

[*This Association is not responsible as a body for any opinions expressed in its Papers by Members.*]

NOTES ON SOME NEW JERSEY ROADS.

By T. B. SPEIGHT, O.L.S.

Toronto.

BLAZED routes through forests, and trails across prairies, answer the wants of the Indian, but in civilized countries improved roads are an absolute necessity. The better the roads, the less the cost of transportation and travel, the more remunerative are the products of agriculture and the cheaper to the farmer are his necessary supplies.

The inhabitants of sparsely settled districts must, of necessity, submit to the inconvenience of poor roads; but as the country becomes more populous, and the area of cultivated lands is increased, and the products of human industry multiplied, with the increased wealth that these conditions produce, the roads can and should be improved and perfected.

There is no reason why every thickly settled and productive county in Ontario should not be furnished with good roads. Improved roads benefit all classes of the community and stimulate every branch of productive industry.

In most cases, I am satisfied that the reason why the roads in this Province are not better is not that the necessary cost of construction and maintenance is beyond the ability of the people, it is rather the indifference of the parties interested, and the lack of some well-devised plans for their construction and improvement, such as are in force in the principal countries of Europe and are now being carried out in the State of New Jersey, to the south of us, with such marked success, under the system of State Aid, legislation for which was passed in 1891. So complete has been the success of this law that many of the thinking people in the adjoining States are now agitating for similar systems as a means of securing better highways.

Farmers are not now the only class that are interested in good roads. A new factor has arisen in recent years, which promises to take an important part in the educating of public opinion as to the advantages to be derived from better public roads in this Province. I refer to the wheelmen, who are in a position to know of the defects of some of our roads from sad experience. The annual increase in the number of those who ride the wheel is enormous, and the silent steed is no longer regarded simply as a sportsman's hobby, but has also become the easiest and quickest means of transit for the busy man. Hundreds of professional men, clerks, mechanics, laboring men, now go to and from their work on the bicycle.

During the autumn of 1895 I visited Essex County, New Jersey. I was so favorably impressed with the uniformly fine roads over which I frequently travelled on my wheel, that I sought to discover how these roads had been brought to such a state of excellence.

It may be truly called the wheelman's paradise, and any traveller who does not become enthusiastic about such roads as these must indeed be hard to please.

The construction of a complete and thorough system of country roads in any district has many advantages; it increases the marketable value of all lands, and often leads to the improvement of lands hitherto so inaccessible as to be considered almost worthless, while the inhabitants soon reap all the advantages that the improved conditions of locomotion give rise to. Besides which, when the construction of roads is carried out according to some regular system, the expenditure is less than when it is carried out in a fitful or irregular manner and in the end a more satisfactory result is ensured. The conditions of social life are also much improved through the facilities afforded for coming together, and thus one of the great objections to country life—its isolation—is removed.

In Essex and Union counties, New Jersey, where a new system of Telford and Macadamized roads was adopted some years ago, and the roads constructed by funds borrowed upon bonds, the practical result has shown the policy to be most beneficial. The property throughout these counties has increased in value far more than the cost of the roads, and not only in the case of sale and exchange, but upon tax levy. The actual increase of values of lands benefited by the improved roads, it is said, meets the increased taxes requisite to pay the interest upon the bonds issued for the improvement. I might say that these counties are largely wealthy suburban communities and they could well afford to bear the burden of the road tax, but even in those townships that are occupied entirely by a rural population, the increased value was quite as marked as in the suburban centres.

In many of the townships, before good roads were constructed, the assessment of farms had been practically stationary for the previous twenty-five years. Essex County was the pioneer in this movement and a special law for the county was passed about the year 1868.

I am much indebted to the writings of Mr. James Owen, C.E.* (who was appointed about that date), also to his assistant, Mr. A. H. Snow, and to Henry I. Budd, State Commissioner for Roads, as well as to "Good Roads Magazine" for information concerning these far-famed roads. In Essex County alone, they have about two hundred miles of Telford and Macadam highways.

The people were quick to see the advantages of good roads after a few miles were constructed, and it was not long before the major part of the farm produce that formerly went to the city of Elizabeth was diverted to Newark, where the farmers could draw four times as

* "An Address on Highway Construction in New Jersey," by Jas. Owen, C.E.

much over the new country roads to Newark as they had formerly done on the old mud roads to the city of Elizabeth, Union County; so, in self defence, the city of Elizabeth and Union County set about to follow the good example of Essex County in the matter of better roads, to try to regain the lost trade.

I cannot do better than to quote here the words of Mr. C. C. McBride, Editor of the Elizabeth *Daily Journal*, concerning the roads of Union County, which adjoins Essex, when he states: "They are famous to every citizen of the county. They have increased our wealth, enlarged our commercial relations, built up new industries, and new places of residence, brought into market locations practically unknown and inaccessible, and have diffused a new spirit of enterprise and progress throughout the whole country. They were built in faith and what some men considered exaggerated expectations, but they have in every respect more than realized every promise. There is not a man in the county, of sound mind and reasoning faculties, who would return to the old roads if this were possible. They are as beautiful as they are useful and they have demonstrated to the supreme satisfaction of all whose lines have fallen within the pleasant borders of our county that they have been the best investment the county ever made. And they have only begun to exercise their beneficial influences. They are permanent, they are an unceasing joy, and they are daily increasing our wealth and decreasing our tax rates." These words will apply with equal force to the Essex County roads.

To come now to the practical construction of the roads. After they have been carefully graded, with a maximum gradient rarely exceeding four feet in one hundred, the road bed is well rolled with a two to five ton roller, particular attention being paid to the crowning—ten inches is found sufficient in a thirty foot pavement. The following might be taken as a standard specification of the pavement in the County of Essex.

TEN-INCH PAVEMENT.

"Foundation to be a single layer of any hard, durable stone (except water-worn stone), six inches deep, to be set by hand in the form of a close pavement. The stones to be laid with their largest side down, in parallel rows, across the street, the joints to break as much as possible. The breadth of the upper edge of stones not to exceed eight inches and not less than four inches. The interstices are then to be filled with stone chips firmly wedged by hand with a hammer and the projecting points broken off, and the whole surface to be subjected to a thorough settling or ramming with a heavy sledge hammer.

On the top of the foundation a course of broken trap-rock, to be either Orange Mountain or Bergen Hill or Palisade trap, not larger than two inches in diameter, is to be laid and spread and thoroughly rolled. Sufficient stone is to be spread to make a depth of two inches when consolidated.

Packing. Good loam or clay is to be placed in a thin layer on top of the two-inch stone and thoroughly rolled. Only the packing necessary to bind the stone is to be used and according to instructions.

On top of the two inch stone, a course of broken trap-rock, either Orange Mountain or Bergen Hill or Palisade trap, not larger than one and one-half inches in diameter and not less than one inch in diameter, is to be spread and thoroughly rolled. Sufficient stone is to be spread to make a depth of two inches when consolidated. On top of this course spread another layer of packing, similar to the first course.

When the broken stone is thoroughly rolled and consolidated a coat of screenings to be spread, of sufficient thickness to make a uniform surface to the road when rolled."

The price originally paid, say, about 1892, for a Telford pavement was about \$2.25 a square yard twelve inches thick. This has been gradually reduced by the improvements in drilling and blasting, by increased perfection in the stone-breaker and last of all by increased knowledge in the laying and building the road itself, to an average price of 60 to 80 cents per lineal foot for an eight-inch Telford road, 16 feet wide or 56 cents per square yard, showing a very large reduction due to improved machinery and improved methods of construction.

The stone-breakers now in use break about 350 tons per day. The stone is procured in the northern part of the State in what is known as the Orange or Palisade Mountains. The average crushing strength of this metal is about 20,000 lbs. per cubic inch. "Roads built as above," says Mr. Owens, "now cost, in Essex County, 60 to 80 cents a lineal foot, on a roadway 16 feet wide, according to their thickness and the distance the material has to be hauled, including quartz stones for foundation and local help in hauling, and, as much as possible, local labor, and also reducing on many roads to 14 feet, and even 12 feet, I think the cost throughout the State might be placed at \$2,500 per mile, provided due economy and wise administration are secured. The cost of repairs, a proper re-coating of the surface, can be put on in the same locality from 20 to 25 cents per lineal foot, for a 16 foot road. This, by reducing the width and supposing a renewal every 5 years, would amount to about \$159 per mile on the average. While these estimates are based on present prices and present practices, the cost of the original roads of Essex County was far greater, experience with that work was limited, the machinery had not been brought to the perfection that it has to-day."

The excellence of the roads we have alluded to has been so far-reaching in its influence on the community that, in order to foster and encourage the construction of such roads, the State of New Jersey has passed what it known as the "State Aid Law," setting apart \$100,000 a year to be given to the different counties on certain conditions. Some of the salient features of this beneficent measure are as follows:—

“ The Governor of the State appoints a State Commissioner of Public Roads, who must report to the Legislature what roads were constructed with State aid for the year ending on the next preceding 31st day of December ; and the amount of their cost and in general the operations of his office for said year.

The Board of Chosen Freeholders of any county in this State to acquire, improve, maintain and assume full and exclusive control of any public road or roads or parts thereof in their county so far as may be necessary for the purpose of improving and maintaining the same as a road and roads for carriages, etc., but for no other purpose, except such roads or avenues as are now under the control of any County Road Board ; then, in order to acquire and assume such control in any county with power to improve and maintain the same, the said Board shall cause a map to be made, or adopt a map already made on which the principal public roads or highways of the county shall be or are laid down and shall cause the roads or parts of roads which the said Boards intend to acquire and assume such control of, to be indicated thereon, and shall file the said maps when so marked, in the office of the Clerk of the County ; whereupon the roads or parts of roads so marked or indicated on the said map shall become and be known as ‘ County Roads ’ and shall thereafter be improved, maintained and kept in safe and convenient condition for public use, etc.

The Board of Chosen Freeholders shall employ a competent engineer, at a reasonable compensation, to survey the county roads, or any part thereof, when necessary, to prepare specification for pavements or other improvements, intended to be made in pursuance of this act, and to supervise the work and materials used ; after such improvements or any part thereof shall have been completed the same shall be kept in repair at the expense of the county ; and some competent person shall be employed by the said Board annually at a fixed compensation to inspect the condition of the county roads, etc.

Such Inspector shall have power to cause the necessary repairs to be made or other improvements under this Act. Whenever the Board of Chosen Freeholders of any county in this State shall by resolution have declared their intention to cause any particular road or section thereof within such county to be improved under the provisions of this Act, such Board shall cause all the necessary surveys to be made and specifications to be prepared ; the specifications shall require the construction of Macadamize road or Telford or other stone road, etc. And after said specifications have been prepared they shall be submitted to the Board of Chosen Freeholders for their approval or rejection ; and if such Board shall approve them they shall then be submitted to the State Commissioner of Public Roads for his approval or rejection ; it shall be the duty of the Commissioner of Public Roads, before approving the specifications for any road so submitted to him, to ascertain by personal examination or otherwise, the natural character of the soil upon which such road is proposed to be constructed ; and all other facts that he may deem important, and if after examination of the specification and facts so ascertained he shall be of the opinion

that the specifications provide for the construction of a road that will, with reasonable repairs thereto, be firm, smooth, and convenient for travel at all seasons of the year, and if he shall be of the opinion that one-third of the cost of constructing the road or section of road to which such specification relate, together with one-third of the cost of constructing all other roads and sections of roads in this State under specifications previously approved by him, will not in any one year exceed the sum of \$100,000.

If one-third of such cost shall appear to the State Commissioner of Public Roads to exceed the sum of \$100,000 then, and in such event, the said sum of \$100,000 shall be apportioned by the Governor and State Commissioner of Public Roads amongst the counties of the State, in proportion to the cost of road constructed therein for such year as shown by the statements of costs filed in the office of the State Commissioner of Public Roads; the Governor and said State Commissioner of Public Roads shall certify to the State Comptroller the amount to be paid each county for such year.

In every case where a contract shall be awarded, after the presentation of such petition as aforesaid, the Board of Chosen Freeholders, instead of certifying to the County Board of Assessors two-thirds of the estimated cost of the work, as prescribed by this Act, shall certify two-thirds of said estimated cost, less one-tenth of the said estimated cost, which sum the County Board of Assessors shall include in their assessment of county taxes."

It will be observed that under this Act the property owners fronting or bordering on the road pay one-tenth and the State one-third of the costs. These payments are practically a free gift to the county, which pays the balance and thereafter must keep the roads in repair.

So far this Act has been most advantageous and has been the means of stimulating public sentiment in favour of improving the highway throughout the State. Fourteen of the counties, out of a total of twenty-one, in the State, are now taking advantage of the State aid. The demand for stone roads is decidedly on the increase, especially in sections where they have been partially enjoying their benefits.

We are all agreed that improved roads are a prime necessity and it would appear that that which is so desirable, and which everyone must favor, can, with proper effort, be secured.

The fact that "better roads" is in the air and is being discussed in many parts of Ontario, and the existence of an influential organization, such as the "Ontario Good Roads Association" for the purpose of educating the public, generally, to the advantages to be derived from the improved condition of our highways, both indicate progress. The Department of Agriculture is doing a good work in distributing literature along these lines. All this gives promise that the people are at last beginning to be awakened concerning this important subject, and we trust that something will soon be accomplished to wipe out the reproach of the average Canadian country road.

DISCUSSION.

Mr. Bowman—The paper last night was to show the possibilities of getting good road metal in Ontario, and the two work together very nicely. Unfortunately, owing to the limited time last night there was practically no discussion. I have been looking round for some time to get a geological map and I discovered a pretty good one upstairs. It is labelled, "A Strata Map of the United States." It happens to take in Ontario with the United States. This map represents the different strata in the order in which they stand, the Laurentian being the lower, of course. It is a sort of raised map showing the disposition of the different formations. The pink is the Laurentian below, running from a point near Gananoque across to the mouth of the Severn River. In that area there is no difficulty in getting any quantity of trap rock, so the geologists tell us. Up in the Huronian formation, coming down to about Bruce Mines and along towards Sault Ste. Marie, the very best of trap rock can be had, and that is now being shipped from Bruce Mines down through Lake Huron, and by Lake Erie to Cleveland, and was used there last summer in their streets. There are beautiful roads being constructed by the Park Commissioners of the City of Cleveland. It cost them nearly \$4 a square yard for the road constructed, \$3.75 or something like that. The specification is very much like what Mr. Speight gave for these roads in New Jersey. There is a course of ten inches of other stone, limestone, on top of which there is a depth, in different layers, of six inches of trap rock. They do not consider any brick pavement is at all equal to a trap rock macadam road, and that is shown by their willingness to pay about twice the money for the latter. It is for the purpose of park roads, driving roads, not city streets. Trap rock is put down as the first in order of excellence for road metal, trap, or basalt. I have the best authority in Canada for saying that the gneiss of Canada is far superior to the granites.

Mr. Butler—Most of our granites are taken from the vicinity of Granite Island, down in the St. Lawrence River, where it is very largely crystalline, feldspar through it, and more or less mica, so that I know from practical experience and from working where it has been used, that it breaks up quickly and causes mud on the road, in fact I had about forty pounds of it ground up into dust and used as a fertilizer on land last year to test it.

Mr. Bowman—In regard to the relative values of gneiss and granite, I will quote the words of Dr. Dawson, the Director of the Geological Survey. He says: "In comparing the gneisses and granites of our Laurentian country, I would place the former before the latter in point of resistance to wear or crushing, although exceptional cases no doubt may occur in a reverse order."

Looking at the geological map, after we get out of the Trenton formation, and get west into what would be the Devonian, the western part of the Peninsula, we cannot expect any hard rocks, even in

the Trenton, hard limestones are the only valuable rocks, and are much better than you get west. From Hamilton up to the Peninsula between the Georgian Bay and Lake Huron, west of Toronto, there are no hard rocks. That is there are no trap rocks, there is no granite to be got at the surface, or anywhere near the surface. We have to depend on limestones and sandstones; sandstones such as we have in this formation are utterly useless for macadam purposes. The sandstone is very soft indeed. The limestone is what we have to depend on, if we want to take quarried rock. In this limestone will be found cherty bands of very great hardness, and these appear in different quarries opened. In the Hamilton mountain there is a band they will not touch for building purposes it is so hard. It would make excellent material for macadam roads. So in Western Ontario we have to depend on the cherty bands in the limestone, unless we bring in rock some hundreds of miles from the Laurentian area.

Mr. Gibson—I have had a great deal to do with making roads. There is no dispute amongst Engineers as to how we should make roads if we can only get the money to make them. There is one great difficulty that Engineers have at the first start, and that is to get drainage. It seems almost impossible to persuade the public at large that laws should be made to give Engineers a chance to drain the roadways. As a rule the public at large drain all their lands on the public highway, but as soon as you wish to divert the water from the highways to private property you have a law suit. Until the Government makes a simple rule by which an Engineer has a right to turn the water in a roadway and have a simple method of determining the damages, it is almost impossible to improve our ordinary roads. In cities and towns the whole matter is settled up very quickly and they put it on as a frontage tax.

In making roads in the first place we want drainage, because the frost penetrates from three to four feet in the Province of Ontario, and after the water is removed from the roadway you have a bog in the spring. I know Yonge Street is considered one of the best roads in the County of York. Very frequently in the spring it is a quaking bog, and sometimes the heavier wagons cut through the covering of macadam which is frequently six to nine inches, but sometimes only four or five, and thus actually impede the stage lines. This is from want of good drainage to carry off the ordinary rainfall of the country, and sometimes it is impossible to get rid of the water. In the Township of York now they have two or three cases of damage on account of the flow of water, and it is very serious. One case in the County cost the Council \$3,000, for turning the water back out of what they considered its natural course, the only possible course, and in this case it is where there is a swale, and a drain was made. There is never any difficulty in getting the judgment of the court for damages. Some action must be taken, and I think a resolution or suggestion on the part of our Association should be made memorializing the Government, that a Commission should be sent through the Province

to consider the question of how to get proper drainage. The roads in the County of York which have been kept up heretofore by the county are now to be thrown upon the townships. They say they do to pay. Toll gates having been relinquished, the people are fighting very strongly against the roads being left as a burden on the local municipality. Now, the scheme that has been given us by Mr. Speight on the New Jersey roads is a very excellent scheme and the very thing we want in Ontario; that is, that the Provincial Government pay about one-third of the cost of these roads and the local residents, those who have frontages, and the county two-thirds.

In the case of a macadam road, I lay a foundation of good cedar, if the soil is damp or wet. That is consolidated until it is a first class corduroy road. After the cedar is laid, clay is put on, and then upon that is macadam which is consolidated and then gravel, and that is again consolidated. Finish it with a coating of fine gravel, and have it graded to a proper curve and you will have a very good road.

Mr. Speight—What struck me most was the cost of these roads. I find in this year's report of the Inspector of Roads for Burlington County, where the stone had to be brought a hundred miles or so by railway, a 16 feet pavement was constructed for \$3,240 a mile, one-third of which sum was consumed in freight charges on material. So Mr. Bowman's estimate of \$2,500 is well within the limit.

About Provincial aid, I think we never will get a really good system of roads until we get something of that kind, Provincial or Federal. I think \$3,000 a mile is given by Governments towards railways in the various parts of the Province. If they would give \$1,000 a mile towards main highways, it would be a great benefit to the people. Nearly every country in Europe assists in the construction and maintenance of highways. France alone expends twenty million dollars at least a year on roads, and that adds more to the wealth and thrift of the people than anything else does.

This Association is not responsible as a body for any opinions expressed in its Papers by Members.]

“ROAD METAL.”

By HERBERT J. BOWMAN, O.L.S., C.E.

Berlin, Ont.

THE term “Road Metal” is used to designate the material forming the impervious covering of roads, and may be composed of broken stone, blast furnace slag, gravel, or even burnt clay.

GRAVEL.—This is the most common material used in making the country roads of Ontario, and where good pit gravel can be obtained close at hand, it is without doubt the most economic road metal. There is considerable difference in the quality of gravel, that found in the eastern part of the Province making a harder wearing surface as it is composed of fragments of much harder rocks, than those found in western Ontario. This, no doubt, partly accounts for the excellence of the gravel roads of the County of Hastings. In the western part of the Province where gravel is found at all, it is chiefly composed of pebbles of soft limestone which quickly grind to powder under heavy traffic, and in some districts no gravel is to be found within a reasonable distance. For these districts burnt clay may be found to be the most economic material for the road covering, but so far its use seems to be confined to the Western States. For ordinary country roads, unscreened gravel of a depth of ten inches may be used with the larger stones broken by hand, and a road covering formed good enough for all practical purposes, but for leading roads a better road may be formed by screening the gravel, although there is some difference of opinion as to the number and size of screens to be used. The following quotation from a treatise on “The Science of Road Making” by Clemens Herschel, M. Am. Soc. C.E., is worthy of note:—

“In gravelly soil all the materials that are needed for a good road are frequently on the spot; they only need sorting out and relaying. For this reason a common gravel sieve often constitutes the principal instrument, whose judicious use will make a good road out of a miserable string of ruts and cobbly elevations. It would only be necessary to sift out and separate the soil under the road to a sufficient depth, into cobbles, coarse gravel, fine gravel and sand; then replace them in the order named and with the proper thickness of layers of each; wet down and roll, and the result would be a good road.”

Where gravel is scarce or has to be hauled a long distance, an excellent road may be built having a Telford foundation of field stone, on top of which screened gravel is placed in two layers, each to be thoroughly rolled. In this method six inches in depth of gravel is quite sufficient. Roads of this nature are the favorite ones in Central Park, New York, where Rhoads gravel is used and "it being more than ordinarily clean and hard, bears an intermixture or adulteration of twenty to twenty five per cent. of inferior material to perfect its binding properties."

BROKEN STONE.—For leading country roads and town or city streets a better road metal is required than the gravel found in most parts of Ontario, and broken stone will best meet this requirement. Blast furnace slag is also an excellent road metal and is being largely used in the construction of the Rochester, N.Y., boulevards, but the supply of slag in this Province is limited to the product of the new smelting works at Hamilton. Rocks suitable for breaking up into road metal should be hard and tough and proof against the action of the weather, qualities not always found together. Co-efficients of quality for various road materials have been obtained by the engineers of the French "Administration des Ponts et Chaussées" as given in the following table, where the co-efficient twenty is equivalent to "excellent," ten to "sufficiently good" and five to "bad."

Materials.	Co-efficient of Wear.	Co-efficient of Crushing
Basalt.....	12.5 to 24.2.....	12.1 to 16.
Porphyry.....	14.1 " 22.9.....	8.3 " 16.3
Gneiss.....	10.3 " 19.....	13.4 " 14.8
Granite.....	7.3 " 18.....	7.7 " 15.8
Syenite.....	11.6 " 12.7.....	12.4 " 13.
Slag.....	14.5 " 15.3.....	7.2 " 11.1
Quartzite.....	1.8 " 30.....	12.3 " 21.6
Quartzose Sandstone...	14.3 " 26.2.....	9.9 " 16.6
Quartz.....	12.9 " 17.8.....	12.3 " 13.2
Silex.....	9.8 " 21.3.....	14.2 " 17.6
Chalk flints.....	3.5 " 16.8.....	17.8 " 25.5
Limestone.....	6.6 " 15.7.....	6.5 " 13.5

A rougher classification of rocks in the order of their value for road metal is as follows: (1) Basalt or Trap, (2) Gneiss, (3) Granite, (4) Limestone, (5) Sandstone; and it will be interesting to investigate where these may be found in Ontario.

The first three rocks are found in unlimited amounts at most points north of a line drawn from Gananoque to the mouth of the Severn River. Upon reference to a Geological map, the best one being that attached to the Report of the Royal Commission on the Mineral Resources of Ontario issued in 1890, it will be seen that this line represents the southern edge of the Laurentian area in Ontario. Trap rock, which is no doubt the best for road metal,

is said to be found in dykes from a foot or two to forty or fifty feet wide in the gneiss near Gananoque and could, no doubt, be found at many points in the Laurentian of Northern Ontario, but is most common in the Huronian. In this latter formation near Bruce Mines an excellent trap (quartz diabase) is found and is shipped to cities in the United States to be broken up into road metal. It was used last summer in the construction of the Telford roads constructed in Cleveland, O., for the Board of Park Commissioners of that city.

South of the Laurentian area trap, gneiss and granite are found only in the shape of boulders brought down during the Ice Age and dropped as moraines. Thus along the band of moraines, or rough stony hills, stretching from Trenton to the lower end of the Georgian Bay, plenty of material for road metal may be obtained good enough for ordinary purposes. Scattered over a large part of the western peninsula of Ontario, large boulders may also be found, and if care is taken to exclude the soft limestone and disintegrated granite and gneiss, a fair road metal may be made, often the only kind that can be obtained at a reasonable cost. Plenty of limestones, often hard and fairly durable as road metal, may be found among the Trenton limestones stretching from Kingston to about Bowmanville, and across to the Georgian Bay. Some good material may also be obtained from the Niagara limestones along the "mountain" or escarpment between Niagara Falls, Hamilton, and a point near Collingwood, also from the Guelph limestones between Niagara Falls and Southampton. In many of the limestones in this part of Ontario there are cherty bands which would produce excellent material for road metal, and in many of the more rapid rivers considerable accumulations of hard cherty boulders are found.

Although small cobble stones are not desirable for broken stone on account of the smooth water-worn surfaces of the greater part of the product, this objection only holds good to a limited extent when large boulders, often several hundred pounds in weight, are used.

CONCLUSION.—As the best obtainable material for road metal is often the cheapest in the end, further information is required as to where the best rocks are found. No complete geological survey of Ontario has ever been made, and the only information as to the older part of the Province that can be obtained is from Sir William Logan's "Geology of Canada" (1863), and this publication of the Geological Survey is quite out of print and is found only in a few libraries.

The thanks of the writer are due for much valuable information to Dr. George M. Dawson, Director of the Geological Survey of Canada, to Professor A. P. Coleman, of the School of Practical Science, and to A. Blue, Esq., Director of the Ontario Bureau of

Mines ; and it is hoped that the members of the Association of Ontario Land Surveyors will, in the discussion, give much additional information as to the qualities of road metal in actual use throughout the Province.

DISCUSSION.

Mr. J. W. Tyrrell—As to the use of gravel placed at the depth of ten inches, do you think that would be good? It appears to me a depth of comparatively fine gravel such as that would make too heavy a road, that wheels will sink into it to a considerable extent.

Mr. Butler—Perhaps I may repeat one or two things from Trautwine's pocket book. One of the questions asked is, how to make a good road. The first thing necessary is drainage. And what was the next thing necessary? Better drainage. And what is the next thing? A little more drainage. That seems to have been left out of Mr. Bowman's suggestion. Other than that I think his method is all right, but if it is intended to be a road it would be well to suggest this.

The Chairman—I think the title of the paper is "Road Metal," not the making of a road.

[*This Association is not responsible as a body for any opinions expressed in its Papers by Members.*]

THE DITCHES AND WATERCOURSES ACT, 1894.

By B. J. SAUNDERS, O.L.S., C.E.

Brockville.

IN the preparation of the following paper, the writer has been guided by the Draft Bill sent out by the Local Legislature to municipal councils, surveyors, public officers, etc., etc., in the year 1893; by the discussion before this Association at its annual meeting in 1894; by the Ditches and Watercourses Act as passed by the Local Legislature in 1894; and by experience gained in the working of the Act since its passing, and by experience with the former Act of 1883 and its amendments.

In 1893, when the Draft Bill was circulated throughout the Province, there was a general feeling of relief expressed by the many persons—including surveyors and engineers—who had had something to do with the Act of 1883, and it was hoped, and in many cases almost fully realized, that a new era in ditch construction was about to dawn in this Province. What that is which was hoped to be realized, those who have had any experience at all with the Act of 1894 can probably best answer.

That the question of ditch making and the proper drainage of land are important matters to the agricultural portion of our population, is being felt by all classes, especially by the agriculturalists themselves, also that the random construction of ditches and drainage works, which has prevailed to a great extent in the past, is both unwise and expensive, is beginning to impress itself more fully upon the farming community, and not until this class realizes that it is just as important, if not more so, to have their ditches and drains properly and systematically laid out as it was for their side lines to be accurately run, can we expect to see a general advance.

In the Province of Ontario our laws with reference to the division of lands are in a very satisfactory condition; but, unfortunately, the same cannot be said with reference to our drainage laws. The question naturally arises, Who are to be the movers in bringing about a better condition of affairs? Is it the Legislature of the Province? Is it the judges who try appeals? Is it the lawyers who find flaws, real or imaginary, in the Act and awards and proceedings under the Act? or is it the people themselves who have the most need of drainage laws such as are workable for a fairly intelligent man? The

answer to one and all of these questions will undoubtedly be an unequivocal No. Who, then, you ask, are to bring about the desired change? The people themselves who want the ditches are to-day insufficiently organized, and in many cases insufficiently educated, to make a move for themselves for their own betterment, and the only class of men who can intelligently assist them must consequently be the surveyors and engineers of the Province, who certainly have an interest in the matter, and this Association should make itself a unit in effecting a change and impressing its views tangibly upon our Legislature. But this is somewhat away from the subject in hand.

Let us consider the Act of 1894 as it stands, up to and including the time for hearing appeals against awards made in pursuance of the Act:—

Passing Section 1 and 2 by, we find in Section 3 interpretation clauses for a number of expressions and words used in the Act. These have removed many difficulties existing under the former Act, but do they go far enough? Does the word "owner" include a leaseholder, who, so long as he pays an annual rental, controls certain lands, and who has power also to convey his leasehold? also does the word "highway" embrace road allowances controlled by the municipality but which are unopened?

In the 4th Section of the Act we find that every municipal council (1) shall appoint by By-law (Form A) "one person to be the Engineer to carry out the provisions of this Act," and (2) shall by By-law fix the fees of the Clerk and Engineer.

Frequently cases arise where the Engineer will find on his attendance that irregularities have occurred in the preliminary stages of the proceedings, and the only sensible thing to be done is to advise the parties to that effect; but there appears to be no provision in the Act for the payment of any costs already incurred. Whether or not it would be strictly legal to add such preliminary costs to any future proceedings, it, in the writer's opinion, is difficult to say, although it has been his practice to do so.

SECTION 5, LIMIT OF WORK.

The writer has had only one case in which it was necessary to extend the work into more than seven original township lots, and in this case the necessary petition and resolution under this section were obtained. There seems to be more or less absurdity with this Section in limiting the work to seven original township lots, as township lots vary so in width and length, and then the section allows you to extend the ditch along or across any road allowance indefinitely so long as you keep within the \$1,000.00 limit in cost provided by sub-sec. 2 of sec. 5. Again the direction of a proposed ditch might be lengthwise of lots, in which case the limit of \$1,000.00 would undoubtedly be reached long before the limit in length defined by the seven lots. It seems that the suggestion of the Drainage Committee, as recorded in the report of the Association of 1894, had the right way of coming at

the settlement of the extent of work to be done under the Act. The basis of any measurement should be by a definite quantity applicable to all localities alike, and not by any such sliding scale as so many lots, etc. Section 5 also provides that every ditch to be constructed under this Act shall be continued to a sufficient outlet, but the Act does not say what a sufficient outlet is. An interpretation of this expression is found in the interpretation clause of the Drainage Act, 1894, but whether the same meaning is to be placed under this Act is not for the writer to say.

The Act of 1883 permitted the discharge of water upon any owner's land providing the consent of said owner be obtained. Under the present Act the Engineer has to take chances on sufficient outlet in a great many cases, especially in those sections of the Province where drainage work is only in a state of embryo, and between "sufficient outlet," "seven lot limit" and "\$1,000.00," the working of the Act is very much hampered and sadly perplexing.

LANDS LIABLE.

Section 6. We now come to Section 6, in which is found a number of matters which are deserving of close attention.

In the first place, where is the point of commencement of a ditch and who shall fix it? The Act does not state anything definite with regard to the point of commencement. It has been the writer's practice, whether rightly or wrongly, to fix this point so as to give the greater benefit to the owners of the lands higher up than the mover in the particular case. Of course much depends upon local conditions and as to whether persons above the mover have been notified in the first instance or not. The limit of Assessment of lands is fixed at 75 rods on either side of the ditch and the same distance from the point of commencement, with a reservation made with respect to lands through which the ditch does not pass, and which lands also adjoin a road allowance traversed by the ditch. Such lands shall not be liable except when directly benefited and then only for the direct benefit. What did our Legislators really mean? It is almost unnecessary to state to an Association of Surveyors that there are a great many road allowances throughout the Province that are not used for roads, and many of them that never will be opened up as roads. Again we have many roads used by the public that are not on road allowances and nowhere near a road allowance in the usual sense. It would be possible to conceive of an application of this clause were all roads on road allowances and all road allowances used as roads, but under existing circumstances it does seem that the clause is only a stumbling block, and then something not heard of before in the Act is introduced, namely, direct benefit. Why not exempt those lands altogether or assess them as any others. There is also a word "traversed" introduced. How is this word to be applied? Must the ditch traverse one foot of the road allowance or its whole length, or the portions adjoining the lands that are not to be assessed? To some the answers

of the questions here asked may seem simple enough, but to the writer they have proved a source of great trouble, and the only appeal he has ever had was on account of these latter clauses of Section 6. In the draft bill of 1893 this Section was left in good condition, but for some reason or other our lawmakers saw fit to add certain clauses which render it difficult of being clearly understood.

Sub-section 2 of Section 6 is somewhat indefinite with respect to the meaning of "East of the County of Frontenac." This County does not extend from the St. Lawrence River to the Ottawa nor is its easterly boundary a meridian. The description, "Any County lying east of the County of Frontenac" is, to say the least, not as definite as would be expected in an Act of Parliament.

In the matter of assessing lands a good deal of trouble is experienced in assessing timbered lands and lands which owners say they do not wish drained, for no particular reason other than that they have an abundance of other land to work. It is even held by some of our judges that timbered lands should not be made liable for the construction of any portion of the work. If such be the case and the true interpretation of the law, the Act in nine cases out of ten is almost valueless as a means to assist an enterprising man to drain his low lands, for more or less timbered land will be found along every work of this kind, of any extent.

OWNERSHIP.

We have now arrived at that portion of the Act, when the work of making, or attempting to make, a ditch under it is begun. Section 7 is a wise clause, providing for the filing of a declaration of ownership, thus preventing unqualified persons from getting themselves, their neighbors, and the engineer into no end of trouble.

Under Section 8, the owners endeavour to reach a settlement among themselves, and if it appear at the meeting that other parties, who are not notified, are interested, they may adjourn to give such other parties the twelve clear days' notice required by Section 8 of the Act. If an agreement be not arrived at by the parties at the meeting or within five days thereafter, then the owner requiring the ditch may file with the clerk of the Municipality, the requisition (Form E.) requesting that the engineer, appointed by the Municipality, fix a date, etc., when he will attend at the locality, etc., and make his award. The engineer fixes his date and notifies the clerk, who notifies the owner requiring the ditch, and he, the other people. Let us halt for a few moments and look over the procedure up to this point.

- (1) Municipality appoints Engineer by By-Law (3, 4).
- (2) Municipality fixes Engineer's fees and Clerk's fees (4).
- (3) Engineer takes oath of office (S. 2, S. 4) (S. 3, S. 4).
- (4) Owner requiring ditch, takes declaration of ownership and files with Clerk (Form B) (S. 7).
- (5) Owner requiring ditch calls friendly meeting (Form C) to endeavour to effect agreement, not less than twelve clear days' notice

to be given; possibly other parties not notified, must now be an adjournment to give them twelve clear days' notice; result, no agreement (S) (S. 9.) (S. 11).

(6) Wait five days more; result, still no agreement (S. 13).

(7) Owner requiring ditch files requisition with Clerk requesting attendance of Engineer (Form E, S. 13).

(8) Clerk sends copy by registered letter to Engineer (S. 13).

(9) Engineer notifies Clerk of date he will attend, not less than ten or more than sixteen clear days from date of receipt of copy of requisition (S. 13).

(10) Clerk notifies owner requiring ditch by registered letter of date of attendance of Engineer (S. 13).

(11) Owner requiring ditch serves notice on all the other parties named in requisition of date of attendance of Engineer, not less than four clear days (S. 13), (Form F).

(12) Owner requiring ditch delivers a copy of service (Form F) to Engineer, at least one day before date of attendance by Engineer.

Gentlemen, in the name of common sense, where are we? Here are twelve distinct operations to be gone through with before the Engineer leaves home to make the examination, and if number twelve is not complied with he need not start out at all, and the owner requiring the ditch can only start back at, well it is difficult to say where, and begin operations in a manner again.

It does seem that there should be a simpler way of getting down to business in this matter of ditch making, and the members of this Association should think it over and devise some means for simplifying this procedure. It surely is not all strictly necessary to sound jurisdiction. Of the twelve foregoing operations the only one which can be left undone for even a time is that of the declaration of ownership, and it is only by an amendment in 1895 that this was permissible.

Let us suppose that the Engineer attends at the time and place named by him. He examines the locality (in which operation he is not limited), also the interested parties and their witnesses, but he does not seem to be provided with any means of compelling witnesses to appear before him and giving evidence, such as the power with which surveyors are clothed.

In the writer's opinion it is a very wise measure to take the evidence of the parties themselves, reduce it to writing and have it signed by them, as an offset to their swearing differently in the event of an appeal. In this way the Engineer puts himself in the safest position possible, and has a guide as to the wishes of the parties themselves as to how and where they want the ditch constructed and located, leaving himself as an arbitrator when opinions of interested parties conflict, and not open to the accusation in the event of an appeal of being unwilling to listen to the opinion of those most deeply interested in the work. Should the engineer find that other owner's lands than those already notified will be affected by the proposed ditch, he may adjourn proceedings, so that such owners may

receive the notice prescribed by Sec. 14 of the Act, namely, four clear days' notice, while the owners themselves required twelve clear days to bring in other parties. Why not let the engineer bring every owner in on the four days' notice and save time if nothing else?

In the preparation of his award the engineer should be very explicit in describing the point of commencement, the termination of the ditch, also its course, general dimensions, etc., etc. Plan and profile, with cross sections of ditch, should generally be prepared and filed with the award. They will be found very useful in case of appeal, and form a better record for future reference as to the location, grade, etc., of a ditch than a mere written description.

In the event of an appeal tried before the judge, the greatest care should be given by the engineer to the manner in which he prepares his evidence to back up his award, hence the necessity of the greatest care being observed in making the award in the first place. Dissatisfaction will, in fully seventy-five per cent. of award cases, be expressed by some owner or owners affected by the award, and if one half that is told about the unfortunate engineer be true, he is a very dangerous person indeed. It is on account of this dissatisfaction that the evidence of owners affected should be taken in writing at the examination of the lands, by the engineer. It will also often be found upon appeal that the grounds of appeal alone are not tried by the judge, but that the whole proceedings from beginning to end are most minutely gone into. Whether or not this is strictly as it should be, the opinions of the members of this Association from different parts of the Province will be found invaluable to the profession at large.

In conclusion the writer would suggest that efforts be made—

- (1) To simplify the procedure.
- (2) To found jurisdiction in a simpler manner, and give Engineer power with the consent of parties to amend irregularities, such as insufficient clear days in service of notices.
- (3) In the trying of appeals to have the points on which the appeal is based alone tried, and not the whole question from beginning to end upturned.
- (4) Records of appeals kept so that uniformity of work may be more nearly arrived at than at the present time.
- (5) The question of costs settled in the event of awards being set aside, amended, or referred back to Engineer; at the present time the mover, who has done just as the Act specifies, is often saddled with the whole of the costs of an appeal.

The suggestion of a former meeting of this Association, that appeals be tried before a different court, was a good one. Further appeal might then be made to the county judge.

[*This Association is not responsible as a body for any opinions expressed in its Papers by Members.*]

ONTARIO BOUNDARIES.

By A. NIVEN, O.L.S.

Haliburton.

THAT part of Canada now known as Ontario and Quebec was formerly called Quebec, and on the 18th June, 1791 a Royal Proclamation was issued dividing it into the Provinces of Upper and Lower Canada, and the following is the description of the division line given in the Proclamation :

“ Commencing at a stone boundary on the north bank of the Lake St. Francis at the cove west of the Pointe au Baudet, in the limit between the Township of Lancaster and the Seigneurie of New Longueil, running along the said limit in the direction of north, thirty-four degrees west to the westernmost angle of the seigneurie of New Longueil ; thence along the northwestern boundary of the seigneurie of Vandreuil, running north twenty-five degrees east, until it strikes the Ottawa River, to ascend the said river into the Lake Temiscamingue, and from the head of the said lake by a line drawn due north until it strikes the boundary line of Hudson's Bay ; including all the territory to the westward and southward of the said line to the utmost extent of the country commonly called or known by the name of Canada.”

The above described line clearly defines the eastern boundary of Upper Canada, and now called, since the Confederation Act of 1867, “ Ontario.”

The southern boundary east of Lake Superior is fully set out in the commission issued to the Earl of Durham, 30th March, 1838. “ Beginning at the said stone boundary between Lancaster and Longueil, by the Lake St. Francis, the River St. Lawrence, the Lake of the Thousand Islands, Lake Ontario, the River Niagara, which leads into the Lake Erie, and along the middle of that lake, on the west by the Channel of Detroit, Lake St. Clair, up the River St. Clair, Lake Huron, the west shore of Drummond Island, that of St. Joseph and Sugar Island ; thence into Lake Superior.

The portion west of Lake Superior was finally located under the Ashburton Treaty of 1842, and may be quoted from the treaty :

“ Through the middle of the sound between Ile Royale and the northwestern mainland to the mouth of Pigeon River and up the said river to and through the north and south Fowl Lakes to the lakes of the height of land between Lake Superior and the Lake of the Woods, thence along the water communication to Lake Saisaginaga and

through that lake; thence to and through Cypress Lake, Lac du Bois Blanc, Lac la Croix, Little Vermillion Lake, and Lake Namecan, and through the several smaller lakes, straits or streams connecting the lakes here mentioned to that point in Lac la Pluie, or Rainy Lake, at the Chaudiere Falls, from which the commissioners traced the line to the most northwestern point of the Lake of the Woods." This line was determined by the commissioners appointed under the 6th and 7th articles of the Treaty of Ghent, December 24th, 1814; thence along the said line down Rainy River and through the Lake of the Woods to the northwest angle thereof, being in latitude $49^{\circ}-23'-55''$ north and in longitude $95^{\circ}-14'-38''$ west from the observatory at Greenwich. At the northwest angle of the Lake of the Woods, a monument was planted by David Thompson, July 25th and 26th, 1824.

We shall now proceed to travel over the northern and western boundaries of Ontario, and I cannot do better than read the award of the arbitrators appointed by the Government of Canada and Ontario a number of years ago to determine these boundaries, and which, as you are aware, was confirmed by the Privy Council when the case was carried to England.

AWARD OF THE ARBITRATORS.

To all to whom these presents shall come :

The undersigned, having been appointed by the Governments of Canada and Ontario as Arbitrators to determine the northerly and westerly boundaries of the Province of Ontario, do hereby determine and decide that the following are and shall be such boundaries, that is to say :

Commencing at a point on the southern shore of Hudson's Bay commonly called James' Bay, where a line produced due north from the head of Lake Temiscamingue would strike the said south shore; thence along the said south shore westerly to the mouth of the Albany River; thence up the middle of the said Albany River, and of the lakes thereon, to the source of the said river at the head of Lake St. Joseph; thence by the line to the easterly end of Lac Seul, being the head waters of the English River; thence westerly through the middle of Lac Seul and the said English River to a point where the same will be intersected by a true meridional line drawn northerly from the international monument placed to mark the most north-westerly angle of the Lake of the Woods by the recent boundary commission; and thence due south, following the said meridional line to the said international monument; thence southerly and easterly, following upon the international boundary line between the British possessions and the United States of America, into Lake Superior.

But if a true meridional line drawn northerly from the said international boundary at the said most north-westerly angle of the Lake of the Woods, shall be found to pass to the west of where the English River empties into the Winnipeg River, then, and in such case, the northerly boundary of Ontario shall continue down the mid-

dle of the said English River to where the same empties into the Winnipeg River, and shall continue thence on a line drawn due west from the confluence of the said English River with the said Winnipeg River, until the same will intersect the meridian above described ; and thence due south following the said meridional line to the said international monument ; thence southerly and easterly following upon the international boundary line, between the British possessions and the United States of America, into Lake Superior.

Given under our hands, at Ottawa in the Province of Ontario, this third day of August, 1878.

(Sd) ROBT. A. HARRISON,
(Sd.) EDWD. THORNTON,
(Sd.) F. HINCKS.

Signed and published
in the presence of

(Sd.) E. C. MONK,
(Sd.) THOMAS HODGINS.

In other words the western boundary of Ontario will be a line drawn due north from the monument planted at the north-west angle of the Lake of the Woods until it either intersects the English River or a due west line from the confluence of the English and Winnipeg Rivers as the case may be.

The *west boundary* will probably be about 55 miles in length and has not yet of course been defined on the ground.

The northern boundary, as we have seen, is for the most part a natural boundary. The English and Albany Rivers with Lac Seul and Lake St. Joseph, there being a straight line to run between the two lakes a distance of perhaps 15 miles. If these 70 miles or so of line were run, the northern and western boundaries of our Province would be defined, unless in the case of islands in the rivers or lakes, where it might be necessary to determine upon which side of an island the deep water channel would be. Dr. Bell says there are such in the Albany River.

The eastern boundary of Ontario is in part a natural boundary, and the remainder made up of straight lines.

Commencing at the south-east angle of the Province so to speak on the St. Lawrence River at the stone mentioned in the proclamation of 1791, two lines of about 30 miles in length bring us to the Ottawa River, at what is now called Point Fortune.

These lines were, I believe, run a number of times, and as usual when lines are run magnetically they differed, no two running in the same place. The boundary was finally established in the year 1862, under instructions from the Commissioner of Crown Lands to E. T. Fletcher, P.L.S., dated Quebec, 15th July, 1862. From Point Fortune on the Ottawa to the mouth of the Mattawa River, a distance of about 250 miles, the survey plans of the Engineers of the

Ottawa Ship Canal Company were reduced in 1866 by the Crown Lands Survey Department and adopted by the Government of Canada as a correct plan of the Ottawa River, showing the boundary between Upper and Lower Canada, now Ontario and Quebec. This plan was approved by Alexander Campbell, Commissioner of Crown Lands, at Ottawa, June 29th, 1867.

From Mattawa to the head of Lake Temiscamingue the boundary was surveyed jointly by the Governments of Ontario and Quebec. The survey was made by Mr. J. L. P. O'Hanley on behalf of Ontario, and by Mr. W. W. O'Dwyer on behalf of Quebec.

Instructions were issued October 1st, 1872. They commenced at the junction of the Mattawa River with the Ottawa latitude $46^{\circ}-16'-30''$ N and traversed the west and east shores of the Ottawa and Lake Temiscamingue to its head, each surveyor taking his own side of the river and lake. They connected their survey occasionally for purposes of comparison, and made a joint plan at the close of the work. Mr. O'Hanley says he left Ottawa on the 6th November, 1872, arrived at Mattawa, November 13th, and after forwarding supplies, commenced work December 2nd, completed the survey to head of the lake, March 25th, 1873, and returned to Ottawa, 5th April, having been away 156 days, made up as follows :

65 days running the line.
 18 days so stormy that no work could be done.
 22 Sundays.
 3 holydays.
 18 moving camp.
 14 forwarding supplies.
 16 travelling.

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The distance is about 110 miles, which, with offsets, islands and triangles, make a total of about 160. Of the distance run, one-seventh was in the bush along shore, and the strength of the party was 16—12 men and 4 of a staff.

On October 16th, 1873, the same surveyors were instructed to run the due north line from the head of Lake Temiscamingue to the boundary line of Hudson's Bay, and to plant stone monuments at every mile.

Orders were subsequently sent Mr. O'Hanley to stop at 50 miles unless he came to the height of land sooner. They left Ottawa, 4th November, 1873, reaching Fort Temiscamingue on 23rd of same month. The part of the lake north of the Fort having frozen over on the 20th, and the ice not being strong, they camped at the Fort till the 8th of December, when another start was made and they reached the head of the lake with their supplies on the 12th.

After determining the "head of Lake Temiscamingue," as described in 38th Vic. Cap. 5, Statutes of Ontario, and getting the

necessary observations, the line was run north astronomically to Labyrinth Lake (tributary to the Abbittibe waters flowing to James' Bay), a distance of about 45 miles. The height of land was crossed at 42 miles 24c. 85l. The initial point on the boundary line is a point bisecting a line drawn due east from where the north side of the "Chenail du Diable" intersects the east side of the Blanche River, to the River de Quinze, the latitude of this line is given as $47^{\circ}33'48''$. 37 North, and its length as 86c. 64l.

From this point the boundary was run south to Temiscamingue Lake across some islands—at 25c. 77 $\frac{1}{2}$ l. south of the initial point, and on the bank of "Chenail du Diable," a large stone monument was planted, marked as follows :

On the South " December, 1874 "
 On the West " Ontario "
 J. L. P. O'Hanley, Boundary Commissioner.
 On the North " Latitude $47^{\circ}33'31''$ N "
 On the East " Quebec "
 W. W. O'Dwyer, B. C.

This stone was made the zero of all measurements north of this point, and the point on the ice of Lake Temiscamingue adopted as the zero for levelling to this stone is 78c. 68l. Another large stone was planted on Wright's Island marked " Ontario " on west, and " Quebec " on east.

The line was run with the transit ; stones planted at every mile marked on south side from 1 to 42 miles, on east " Quebec," and on west " Ontario." A large wooden post also planted alongside the stones and witness trees at right angles to line, marked W. T. At 42 miles, 24c. 85l. a cut stone was planted marked as follows :

On East " Quebec."
 On West " Ontario."
 On South " Height of land."

Ten links north another cut stone marked :

On West " O'Hanley, B.C."
 On East " O'Dwyer, B.C."
 On South " Latitude $48^{\circ}10'24''$ N."

The line was cut out at commencement, 30 feet wide, afterwards reduced to 20 feet, 14 feet, and finally to 8 feet, which width was I believe continued to the close. Levels were taken and posts planted every 200 feet over its whole length, and it was found that Labyrinth Lake was 326 feet higher than Temiscamingue.

The survey was completed on the 18th April, 1874, and the party got back to the head of Lake Temiscamingue on 23rd, and as the ice was then unfit for travel, they remained there, filling in a part of the

time by traversing Blanche River, until the 20th May, when they broke up camp and arrived at Ottawa on the 28th.

Mr. O'Hanley tells us that the boundary line for the first 20 miles is through a clay formation, the 6 miles next the lake low and swampy and partly flooded in spring. Remainder is high and dry, and cut up by gullies. Beyond the clay the Huronian formation extends to the height of land.

The Manitou rock is 475 feet above the surrounding country, or 1,000 feet above Lake Temiscamingue, and there is pine timber on the height of land and 10 miles south.

The 45 miles straight line expedition occupied 207 days as follows:

70 days working on the line.
 12 " all hands portaging.
 11 " moving camp.
 8 " so stormy that no work could be done.
 29 Sundays.
 2 holydays.
 19 travelling up.
 10 travelling down.
 3 days waiting for observations.
 16 " delayed going up
 26 " delayed returning.
 1 " paying off men.

—
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The strength of the party was 11 labourers; 1 stonemason; 4 staff—total 16.

After a great deal of correspondence between the surveyors, joint plans were prepared of the whole work from Mattawa to the head of the lake, and from the head of the lake to the height of land. The red dotted line up the Ottawa River and through Lake Temiscamingue on the former is declared to be the true boundary between Ontario and Quebec, and is signed by the late Commissioner of Crown Lands, T. B. Pardee, on behalf of Ontario, and by H. G. Mahliot, Commissioner of Crown Lands for Quebec, and bears date 27th December, 1875.

The straight line plan has no date, but is signed by Messrs. O'Hanley and O'Dwyer.

I might say that the two survey parties were together on the due north line, so that the total strength of the united party was probably 32. The men of both parties worked together on the line. The chainmen were supposed to check one another, and the Surveyors and assistants ran the line and took the levels.

The following are extracts from Mr. O'Hanley's Report of Survey:—

" From the foregoing you may be able to form some idea of the character and magnitude of the undertaking which the Govern-

ment confided to my charge, and the manner of its performance, but no description without experience can convey the faintest impression of the obstacles to be encountered, the difficulties to be overcome and the hardships borne on an expedition of this kind, in a remote district, in the depth of a Canadian forest, particularly in the inclement winter of these hyperborean regions.

"The important work of permanently fixing the boundary between the great Provinces of Ontario and Quebec deserved all the scientific skill and accuracy that we were capable of bringing to the task, and all the care and attention in its mechanical execution which we could bestow, while observing the strictest economy consistent with efficiency; cost was secondary to precision. With this work our names (that of my colleague and myself) shall be associated so long as these Provinces shall endure, and perchance the boundary we establish will continue to be recognized when 'Ontario' and 'Quebec' shall be spoken of as the ancient names of new and mighty nations."

The remainder of the east boundary of Ontario from the height of land to James' Bay, a distance of about 225 miles, has yet to be defined on the ground. Of the country through which it will pass, nothing is known north of Abbitibbe Lake, the line of travel between Temiscamingue and Moose Factory being by the west end of that lake, Abbitibbe River and Moose River, a considerable distance west of the boundary.

Roughly speaking, the distance round this Ontario of ours, following the boundaries through the lakes, is about 3,300 miles and the area of the Province is estimated at about 200,000 square miles.

It has a seaboard on James' Bay of 200 miles, and the Albany River is probably 450 miles long. The northern boundary of the Province being nearly 1,000 miles in length.

DISCUSSION.

Mr. Chipman.—I think the Government of Ontario should have the easterly boundary of this Province run through to James' Bay immediately. It crosses a tract of territory that has not been trodden by a white man, during the last hundred years at least, and no one knows what is in it; and the same may be said of the western boundary, only that is of less importance to us. Around the head of James' Bay we have a territory as large as half of the settled part of this Province, and from what I have read that land is suitable for cultivation to a great extent, and the climate there is certainly not more severe than in Manitoba, and is more equable.

Mr. Kirkpatrick—Some of you may have noticed in the papers recently that the United States were claiming Hunter's Island. Mr. Niven wrote out the description from the Commissioners' report in 1842, and naming those different lakes, Cypress Lake and those other lakes, and I might say a plan of the route, I think 60 sheets in all, has been in the Department of Crown Lands since 1842, and we assumed it was really the correct one. It was signed by David

Thompson, the Astronomer, but within the last few years it was discovered that some of the islands on the south side of Hunter's Island, apparently Canadian, belonging to Ontario, were really American. We found there were a series of official maps at Ottawa on record, and we had access to them, and found that while David Thompson's maps were true in the main there was a disputed territory even at that time which he evidently was not aware of, and that, according to the lines as run out under the Treaty of Ghent by him, there was a portion which remained in dispute or unsettled until 1842, when Lord Ashburton and Daniel Webster agreed upon the boundary, and they laid down the line; and it was finally determined, and to it both Commissioners affixed their signatures, as Mr. Niven has said, running it up through those lakes.

The Americans, as reported in the newspapers, claim that the line should go north of Hunter's Island, and that Ontario has seized I do not know how many hundreds of square miles belonging to Minnesota, and the President has been called upon to assert his rights, as the trouble in Venezuela was nothing to the injustice the poor State of Minnesota was suffering owing to the greed of the British Government.

I may say, as regards the north-west angle of the Lake of the Woods, Capt. Cameron, as the Commissioner for running the 49th parallel, reports, in his description of that survey, I think it was in 1872, that the Commissioners had great difficulty in finding the monument which was reported to have been planted in 1842 by the Commissioners of that period, but that after a great deal of trouble they found a square block of logs, and it was supposed that this formed the basis of the monument, and the monument really, at the time they were there, was under water; so they determined the North-West angle at this point and planted an iron bar, which I had the pleasure of standing beside a couple of years ago. This monument is a large iron post about six inches square, and has got "Convention of London," on north side, and had the date on the other side, "October 20th, 1818," and showed on the top "Hamilton" where it was cast. I considered it was the true North-West angle. There is no trace of a line running north or south from that now, it stands apparently in bush that has been there probably thirty or forty years. The line to be defined will be run between the Province of Ontario and Manitoba from this iron post.

Mr. Chipman—How far is this North-West angle north or south of the 49th parallel?

Mr. Kirkpatrick—I should say it was about 26 miles north.

Mr. Chipman—Does the United States own any land north of the 49th parallel?

Mr. Kirkpatrick—Yes, they do. They own an area of land equal to about 70,000 acres. From this point (indicating it) on the map at the North-West angle the boundary of Manitoba and Ontario will be a straight line drawn up to the English River.

[This Association is not responsible as a body for any opinions expressed in its Papers by Members]

SECTIONAL SURVEYS.

By P. S. GIBSON, O.L.S.

Willowdale, Ont.

IN treating of this subject the writer will enter into a short account of the two classes of surveys made by the Government prior to the introduction of the sectional system, stating some of the reasons why this system was much to be preferred to the former ones; also giving an outline analysis of the law on the re-survey of sections.

1. Single front concessions are such as have had only a single row of posts planted on the concession lines, and the lands have been described in whole lots.

2. Double front concessions are such as have had posts or monuments planted on both sides of the allowance for road between the concessions, and the lands have been described in half lots.

3. Up to about the year 1819, townships were laid out with single front concessions, and from 1819 up to about 1829 with double fronts; after 1829 sectional surveys were introduced and still continue to be laid out.

4. Single front concessions generally contained 200 acre lots, each 20 chains by 100 chains.

5. Double front concessions also contained 200 acre lots, but they were 30 chains by 66.67 chains.

16. In these two systems of surveys, no side roads or proof lines were supposed to have been surveyed although some may have been.

17. In townships surveyed with single front concessions we find jogs in the side roads at nearly every intersection with the concession roads, and in many cases these jogs would not have been so great had the surveyor in measuring along the fronts of the concessions begun his chaining each time at the same base line, instead of chaining up one concession and down the next to save time.

18. In townships surveyed with double front concessions we of course find no jogs in the side roads at the concession roads, as none by this method of surveying could occur, but, instead, there may be jogs all along the middle of the concessions, and such jogs are very common, sometimes being as great as 10 chains, but only in rare cases. These jogs are very inconvenient, making it necessary for the Municipal Council of the township to purchase land to connect the ends of the side roads at the jogs in order to obtain a continuous right of way.

19. For the above and other reasons the Order in Council of 27th March, 1829, mentioned in section 52 of the Survey Act, was passed, authorizing the dividing of townships into sections.

20. In the Order in Council it states the reasons for these inaccuracies occurring in the old methods of surveying, they being "generally owing to the surveyor employed not having been directed to run transverse or proof lines at the intersections of the cross roads on the several concession lines."

21. And continuing, states that the proposed new mode of surveying "deviates very little from the useful method and form, but most essentially by being scientifically correct." And "that the distance to be run in a township will be about one-fourth less, and the posting and fixing of boundaries about one-half the number that were formerly required, and will at the same time be less expensive and equally beneficial, if not more so, to the settlers."

22. The form of section laid out under the Order in Council contained 2,400 acres, twelve lots of 200 acres each, six lots in each concession and roads were run around the entire block.

23. The Order in Council then goes on to explain how in after years side lines of lots can be much more easily run under the sectional system of surveys. The surveyor would have "well known points to govern him, the intersection of the proof lines will point out the angles of each parallelogram, and consequently the same may be easily divided from angle to angle into six equal parts, even although all the original boundaries of the lots had been lost on the concessions, and then run the side lines of the lots from the front of one concession to that of another according to their respective numbers . . . by a direct line, and the sub-division thereof will of course correctly follow."

24. This method of running side lines by drawing a straight line between the stakes planted on the front of each concession is of course not pursued in Ontario, the correct method being to run the side line from the stakes planted at the front of each concession on the same course as the base line, being the boundary of the section, as stated in section 59 of the Survey Act.

25. In section 52 of the Survey Act we find three different classes of sections spoken of, viz.: those divided agreeably to the Order in Council containing 2,400 acres, and sections containing 1,000 acres more or less, and 640 acres more or less. In the latter roads were not laid out around the blocks.

26. In surveying sections with roads around them the lines are run in the centre of the roads, and stakes planted for the corners of the lots and side roads at the proper distance from the said centre line.

27. In this section 52 an important point arises as to how a surveyor would run a "blind" line, *i.e.*, the line between the two concessions of the section, from the fact that it makes no provision for the running of such a line.

28. Now as the running of a blind line is actually the running of a concession line when it has not already been run, the only course left open for the surveyor would be to accept it as such, and follow up the rule of so drawing it as to leave each of the adjacent concessions of a depth proportionate to that intended in the original survey.

29. Suppose the case of running a "blind" line between two concession lines that are very crooked, and in the original field notes it shows one end of a concession as 50 chains deep, and the other end as 49 chains deep with the adjoining concession of the section 50 chains at each end. The instructions to the surveyor were to run all the concessions 50 chains deep. The question is: How would a surveyor on a re-survey run the blind line? At that end of the section where each concession is 50 chains deep, he would measure the distance on the ground and take half and plant the stake for one end of the blind line? At the other end of the section, where one concession is 49 chains and the other 50 chains deep, he would measure the whole depth of the section, and the blind line stake would have to be planted by proportioning either the 49 and 50 chains, or the 50 and 50 chains, as it was intended that the depth should be in the instructions.

30. This gives rise to another question, as to what is meant by the phrase "intended in the original survey." Let us refer to those sections of the Act where it speaks of the running of concession lines in both alternate single front concessions, and alternate double front concessions which are similar to one case in sectional surveys. Here we find what might be taken as an explanation of the phrase. It says, "to the depth proportionate to that intended in the original survey, as shewn on the plan and field notes thereof of record in the Department of Crown Lands."

31. Although this apparently solves our difficulty, still could not the phrase be taken to mean to the depth of the concession given in the instructions to the surveyor who originally surveyed the township.

32. Coming back again to the question of running the intermediate part of the blind line between its end stakes, as the two concession lines as run on the ground are very crooked, how should we proportion the depths along the side lines to locate the blind line?

33. Some may contend that the intended depth of the lots in the going concession should be ascertained by proportioning the depths given at each end, and establish the blind line accordingly. Others that the line should be drawn as if all the lots were intended to be the same depth as per original instructions to the surveyor. And still others that the last lot 49 chains deep should be proportioned as shown on the plan and field notes, and all the other lots taken as 50 chains deep, and the blind line drawn accordingly.

34. As to the running of side lines in sections, Section 52 of the Survey Act says, that they shall be run in like manner as the division or side lines in townships originally surveyed before the said day

(27th March, 1829) are governed by the boundary lines of the concession, and shall be governed by the boundary lines of such section or block.

35. Therefore side lines in sections must be run on the same course as the base line if so intended, and where end of concession is wholly bounded by a lake or river, or other natural boundary, or has not been run or was not intended to be on same course, then the line must be run on the same course as the other end of the concession, if intended to be on the same course and if such boundary line was run in original survey. And where side line was not intended to be on same course as base at either end of concession, then to be run at such angle with first base as stated in plans and field notes, provided such line was run, and if not run then at an angle with second base; and if it had not been run either, and if concession was wholly bounded at each end by a lake or river or other natural boundary, then side line to be run at such angle with the course of the line in front of concession or portion of concession as stated in plan and field notes. If a concession that is bounded at both ends by a lake or river has a proof line or lines run in them, then side line must be run on same course as the governing proof line.

36. The above are rules laid down for running side lines in concessions other than sections and which apply also to sections, for side lines in sections must be run in like manner, etc., as before stated.

37. But there is apparently provision made in Section 52 for an entirely different circumstance, viz: that of a base line being *broken* by a lake or river (*i.e.*, where it is not wholly bounded by a lake or river) in such a way that the course thereof cannot *accurately* be determined.

38. Now the question is what cases would this cover? And how are surveyors to tell when the base cannot be accurately determined? If the base line is broken in the middle it does not interfere with the surveyor obtaining the astronomic bearing of it.

39. But suppose a case where one end of a base line is broken or cut off by a small lake in the township, would that end be accurately determined by intersecting the concession line by a line drawn through two or even more side road lines?

40. If the four corner stakes were lost at and adjoining one end of a base line, how should a surveyor proceed to locate that end of the base line? He would of course intersect the adjoining known parts of the concession and side road lines.

41. And so there is no apparent reason why the surveyor should not apply the same method in the case of the end of a base being cut off by a lake or river.

42. A question might here be asked, Does a lake or a portion of a lake which is apparently upon a lot belong to it? In the case of a very large lake, as Lake Ontario, we know that it does not, as it forms the boundary of the township. Now, suppose that such a lake cuts

off the one end of a base line and no monument was planted on the base except at the other end of the section, would not this be a case where the base could not be accurately determined, as the Act does not provide for the producing of lines, and the side line would have to be run upon the astronomical course if the base at the other end of the section were broken likewise

43. We might go on discussing very many probable cases in this way and still get no nearer to a definite understanding as to what extent the base line would be broken so that it could not be accurately located. The whole sentence probably means that if the surveyor should find it an impossibility, or at least a very difficult matter to locate the base or governing lines accurately in such cases, that he is to run the side lines on the astronomical course of the side lines of the lots in the township as shewn on the plan and field notes, etc., meaning, it is assumed, the bearing shewn of the side line required to be run.

44. Another question which arises is, When is a line said to be run? Does it require to be permanently marked with monuments? Or would merely sighting and chaining the line be sufficient?

45. And, again, what are the boundaries of a section where it is broken by a lake or river? Would the intersection of the concession and side road lines form the boundary? Or would the boundary of the lake form the boundary of the section?

46. In determining the position of front stakes in sections where they are lost, the distance between the two nearest known front stakes and on opposite sides of the lost stake or stakes in the section must be measured and each lot given its proportionate width as intended in the original survey, as shewn in the plan and field notes thereof etc., and the boundaries of the section shall govern the widths of the lots within that section.

47. Assuming that sub-section 2 of section 60 of the Survey Act applies to sections, then if there is a stake in the centre of the concession road or on the side of the road opposite to the lost front stake it should govern in the place of the lost one. But this law apparently only applies to double or alternate concessions, as these are the only ones mentioned.

48. A question may be asked, What is meant here by alternate concessions? It is evidently intended to be applied to sectional surveys, where stakes were planted on opposite sides of the road.

49. There are double front sections and single front sections, but there is no such thing as double front concessions in a section.

50. Sections containing 2,400 and 1,000 acres or sections in which there are two concessions are surveyed as if they were double front concessions, and 640 acre sections or those that contain only one concession are surveyed like single front concessions.

Many more points of interest in this subject might still be discussed in this paper, but want of time and space will not permit the writer to do so.

DISCUSSION.

The President—There are many points that have puzzled a great many surveyors. I think if the papers were submitted to the Surveying Committee of the House next year and they were to give us a few ideas on the points raised, it might be one way of getting over some of the difficulties, but, as Mr. Gibson says in his paper, there are points very difficult to determine.

Mr. Speight—I think this is an exceedingly fine paper Mr. Gibson has prepared for us. There is no one better qualified than he to lay this matter of sectional surveys before the Committee of the House. In 1897 I suppose there will be a revision of the Ontario Statutes, and it would be well to have a good strong Committee formed to make a revision of the Survey Act, so that we may know what requires alteration.

Mr. Niven—I may say that I suggested a number of years ago the Act should be re-written, and I am of the same opinion still. I think it would be a good plan to get a committee together and see if they can agree upon something that would be less complicated than it is now. I think if you take any half dozen surveyors in the Province and put them together and discuss this paper of Mr. Gibson's for a day or a week, probably they would not come to a right conclusion then.

Mr. Gibson—If there is any law for it you are not responsible then.

Mr. Niven—I have not had time to look at it carefully, but I think I agree generally with what Mr. Gibson has written. At the same time it would be a good thing if the Act could be put in less complicated shape than it is at the present time.

Mr. Gibson then explained from a sketch (on the blackboard) of a township plan illustrating where a base line should be taken up, where it is broken by a lake.

Mr. Kirkpatrick—Many lakes are much larger than some concessions. We sell over and over again every day islands in those lakes. Could we describe those islands as being in any concession? They are in the lake. They are in a township but not in any concession.

Mr. Butler—You issue instructions to the surveyor to lay out the township and you are ignorant of the fact whether there is water there or not. The surveyor proceeds to the ground and has to cross the lake and take the concessions into account. It is true he does not draw his lines through the water, but he must transfer those lines across the lake as instructed, and has to take the distance across the lake to carry his correct chainage.

Mr. Walker—This question about the boundary depends a good deal on the character of the lake it seems to me. If that be a navigable lake the township will stop undoubtedly. But if it is an unnavigable lake the case will be entirely different. If it is an unnavigable lake it will be called a pond, and it will belong to the owner of lots.

Mr. Kirkpatrick—The description for this land stops at the water's edge. We have a case in the County of Waterloo in which there is a marl bed at the bottom of the lake, and a man came down and wanted the land. There is a road running through it, and I hunted up the description and found the road stopped at the lake. The description ended at the lake. What I advised the man to do was to employ a surveyor to survey the land under the water and to apply for that to the Government; then I said if you get the consent of the municipality we will grant you the land under the water. It is an invariable rule that the Commissioner of the Crown Lands will not sell any land which might be utilized for a road allowance. He holds that that has to be kept in the Crown for the municipality. If the man could obtain the consent of the municipality he could get it. The municipality has the first right to it.

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CROWN SURVEYS.

By JAMES DICKSON, O.L.S.

Fenton Falls, Ont.

Look at the map of the Province of Ontario. The question at once suggests itself, why so many different systems of surveys ?

Start out from the east boundary of the township of Alice on the Ottawa River, thence south to the township of Oso, west to the east boundary of the county of Ontario, north on that line to the township of Morrison, thence west, following the Severn River, to the Georgian Bay. One would think that each and every man employed to survey a township south of those lines had done his work according to the dictates of his own sweet will or fancy. The townships are of all sizes, all shapes, and the lines at all conceivable angles with the meridian, and the systems of surveys in sections adjacent to each other differ as widely as though they belonged to different countries. There is no reason why the townships should not all have been the same size or very nearly so, the lots the same acreage, and all lines having the same bearing. And how much better for all purposes it would have been, and how much more uniform the map of Ontario would look to-day, had a system on this basis been established when the first surveys were made and adhered to throughout the whole Province.

It was not until the surveys of the northern townships of the counties of Victoria, Peterborough, Hastings and Addington were begun that anything like a uniform system seems to have been adopted, and it has been adhered to by the different Governments which have succeeded each other since that period, without any variation, until the chain of waters formed by the Mattawa River, Lake Nipissing and French River is reached. In all that vast "Huron and Ottawa Territory," the townships are all the same size, 50,000 acres; the lots 20 chains by 50 chains, except where gross errors have been made by some surveyors—errors which were not known to the Department of Crown Lands until it was too late to remedy them. North of that chain of waters, and all over the other parts of Ontario, a different system—making each township six miles square, and all lines running due north and south and due east and west—has been inaugurated. In those townships the lots are 80 chains by 40 chains, and have an area of 320 acres each.

I believe a majority of the profession prefer this new system of survey to the old; but I am free to admit that I cannot look upon it as any improvement on that of the Huron and Ottawa Territory. A 50,000 acre township is certainly a more convenient size for a muni-

cipality than one of less than half that acreage, and it is quite as easy for a surveyor to run his lines at any given angle with the meridian as it is to run them due north and west.

But there is one point in the new system with which I can cordially agree, viz. : to leave no road allowances, but set apart five per cent. of each and every lot, to be used as public highways; the municipality having the power to locate them wherever the country is best adapted for the purpose. In many parts of our northern counties, the municipalities have had infinite trouble in locating deviations for roads where the original allowances passed over mountains, lakes or marshes; in some instances having to pay a litigious person nearly as much as his whole farm was worth in order to get a road into some sparsely-settled section, an outlay which would have been altogether avoided had no road allowances been laid out in the original survey, but a small percentage of land reserved for that purpose the roads to be located according to the requirements of the settlement.

The policy the Government has adopted of surveying the whole country ought to commend itself to every person, even although the land in some parts may not be adapted for agriculture. The amount it costs, 7 cents per acre, is a mere bagatelle in comparison with the fund of useful information available by means of the surveys. And, moreover, it has frequently occurred that where a township, or part of a township, has, decades ago, been left unsurveyed, it has been found necessary to send out parties to complete the surveys, and besides it not infrequently happens that a poor man may settle in those unsurveyed parts, and, before he can get a deed, must have a survey and plan of his intended purchase made at his own expense, an outlay he can ill afford and ought not to be called on to make.

What has long been known as the "District Line" in the county of Renfrew was begun by the late A. Wells, P.L.S., in March, 1851, and completed a few years later by the late Robert Bell, P.L.S.

It starts at the north-east angle of the township of Palmerston, and running N. 20° 51' 40" W. Asty., strikes the Ottawa River a few miles north of the town of Pembroke, at the north-east angle of the township of Alice.

This seems to be the date on which a uniform system of surveys in the Province was first adopted, for we find all the townships laid off to the west of that line are, as nearly as may be, of uniform size and all the lines have the same bearing.

Then we have the Bobcaygeon Roadline starting at the north-west angle of the township of Stanhope, and extending on the same bearing as the District line above mentioned, to Lake Nipissing. This line was begun in the year 1859 by the late John K. Roche, P.L.S., who was accidentally drowned by the swamping of his canoe in a gale of wind on Balsam Lake, on his way home to Lindsay on a visit during the progress of the survey, and completed by the late Crosbie Brady, P.L.S., in the year 1860. The Bobcaygeon line is upwards of ninety miles west of the District line, and seems to have been also a base from which the townships were laid off to Georgian Bay to the

west and towards the east, until the surveys carried on from the Ottawa were met with, and with the exception of two—Preston and Sproule, which are in the Algonquin Park—there is now only one township, Airy, unsurveyed in the whole Huron and Ottawa Territory.

During the summer of 1893 I was sent out by the Department of Crown Lands to run a part of the south boundary of the Algonquin Park. My line started at the north-east angle of the township of Nightingale, and ended on the west boundary of the township of Clancy. It was a connecting link between the surveys carried on east from the Bobcaygeon line with those carried west from the Ottawa side, and was laid down on the projected plan accompanying my instructions, thirteen miles long.

Produced west from where I started, a distance of thirty-three miles, it would strike the Bobcaygeon line seventeen miles north of the initial point of that line. And produced east from my terminal point it would strike the District line at a distance of forty-five miles; and sixty miles north of its initial point, I found the true distance thirteen miles twenty chains and fifty links; an error of only a small fraction over a fourth of a mile. Now, had all those surveys—the District line, the Bobcaygeon line, and intervening townships—been made by one man, I should consider it very poor work indeed. But when we consider that the two base lines were run with a long interval between by men who probably never saw each other, nor had ever had any correspondence, the number of surveyors also having no connection with each other who laid out the intervening townships; and the small army of chainmen amongst whom the work was divided; the mountains and hills to be chained over; the swamps and marshes that were waded through; the ponds, lakes and rivers triangulated; and last, but by no means least, the incessant war which many of the parties had to wage with mosquitoes and flies—I think this shows a degree of accuracy to which we Ontario surveyors can point with honest pride.

It is a well-known fact that nearly all Crown Surveys, previous to forty years ago, were made by compass, without even the formality of an observation to start a line from, and this is generally assigned as the reason why so many of the older surveys are found to be so very inaccurate. This conclusion is certainly wrong. In my practice—and I think other surveyors who have had much to do in those old townships will bear me out in this—I have found a greater number of errors clearly traceable to bad chaining than to all other causes put together; and errors which were of much more consequence than any I have ever found which were occasioned by a line being run on a wrong bearing.

If some concesssions are found five or any number of chains more or less in depth than they should be, all across a township; or lots, which should be—and were all returned—thirty chains wide, without an exception in a whole township, are found in the field to vary all the way from fifteen to ninety chains, one cannot possibly say those errors are occasioned by the use of the compass. They

are clearly traceable to gross negligence or incompetence on the part of the chainmen, but errors from which no surveyor can by any means wash his hands of responsibility. So gross do I find the errors made by the chainmen in the old surveys where I practise, that it is only at very rare intervals the measurement of a lot comes within a chain of what it was intended to be.

I do not wish it to be taken for granted from the above that I am either in favour of, or condone, the use of the compass in making a survey of a new township. On the contrary, I submit that the Government should prohibit its use altogether in laying out the lots, and insist on all the lines being run by theodolite or transit and by no other instrument, and then only from carefully-taken astronomical observations frequently repeated during the progress of the work. I have always failed to see where any great saving of time or labour comes in by using a compass, instead of a proper instrument, if the lines are opened out as per instruction, for I hold that it is just as necessary to get good, accurate backsights with a compass as it is with any other instrument.

I admit that if the country is level, or nearly so, fairly good backsights can generally be had, although the lines may not be well opened out. But, if it is at all broken or rough, everything must be cleared out, in order to secure an accurate backsight. For, to maintain that in one case out of ten, a line can be run even approximately correct by depending upon the magnetic needle alone, is simply absurd. If the country is comparatively level, and trees left in the line are standing perpendicularly, with proper care, good backsights may be had. But if the land is broken or knolly, or if the surveyor has to set up his compass behind a leaning tree on the side of a rise, where he cannot get a sight back along the level, or should a tree stand upon the top of a narrow ridge where he must take a sight, there is nothing for it but to cut everything out of the line if even approximate accuracy is to be achieved.

I have heard a good deal of blowing of trumpets as to the accuracy some men attain with the magnetic compass; but in all my experience, as inspector of surveys in all parts of Ontario, both in wet land and dry land, over mountains and on the level, I cannot recall an instance where a line was run over a hilly country or through thick woods, and not sufficiently well opened out to enable the surveyor to get good backsights, where it came out correctly.

In a former paper on Crown Surveys, I referred at considerable length to the unprofessional manner in which some surveyors did their work. I am pleased to be able to testify that there is now a marked change for the better. But there are still a few who think it the correct thing to run in with an angle to the post if they find their line is coming out wrong, and *forget* to note the change in their returns; who think it the correct thing to show a neat, well-proportioned triangle, to calculate the width of a lake or river, in their field notes, although there may be no trace of any kind of triangle in the field, and, in fact, it was utterly impossible to lay off any such

triangle at all in the place referred to; or to show in their field notes a neatly made traverse of every lake and pond in their township, although not a single line was ever run any place except on paper, *and take a solemn oath that the notes are true and correct.* If such men would perform their work in the same manner when employed by private individuals, they would soon be under the necessity of adopting some other line of business for a living. In a large majority of the Government surveys now being made, the lines are so accurately run, well blazed and posted, that they can be easily found as long as the timber remains standing, or after the timber is all gone, a re-survey made by the original instructions will re-establish the original lines and the position of the original monuments with almost perfect accuracy.

But while there is such a marked improvement in the execution of the new surveys, there is also a flagrant violation of the law which some surveyors either indulge in themselves or permit their men to do so while in the field. The unlawful killing of game I have recently met with myself, and have also heard of other cases, where moose, deer, and even beaver, have been killed; and in nearly every instance portions of the carcasses left to feed the fox and raven where the animal fell. This practice forms no part of their instructions, and it ought to be a point of honour with the surveyor to stamp it out and not allow revolvers and repeating rifles to be taken into camp at all.

It is frequently urged in excuse, "we were short of provisions," or the "lads could not resist the temptation to have a piece of fresh meat." This "short of provisions" tale is worked for all it is worth, with good, decent interest added. I know of one surveyor who is so habitually short of provisions that he nearly always works his men on Sunday. Taking barely supplies enough for a given number of days, and allowing no margin for foul weather or accidents. An extra bag of flour and sack of pork would obviate any necessity for this on a six weeks' trip. And a man who cannot go half-a-mile from camp unless armed to the teeth for fear of a death struggle with the proverbial "she bear and cubs," or a pack of hungry wolves, had better be left at home in the city, where he may have opportunities of doing some good, for he will, to a certainty, be found of exceedingly little service in camp. And besides most of the hunting is prosecuted on the Lord's Day, oblivious to, or utterly regardless of the fact that the Divine command, "Remember the Sabbath day to keep it holy" applies with equal force in the sombre woods and crowded mart.

I cannot close this paper without a passing tribute of praise to those geological surveyors who have penetrated into the most remote parts of the Province for so many years. We might well call them the pioneers of the surveyor. For, go where you will, you will find you have been forestalled by the geologist.

They have traversed almost every lake and river or creek large enough to float a small bark canoe. They have toiled and packed over the most difficult portages; climbed the highest mountains; paddled or waded up, or, taking their lives in their hands,

run down the most difficult chutes and rapids ; sketching every mountain, and making a rapid traverse of every lake and stream as they went.

Starting from some established geographical point, they have plunged into the heart of the wilderness and mapped out their work with a degree of accuracy which is simply marvellous. So accurate do we find their maps that when we come to make actual surveys of localities which must have been hundreds of miles from the nearest established point when the geologist made his survey, we find the location of a lake or river almost correct. It is only at rare intervals they are found to be a mile out. A degree of accuracy which, all things considered, seems beyond the bounds of possibility.

DISCUSSION.

Mr. Kirkpatrick—There is one point in Mr. Dickson's paper that bears out also the necessity of an amendment to the Survey Act, and that is, in the next system of surveys away on the north shore of Lake Huron and Lake Superior, where townships are surveyed out six miles and no road allowances are left, the patents that are issued reserve five per cent. of the acreage and the right of the Crown to lay out roads where necessary. Now the question has arisen, and I do not think it has ever been decided yet, has the municipality the right to lay out roads where necessary? That was intended to be so, but such a clause will have to be introduced into the Act, giving the municipalities the same unquestionable right, and that will be another amendment that will itself appeal to every man in the Local House to have carried out. I think we are all indebted to Mr. Dickson for his very valuable paper.

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NATURAL BOUNDARIES.

By A. P. WALKER, O.L.S.

Toronto.

SCOPE OF PAPER.

1. THE scope of this paper is to present, in as condensed form as possible, the legal decisions which have come under the writer's notice, bearing on the proper method of surveying and determining the boundaries of landed property, described as bounded by lakes, rivers, or water-courses only, and from these decisions to draw a few deductions which may open up this important subject for discussion, benefiting thereby the members of the profession generally.

THE COMMON LAW OF ENGLAND.

2 By the Common law of England, on which our law is to a great extent based, the waters of the sea (for a certain distance from land) and waters of navigable rivers, belong to the Crown, subject to the rights of navigation; and according to the same law, the soil under the sea, the sea shore, and the beds of navigable rivers, as far as the tide rises and falls, are also the property of the Crown. On navigable rivers above where the tide rises and falls, it has however been held that the bed of the river belongs to the riparian proprietors, or owners of the bank, on each side to the middle thread of the river, although these owners have no right to obstruct navigation.

COMMON LAW AS APPLIED TO CANADA.

3. The above law, although applicable to the short lengths of rivers above tidal waters in England, is altogether unsuited to the great lakes and rivers of Canada. Under this law an owner of land on the bank might claim out to the centre of the rivers St. Lawrence or Ottawa, or even Lake Ontario, as none of these are actual tidal waters. In the case of *Parker v. Elliott* (1 U.C.C.P. 470) in 1852 it was decided that this law did not apply here, and the lands of the owner extended to high water mark only.

PARKER *v.* ELLIOTT.

4. This case (*Parker v. Elliott*) is of a good deal of interest to Surveyors, and the writer trusts a few words respecting it may not be uninteresting. *Parker* was the riparian owner of lots 22, 23 and 24

in 1st Concession of Township Pickering, which parcel was described in Crown grant as "Commencing within one chain of the south-east angle of lot 25 on the bank of Lake Ontario." Thence passing around the property and concluding "along the bank of the lake to the place of beginning." The action was brought to decide the ownership of a strip of land, about 4 chains in width above the water level, which crosses in front of these lots and separates the waters of Lake Ontario from a sheet of water within, called Frenchman's Bay, which strip and bay Parker contended formed part of the lots in question. Chief Justice Macaulay, in delivering judgment, says that "the bank as intended in the patent must be taken to mean the land line defined by the high water mark." Justices Sullivan and McLean concurred in this view, although there was some difference of opinion as to how high water mark should be defined.

THE CROWN OWN WATER LOTS OUTSIDE HIGH WATER MARK.

5. As far as the the writer can ascertain this decision has always been followed, and the Crown, represented by either the Dominion or Provincial Government, now appears to have the unquestioned right to the water lots outside the high water mark on navigable rivers or lakes.

DIXSON *v.* SNETSINGER.

6. This decision (*Parker v. Elliott*) was followed by Mr. Justice Gwynne in 1863, in the case of *Dixson v. Snetsinger* (23 U.C.C.P. 235), who went further, and decided that in order to determine whether a certain stream is navigable or not, we must consult the Civil law, and not the Common law of England.

NAVIGABLE RIVER ACCORDING TO CIVIL LAW.

7. This Civil law was the law in force before the conquest of Canada from the French, and was in general replaced by the Common law of England. What then is a navigable stream according to this Civil law? The following is taken from the decision in *Gage v. Bates* (7 U.C.C.P. 116): "Navigable rivers, in the language of the Civil law, are not merely rivers in which the tide flows and reflows, but rivers capable of being navigated; that is navigated in the common sense of the term."¹

8. In *Attorney-General v. Harrison* (12 Chy. 470) the Sydenham River is decided to be a navigable stream, although at that time obstructed by fallen trees and sunken logs.

9. In *Dixson v. Snetsinger*: A channel of the River St. Lawrence was extremely rapid, but small Canadian boats, 25 feet long, used to pass up, being drawn through the rapids by men with cable. This was held to be a navigable river also.

NAVIGABLE STREAM DEFINED.

10. It would therefore seem that a navigable stream in Canada is one actually navigable by boats or vessels used in the prosecution of commerce.

HIGH WATER MARK DEFINED.

11. As in paragraph 5, it appears that a lot fronting on navigable waters extends to high water mark, we, as Surveyors, may often be called upon to define this boundary. How shall we proceed? The term "high water mark" should not be taken in its literal sense, nor does it mean the highest known water mark. Mr. Justice Wilson puts the matter very clearly in his decision in *Plumb v. McGannon* in 1871 (32 Q.B. 8) when he says: "The evidence does not shew what the limit of the highest ordinary state of this river is, or was; as that would seem to be the proper limit of high water mark, and not the highest limit that the water reaches in the course of the year; for the great flow caused by the melting of the snow and ice, and by the spring rains, or by other unusual floods or causes, is to be excluded in determining the limit of high water mark" "The true limit would appear to be by analogy to tidal waters, the average height of the river after the great flow of the spring has abated, and the river is in its ordinary state." The writer thinks that, basing our work on this decision, there should be no great difficulty in establishing the boundary.

THE LAW OF ACCRETION.

12. But here another difficulty arises, namely the question of accretion, which is the gradual change always going on in the position of the bank and high water mark

Sir John B. Robinson, in the case of *Cobourg and Peterborough Railway v. Throop* (2 App R 212), says, in deciding the case: "When the gain from accretion has not arisen from any sudden and violent change, but has been gradual and imperceptible, according to the sense which is now put on these terms by Courts of Justice, the high water mark as it stands from time to time, influenced by this imperceptible increase to the width of the shore, is what is to be regarded. If it were otherwise, the consequences of such a change by accretion, though to a much less extent, would be most disastrous to proprietors by shutting them out from the water altogether." The judge also quoted, with approval, a previous decision in which it was stated: "If this accretion which was contributed to, or even purposely contributed to by the act of defendants, that would not take the matter out of the ordinary law with respect to the accretion."

BOUNDARIES NOT PERMANENT.

13. Taking these two decisions together it would appear that such boundaries cannot be permanently established for all time, but should be determined annually after the great flow of the spring has abated.

14. Another interesting point is how does this law of accretion affect the width of road allowances laid out of a stated width from the water's edge. Does the natural accretion form part of the lot on op-

posite side of road, or is it part of the road itself, or is it the property of the Crown? The writer has been unable to find a legal decision on this point, but is of opinion that such accretion is the property of the Crown.

OWNERSHIP OUTSIDE HIGH WATER MARK.

15. Outside of this high water mark the land covered by water is vested in the Crown, whether as represented by the Dominion or Provincial Governments the writer cannot say. The matter is now being fought out in the Supreme Court.

BOUNDARIES IN UNNAVIGABLE STREAMS.

16 Taking up the question of boundaries defined by un navigable rivers, the following are three decisions bearing on this point. In the case of *Queen v. Robertson* (a Supreme Court case), Mr. Justice Strong says (6 S.C.R. 130): "No principle of law can be better established, both in England and America, than the rule which ascribes the ownership of the soil and bed of a non-navigable river, *prima facie*, to riparian proprietors of the opposite banks each to the middle thread of the stream."

In *Kains v. Turville*, 1871 (32 Q.B. 17), (a case of removing gravel from bed of Kettle Creek, an un navigable stream in Township Yarmouth) the following extract from description is taken: After going to the west limit of the road which crosses Kettle Creek, "Thence north along west side of said road 25 links more or less to the water's edge of Kettle Creek. Then keeping along the water's edge of said creek with the stream until the said creek intersects the line or limit between lots." (The rest of description is immaterial.) This description was held by Chief Justice Draper to hold the land to centre of creek, except in the case where the creek was specially excepted in description, as was the case in *McArthur v. Gillies* (29 Chy. 223) when the land on one side of an un navigable river had been conveyed to one party, and afterwards the land on the other side "together with the whole of the river" to a second party. The decision did not turn on these descriptions, which is to be regretted, but the judge seems, from his remarks, to favour the bank being the boundary in place of the thread of the stream.

BOUNDARY IN THE CASE OF REGISTERED PLANS ADJOINING UN-NAVIGABLE STREAMS

17. In the case of *Platt v. Attrill*, which went to the Supreme Court, the judges there say (10 S.C.R. 425) that when a certain "Block F" was laid out on a Registered Plan, and shewn on this plan bounded on one side by the water's edge of the River Maitland (an un navigable stream), and this Block was conveyed by deed to one Ross, unless specially reserved, the portion of the bed of the river between this Block and middle thread of the river would and did pass by the deed to Ross.

MIDDLE THREAD OF RIVER DEFINED.

18. "The middle thread of the river alluded to in the above cases is the middle line between the shores upon each side without regard to the channel or lowest and deepest part of the stream, and in ascertaining the shores or water lines on each side to measure, it will be proper to find what these lines are when the water is in its natural and ordinary stage, at a medium height, neither swollen by freshets nor shrunken by drought. (*Trustees v. Dickenson*, 9 Cush. 544.) If the river be divided in two courses by an island in its middle, the thread of the river for boundary purposes bisects the island." (Phear "Rights of Water.")

19. Here again the law of accretion makes itself felt, and any gradual change in the course of the stream changes the boundary accordingly.

The writer has pleasure in acknowledging the great assistance given him in the preparation of this paper by Mr. Angus MacMurchy, one of the C. P. R. solicitors, who placed a valuable law library at the writer's disposal.

DISCUSSION.

Mr. Sankey—I would like to ask Mr. Walker whether, in his search in the preparation of his paper, he found any cases which recorded the definition of what a navigable river was, and whether the title to the bed of the river ever passed out of the Crown at all. It is a case of some interest to surveyors. In some cases the bed of a river, as one contended, does not pass in the patent; in other words, "to the water's edge" or to "the bank of the stream" is the wording in the patent. Perhaps in a concession farther up the river you find the whole bed of the stream passes in the patent. The lot passes as a full lot. It is one of the points I think there is some dispute about as to whether certain rivers are looked upon by the Crown as navigable when in fact they are not. I see in this paper you say, one actually navigable by boats or vessels used in the prosecution of commerce.

Mr. Walker—I may say in answer that I looked that up as fully as I could, and this was the decision that seemed to throw most light on the subject. I think it would have to be decided in the courts whether a river is navigable or not. There is no way of actually deciding it except in that way. There are a great many rivers there is very little doubt about, but there may be some that may be so nearly on the line between a navigable and unnavigable river they would be unable to decide it without reference to the court.

[*This Association is not responsible as a body for any opinions expressed in its Papers by Members.*]

A ROAD OR NOT A ROAD.

BY M. GAVILLER, O.L.S.

Collingwood.

—
KENNY *vs.* CALDWELL.

IN September, 1875, I was employed to stake out lot letter D, on the east side of the Penetanguishene road, in the 1st concession of the township of Oro, and planted posts for the angles of same. In February, 1876, I was employed by the Township Council, township Oro, to stake out a schoolhouse ground at the westerly end of the gore composed of lots D and E, east of the Penetang road, and located the westerly apex of the gore 74ft. 10in. east of the easterly limit of the Penetang road, and distant one chain each way at right angles from the northerly and southerly boundaries of lots 10 and 11. (See plan I.)

I found that another surveyor had planted a post, for this said point, *on the easterly limit* of the Penetanguishene road, 22ft. 9in. northerly from the north-west angle of lot No. 10, leaving an unaccounted-for strip of land between said lot 10 and lot "D."

The plaintiff Kenny purchased part of lot "D," the following being the description in the deed: "The south-east part of lot letter D on the east side of the Penetang road, being a block of land having a frontage of 80 rods on the eastern boundary of said lot D and 200 rods on the southern boundary thereof."

Caldwell, the owner of that part of lot D north of Kenny's portion, having been instructed that there was no legal road between lot 10 and lot D, put up his fence, as Kenny considered, nearly one chain too far south, alleging that Kenny's purchase should be bounded on the south either by the northerly boundary of lot 10 or the strip of land 22ft. 9in. wide. That part of the road in dispute at Kenny's purchase had been opened and travelled as a township road for some thirty-five years, the westerly part having been opened up for traffic some years later. Hence the suit.

The Penetanguishene road lots, on each side, and front of 2nd concession, were laid out by Deputy-Surveyor Wilmot in 1811, said road being termed "a road of communication between Kempenfeldt Bay and Penetanguishene Harbour on Lake Huron."

The line for said road was run in the centre of a road allowance one chain wide.

On the plan returned by the surveyor no number or letter was placed on the gore lots on the east side of the Penetang road, or on the lots between No. 10 and No. 11 in the 2nd concession.

The suit was tried in the High Court before Ferguson, J., who gave judgment dismissing the plaintiff's action with costs, in 1891.

Then appeal to Divisional Court.

Then appeal to the Court of Appeal.

Then appeal to the Supreme Court, the judgments of the two latter being in favor of the plaintiff, thereby establishing the road in question.

INSTRUCTIONS.

(Extract from.)

SUR. GEN. OFFICE,

York, August, 1811.

Mr. Saml. S. Wilmot, Dept. Surveyor.

S r,—His Excellency the Lt.-Governor having been pleased to order that a road of communication between Kempenfeldt Bay on Lake Simcoe and Penetanguishene Harbour on Lake Huron should be surveyed and laid off into lots for settlement, you will, without loss of time, prepare yourself to perform that service, and having provided your usual party as to the number of hands (for which you will be allowed the accustomed pay and allowance for ration), you will proceed to the north side of Kempenfeldt Bay, near to the place at the head thereof where in June, 1808, your examination for a line for a road commenced, and there select and choose the most suitable position for a town and harbour.

You will then survey the outlines of said town of one mile in length and half a mile in breadth, and return me a rough plan thereof that I may prepare instructions for laying out the same into lots. This having been done, you will proceed to examine and fix upon the most proper ground for a road as direct from thence as may be to the south side of Penetanguishene Harbor, which having ascertained *you will survey and lay off on each side of your line or road* (which is to be a chain wide) *lots of twenty chains wide*, and extending one hundred chains in depth, to contain 200 acres in each, *with one chain of allowance for road between every five lots* until you come to within half mile of Penetang Harbor (the site of another town). You will then survey the outlines of this town plot and return to me a rough plan thereof, so that instructions may be prepared for laying out this into lots also, etc., etc. . . .

Your field notes, diary and account you will make out and attest in the usual manner, etc., etc. . . .

EXTRACT FROM WILMOT TO SUR. GEN. DEPT., CROWN LANDS.

22nd October, 1811.

Sir,— . . . Having fixed upon the situation for the village, I opened a line N. 12 degrees east, and allowing half a mile for the depth of the village, I began to lay off lots of 20 chains each with an allowance of one chain for road between every fifth lot to No. 10, where I altered my course to N. 30 degrees, which I continued to No. 17, and found that the line interfered with a swamp that I had not any knowledge of in my tracks in that part of the country. I then thought it advisable to make an offset of 20 chains to the left, at the end of which I produced a line N 30 W. to Penetanguishene Harbor, making a distance of $39\frac{3}{4}$ miles from Kempenfeldt Bay, my place of departure. . . . The quality of the land on the road of communication is, generally, very good, both for settlement and a road, but not so well watered as it ought to be. Therefore I should advise that the 2nd concession on each side of the street should be surveyed, etc. . . .

INSTRUCTIONS.

25th Oct., 1811.

Mr. Sam. S. Wilmot, Surveyor.

Sir,—I am to acknowledge the receipt of your letter of the 22nd inst., together with the plan of your operations on the line of communication between Kempenfeldt Bay and Penetanguishene Harbor, . . . and, for the reason you assign, think it advisable that you survey and lay off the front of the 2nd concession on each side of the road or line of communication, as this will complete the survey of each 1st concession and lay off the front of the 2nd . . .

P.S.—You will continue to lay off the lots at right angles to the road, and should there be a gore between the village and the first lots on the road, you will leave it for further disposition. . . .

T. G. RIDOUT, S.G.

EXTRACT FROM C.L.D. TO WILMOT.

28th Oct., 1811.

. . . You will find by my instructions to you on 25th inst. that you are to survey a 2nd concession line on each side of the street, and which is to be performed on the same principle as the 1st concession. . . .

T. G. RIDOUT, S.G.

DESCRIPTION FOR PATENT OF LOT "D."

CROWN LANDS DEPT.,
27th April, 1839.

Grant to Catherine MacDonal. . . . All that parcel of land in the township of Oro, in the county of Simcoe, in the Home

District, being lot lettered D on the east side of the Penetanguishene road, that is to say, commencing on the eastern side of the Penetanguishene road at the intersection of allowance for road between lot lettered E and lot No. 11, and between lot lettered D and No. 10, then north about $79^{\circ} 30'$ east to the allowance for road in rear of the said lot lettered D, then south 9° west to the allowance for road between lot No. 10 and lot lettered D, then north 81° west, 100 chains more or less, to the place of beginning, containing 200 acres, more or less. . . .

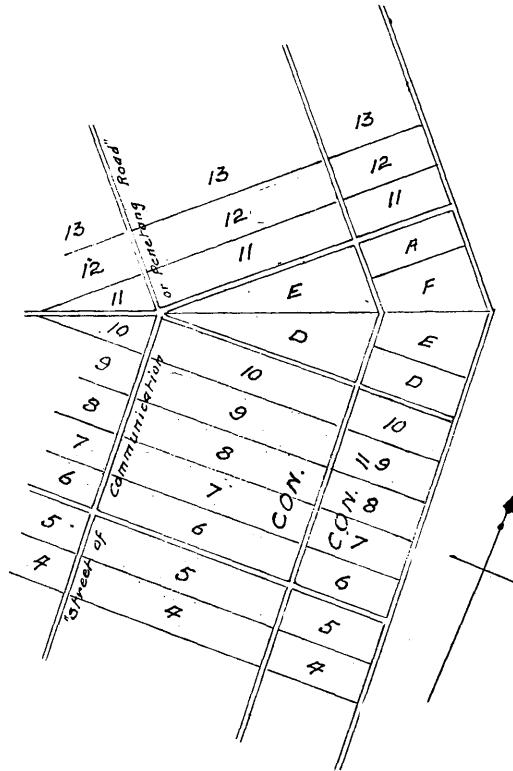
DESCRIPTION OF LOTS 4 AND 10.

27th April, 1839.

Commencing on the east side of the Penetanguishene road at the westerly angle of each of said lots respectively, then south 81° east 100 chains, more or less, to the allowance for road in rear of the said lots, then north 9° east 20 chains, more or less, to the limit between lots 4 and 5 for lot No. 4 and to the allowance for road between lot lettered D and lot No. 10 for lot No. 10, then north 81° west one hundred chains, more or less, to the Penetang road aforesaid, then south 9° west 20 chains, more or less, to the place of beginning in each lot, containing 400 acres, more or less, etc. . . .

Gore lot E was not described for patent until 24th March, 1840.

PLAN
CROWN LANDS OFFICE
"Departmental Plan"

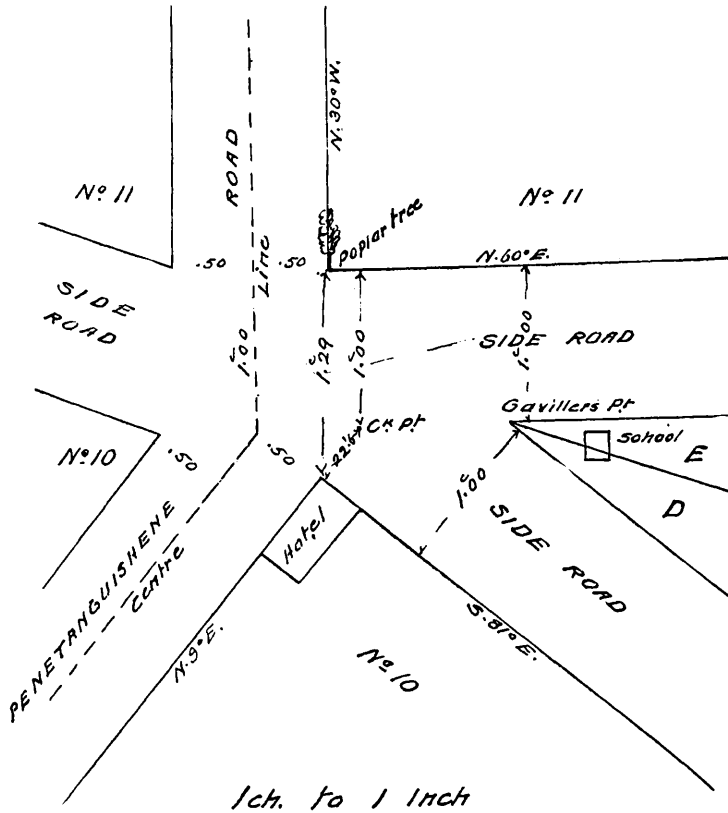


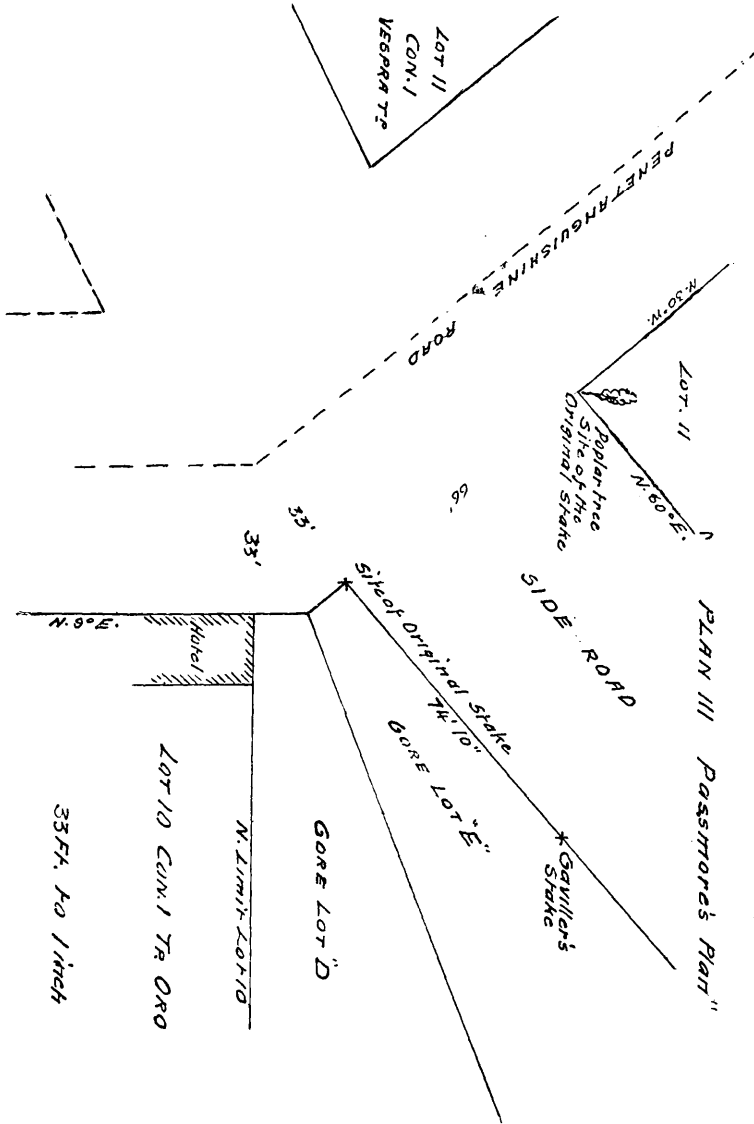
80 chs. to 1 Inch

Note: On Sam. Wilmet's Plan, Lots lettered,
have no letter or number on them

PLAN III

'Gavillers Plan'





Extract from Field Notes, December 31st, 1811, by Surveyor Wilmot, beginning on the North Shore of Kempenfeldt Bay :

<i>Nos.</i>	<i>Chs.</i>	<i>Lks.</i>	<i>Nos.</i>	<i>Chs.</i>	<i>Lks.</i>
N.	9°	E.	N.	9°	E.
....	20	Depth of Village	10	20	....
2	20	....	N.	30	W.
3	20	....	R.	1	....
4	20	....	11	20	....
5	20	....	12	20	....
R.	1	....	13	20	....
6	20	....	14	20	....
7	20	....	15	20	....
8	20	....	R.	1	....
9	20	....	16	20	....

Extract from Field Notes, Second Concession, Township of Oro, distant 101 chs., at right angles from Street.

<i>No.</i>	<i>Chs.</i>	<i>Lks.</i>		
N.	9°	E.		
....	....	....	Lots 20 chains ; - and road every	
9	20	....	5th lot, 1 chain.	
10	20	....	
R	1	....	
....	20	....	{ This is now D. This is now E. This is now F. This is now A. }	Notes made by Crown Lands Department.
....	15	....	
....	14	66		
....	20	52		
R	1	....	
11	20	....	
12	20	....	
13	20	....	
14	20	....	
15	20	....	
R	1	....	

REASONS OF APPEAL.

1. The true boundary between the two parts of lot "D" and between it and lot 10, which road has been opened and travelled for a great many years and has been treated by the inhabitants and the Township Council, by grants of money, statute labor, etc., as a public road.

2. This appeal is from the judgment of the Divisional Court, which being equally divided, the judgment of the learned trial judge, treating the road as non-existent, stands.

3. The plaintiff submits that the road in question exists, as shown by (a) the original plan made by the original surveyor, in which it clearly appears, and which is quite consistent with the field notes and with work on the ground; and (b) by the adoption of this plan by the Crown Lands Department and the patents and descriptions therefor subsequently issued by the Department, in which this road is expressly recognized and described.

4. The plaintiff submits that either of these two grounds is sufficient alone to entitle the plaintiff to judgment.

As to "a":

1. The instructions to the original surveyor were to lay out a road of communication (the Penetanguishene road), together with a concession on each side of said road, and also in the same connection to "complete the survey of the 1st concession" by surveying the 2nd concession "on the same principles as the first" and to leave a road allowance between every five lots.

2. The original surveyor returned to the Department immediately after his survey his plan showing clearly the road allowance where it ought to be by the instructions (he having surveyed from the south), immediately north of lot 10 and between it and the "gore."

3. The defendant contends that the field notes are inconsistent with this plan, but it is perfectly plain that the intention of the original surveyor was to lay out this road, and it would be extraordinary to find such inconsistency where the field notes and plan are drawn by the same hand; and as a matter of fact the plaintiff submits that there is no such inconsistency. The field notes at this point, after reaching 10, show a change of course as follows: "N. 30° W" and then "R 1 chain," and then lot 11 and so on.

4. *It will be observed that the field notes make no reference to the "gore" expressly*, but simply show the opening for the road allowance or road allowances, as the case may be, and then continue on the new course.

5. It is submitted that it is not inconsistent, but, on the contrary, quite consistent with the plan and consistent with the existence of the road in question, or even with the two roads north and south of the gore.

6. The defendant insists that the road is north of the gore and south of 11, and the plaintiff, while neither denying nor admitting it, submits that the existence of two roads is quite consistent with both

the plan and field notes; in fact, two roads are shown on the plan, and it is observable in this connection that *both roads are continued and the same plan followed on this the 2nd concession which was surveyed by the same surveyor* at the same time, and there are not five lots in the 2nd concession forming the back part of this gore between the two roads any more than there are in the first.

7. On the other hand, the theory offered by the defendant, namely, the frontage of both "D" and "E" on the Penetanguishene road, would be quite inconsistent with the said field notes.

8. The defendant's theory also leaves a considerable space of land between lot 10 and lot D wholly unaccounted for, and for which the surveyors called by the defendants frankly say they cannot account.

9. It is also observable that the road at this point on the west of the Penetanguishene road is at right angles to neither course.

Then as to "b":—

1. The action of the original surveyor in laying out the road in question was adopted by the Department by the acceptance of his plan, the completion of their office plan from same, and by their transmission, as required by law, of a certified copy of same to the County Registry office, and by the subsequent sales of "D" and 10, *the only two lots adjoining the road in question*. The patents of these two lots are simply patents of these lots by numbers without metes and bounds, but the "descriptions" for same on which the patents were based, *and to which they refer*, do describe the lots by metes and bounds, and both expressly recognize and describe the road in question.

2. The plaintiff submits that this is conclusive both as to the original survey and also by the estoppel against the defendant claiming under one of these patents, without reference to the original survey. (See *Haggarty v. Britton*, 30 U.C.R., 321; *Martin v. Crow*, 22 U.C.R., 485; *Holmes v. Kechnie*, 23 U.C.R., 57; *Stevens v. Buck*, 43 U.C.R., 6; *Smith v. Clines*, 20 C.P., 213; *McEchran v. Somerville*, 37 U.C.R., 609; *Reg v. G.W.R.*, 21 U.C.R., 556; *Reg v. Hunt*, 16 C.P., 145; *Badgely v. Bender*, 3 O.S., 221; *Davis v. Waddle*, 6 C.P., 448.

3. The defendant suggests that the description, for the patent for lot "E" militates against the plaintiff's contention, but this and the patent was *subsequent* to the other patents referred to, and the description is *general* and was based on the then existence of "D" as previously granted, and only purported to deal with "E" and the road to the north; and the plaintiff submits that when properly read it is not inconsistent, but, if so, must give way to the prior and more specific grant and descriptions.

4. Some evidence was given on behalf of the defendant at the trial as to the site of a stake at this gore, which was assumed to be the south boundary of the road south of lot 11. This evidence, which was principally given by an old man named Johnstone, in his eighty-fourth year, was extremely unsatisfactory; he only pretended to have seen the stake once (sixty years before), and had never seen it or the

site since, and on cross-examination placed it in a different place, and where the plaintiff says it was, namely, the north-west corner of 10. The ground was very uneven, a large hollow having been filled up in the meantime and the road and neighborhood cleared of stumps and the face of it quite changed. This evidence is unreasonable, and if accepted would be wholly inconsistent with the field notes and plan and would produce the space unaccounted for, already referred to.

5. The plaintiff also refers to the reasoning in the judgment of Mr. Justice Rose in support of his contention.

REASONS AGAINST APPEAL.

The defendant submits that the judgment appealed from is right and should be affirmed for the reasons assigned in said judgment, and the following and other reasons:—

1. The onus lies upon the plaintiff to establish the true southern boundary of gore lot "D" as well as his title to the land in dispute. This onus he has not satisfied.

2. The true southern boundary of gore lot "D" does not in any way depend upon the existence of a road to the south of gore lot "D" and the opening up and travelling by the inhabitants of such a road, grants of money therefor, or the doing of statute labor thereon, cannot in any way fix the said boundary, although such acts may be sufficient to establish a highway.

3. The field notes of the original survey and the actual work on the ground done by the original surveyor, demonstrate that no road allowance was made or left in the original survey between lots 10 and "D," but that a road was laid off after the change of bearing was made at the apex of the gore, and such road has existed for years between lots 11 and "E."

4. If this were not so, and if a road had been laid out north of lot 10, it would necessarily follow that the balance of the Penetang road from the turn to Penetanguishene, would be, not where it is, but about four rods farther east, because the four rods for the supposed road north of lot 10 (the hotel corner) would carry the turning point in the Penetang road just so much farther along the first course of the latter which to that point was N. 9° E.

5. Again, the original surveyor's instructions were to lay off a road between every five lots, and had he laid off a road north of lot 10 in addition to the one south of 11, which admittedly he did lay off, he would have exceeded his instructions.

6. The plaintiff contends for the road between lots "D" and 10 because the original plan shows a road and because the descriptions for patent of "D" and 10 refers to such a road. As to these the defendant submits that the work on the ground and the original field notes should prevail over any plan or descriptions for use in the office of the Crown Lands Department, and that the latter are not in this case admissible evidence.

7. Moreover, if the plan in question is to be regarded at all, it must be looked at in its entirety and no particular part selected to uphold the plaintiff's contention. If it is looked at in this broad way, it will be at once seen, first, that the alleged road is in line with, and continuation of, the road between 10 and "D" in the second concession, and therefore such alleged road must have been adopted by the Department, if at all, as running in such course, and would occupy the next four rods south of where the plaintiff contends for, and practically come off what is now recognized as lot 10. To place it where the plaintiff contends necessarily introduces a jog not shown on the plan.

Secondly, it will be observed that the plan shows the opening on the Penetang road for the two side roads to be eight rods in width or the width of two roads, whereas the actual distance on the ground between the admitted south west angle of lot 11 (the poplar tree) and the hotel corner is some 45ft. less than eight rods, again showing that the alleged road, if it existed at all, is taken up in part by lot 10.

8. If the existence of such a road between "D" and 10 is to be assumed, there is nothing to indicate that it must necessarily be 66ft. or four rods in width. Is it not more reasonable to suppose that the Department (if the present difficulty ever occurred to it at all) determined to use up the 22ft. 9in. surplus between lots "D" and 10 (occasioned by the change of bearing) in making a road?

9. If the descriptions for the patents of said lots "D" and "E" are to be referred to, it is to be noticed that the Crown Lands Department, when preparing them, was under the impression that such lots came to a point *on* the Penetang road. It will be observed that they both commence at a point *on* the Penetang road, and after describing a triangular piece of land, *return to the same point*. As a matter of survey, these gore lots do not actually come to a point, "D" having a frontage of 12ft. 3in. on the first course of the Penetang road, whilst "E" has a frontage of 10ft. 6in. on the second course of said road. If the point of commencement contended for, namely, P. L. S. Gaviiler's stake, which is 74ft. 10in. east of the Penetang road, along the southern limit of the road allowance between 11 and "E" be accepted, then the point of commencement would not be *on* the Penetang road, nor would the third course of the triangle return to this point.

Further, the distance of the first course, that is, to the rear of the lot, would be, not 100 chains, but nearly one chain less, and the bearing between "D" and "E" would be different to that set out, and not as the evidence shows it to be, and the sizes of the lots "D" and "E" would be unequal and not alike, as set out in the grants.

10. The defendant also relies on the inconsistencies in the description for patents for "D" and "E."

OUT OF ONT. APPEAL REPORTS, VOL. XXI., PAGE III.

"The question was one of boundary. Both parties claimed under the same patent, the contest being as to the point of com-

mencement of the description of the plaintiff's land, the plaintiff contending that there was a road allowance to the south of the lot as patented, and that his parcel commenced at the northerly boundary of this road and not at the northerly boundary of the next lot, which was an ascertained line. The action was tried before Ferguson, J., who found in favour of the defendant, and his judgment was affirmed by the Common Pleas Division, the judges being divided in opinion. A good deal of evidence, which it is unnecessary to refer to in detail, was given as to the work on the ground, one very old man, named Johnstone, describing the position of some of the surveyor's posts in the locality in question. The plaintiff appealed, and the appeal was argued before Hagarty, C. J. O., Osler, and MacLennan, J. J. A., and Robertson, J., on 30th November, and 1st December, 1893."

The Court of Appeal held as follows:—

"The description of a lot prepared for and used by the Crown Lands Department in framing the patent which grants the lot by number or letter only, is admissible evidence to explain the metes and bounds of that lot.

"The plan of survey of record in and adopted by the Crown Lands Department, governs on a question of location of a road, when the surveyor's field notes do not conflict with the plan, and no road has been laid out on the ground." Osler, J., in giving judgment, said:—

"In *Badgely vs. Bender*, 3 O S., 221, Sir Jno. Robinson, in speaking of such a plan, where no evidence remained or could be given of the actual original survey, said (p. 226): 'When we know that it is on these official documents that the patents have been subsequently framed, we must be convinced of the extreme danger of trusting so implicitly to anything else as to these official diagrams for information upon the plan on which the several townships were laid out.' *This has not been questioned in our courts at any time within my knowledge.*"

In *Regina v. Great Western Railway Company*, 21 U.C.R., 555, at page 577, the Court, speaking by the same Chief Justice, says: "Under the 313th clause of the Municipal Act (the origin of which is sec. 12 of 50, Geo. III., ch. 1), the fact of a Government surveyor laying out certain allowances for a road in the plan of the original survey of Crown Lands would be sufficient, we think, to give such roads or streets the legal character of highways, though there may have been no stakes planted on the ground to mark them out."

See also *Regina vs. Hume*, 16 C.P., 145, and in appeal 17 C.P., 443, and *Carrick vs. Johnstone*, 26 U.C.R. 69. So in *Hagarty vs. Britton*, 30 U.C.R. 321; also, *Martin vs. Crow*, 22 U.C.R. 485; *McGregor vs. McMichael*, 41 U.C.R. 128; *McEchran vs. Somerville*, 37 U.C.R., 600, 620, 629.

MacLennan, J.A., in giving judgment, said: "The plan must be regarded as a part, and an exceedingly important part, of his report,

and entitled to as much weight as the field notes, and when not in conflict with the work on the ground must be regarded as conclusive.

If we concede, therefore, that he left the gore alone and unsurveyed, *afterwards the Crown had a plan of the township prepared, and upon this plan* the gore is subdivided into three parts, namely, lots D and E, and an allowance for road along the southern limit of D. Badgely *vs. Bender decides that this plan alone, without any evidence by whom compiled or from what materials, is sufficient evidence of the allowance.*"

There were descriptions for patent.

"These documents are official records. They are instruments signed by an official of the Surveyor-General's Department, and were evidently prepared for the guidance of the proper officer in, and as his authority for, the preparation of the patents." In *Stevens vs. Buck*, 43 U.C.R. 1, Harrison, C.J., reviewed the authorities, and held *that the Department of Crown Lands might alter the office plan of a township, and that the patents afterwards granted would be governed in their construction by the altered plan.*"

Hagarty, C.J.O., and Robertson, J., both agreed with the judgment given.

Appeal allowed with costs.

There was then an appeal taken to the Supreme Court, which Court confirmed the decision of the Court of Appeal, establishing as a public highway the road allowance in dispute.

This Association is not responsible as a body for any opinions expressed in its Papers by Members.]

THROUGH THE BARREN LANDS :

AN EXPLORATION LINE OF 3,200 MILES.

BY J. W. TYRRELL, C.E., O.L.S.,

Hamilton.

PART I.

(2,200 MILES BY CANOE.)

DURING the early spring of 1893, the Director of the Geologic Survey of Canada having issued instructions to my brother, J. B. Tyrrell, Field Geologist of that department, to conduct an explorer survey into the great Barren Land district lying to the west of the northern portion of Hudson Bay, preparations were at once commenced for the undertaking.

For the purpose of taking charge of the topographical work, an acting as Eskimo interpreter, the services of the writer were engaged.

Two 18-foot varnished cedar canoes were ordered from the Peterboro' Canoe Co., to be shipped to Edmonton.

Four expert canoeemen were employed to handle them, and arrangements were made to have a third 19-foot basswood canoe—used during the previous summer—and two men, in waiting at Fort McMurray on the Athabasca River.

Attention was then turned to the procuring of a suitable set of instruments, and after some difficulty we succeeded in obtaining what, I consider, approaches very nearly to an ideal outfit for exploratory work. The following is the complete list :—One large sextant with folding mercurial horizon, one Gurley pocket solar compass with extension leg tripod, two prismatic compasses, one fluid or boat's compass, two pocket compasses, two boat logs, one pedometer, two clinometers, one dipping needle, one pocket chronometer, three American watches, one aneroid barometer, a set of thermometers, a pair of field glasses, an aluminium binocular telescope, and a 4" x 5" hand camera.

Besides the above we provided ourselves with two repeating rifles, one Winchester repeating shot gun, and a good supply of ammunition.

All instruments and arms were well packed for carrying in leather sling cases.

The next matter of importance was the preparation of bills of *supplies* and *provisions*. As much portage work was to be expected on our trip, and as all available carrying capacity would be required for "grub," it appeared to be very necessary that the bulk and

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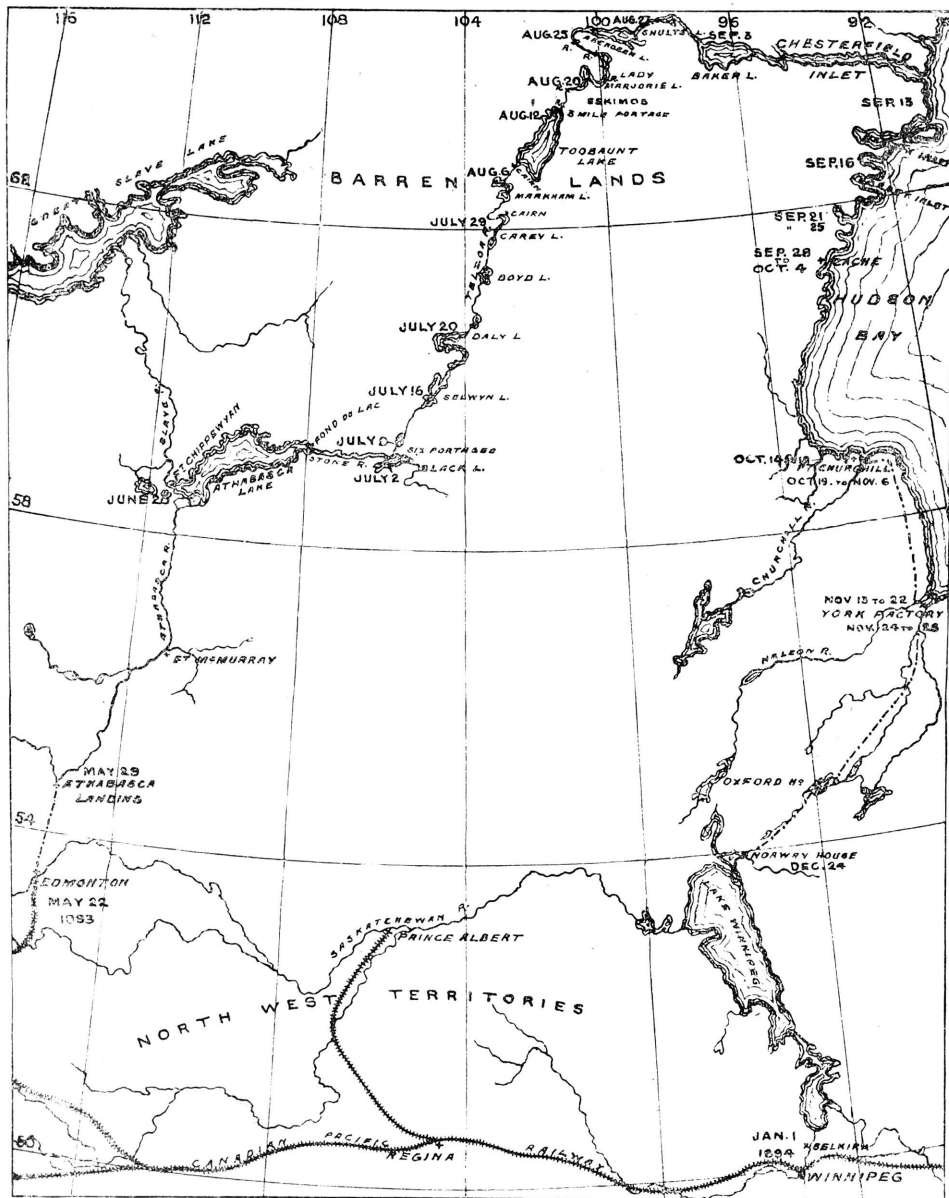
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weight of outfit should be kept down as much as possible. Another feature in connection with our survey was that much of our route would lie within the Barren Lands, where no fuel could be obtained for cooking purposes. Endeavoring to provide for these special features, without going too much into detail, the following was our list of *supplies* :—Three cotton “ A ” tents with tarpaulin floor cloths, one “ reflector ” or Dutch oven, two thin steel frying pans with folding handles, one nest of kettles, the usual culinary camp outfit of dishes, all made of tin on account of their lightness, three Hudson Bay Co. axes, and files to sharpen them, two small gill nets, an assortment of fishing tackle, three tracking lines, eight pack straps, three canoe covers, one dozen large waterproof sacks, five gallons of methylated alcohol, two so-called alcohol stoves, two boxes of candles, matches, one dozen bottles of Jamaica ginger, one dozen bottles of pain killer, and three caddies of tobacco, for use chiefly in securing the goodwill of natives.

Besides the above, the following *provisions* were ordered :—Flour, rice, oatmeal, biscuits, bacon, canned meats, sugar, evaporated fruits, baking powder, tea, chocolate, butter, salt, pepper, and mustard.

With the expectation of securing game on our journey, the quantities of flour and other vegetable foods were made large in proportion to amount of bacon and canned meats.

The orders for these goods, excepting such articles as could not be obtained in the west, were sent on to the Hudson Bay Company's store at Edmonton, where, by arrangement, our party—with the exception of the two Fort McMurray half-breeds—assembled on the 22nd of May.

From Edmonton, the north-western terminus of the Canadian Pacific Railway, for a distance of one hundred miles northerly to Athabasca Landing, our outfit was transported by waggons.

Here the bulk of our “ stuff ” was shipped by the Hudson Bay Company's steamer to Fort Chippeweyan on Lake Athabasca, and on the last day of May, with our light and beautiful little crafts, we commenced our canoe journey.

The *survey*, however, was not begun here ; and as the Athabasca River, from the landing down to the lake, has been so well described already by our friend Wm. Ogilvie, D.L.S., in his most interesting articles, I will not now attempt to re-describe it.

It will be sufficient to say that after passing down the Grand Rapids in safety and reaching Fort McMurray, we were joined by our third canoe and two additional men. Continuing, we arrived at Fort Chippeweyan, about 350 miles below the Landing, on the evening of the 17th of June.

Two days later the Hudson Bay Company's steamer “ *Grahamme* ” arrived with our supplies, and now preparations were made for the commencement of our survey.

Henceforth our route was to deviate from the beaten track of traders and former explorers.

The geographical position of Chippeweyan having been determined, it was to be made our starting point, and from here we would have to carry our whole season's supplies. During our brief stay at the Fort, the opportunity for rating the chronometer was taken advantage of; and what we considered a stroke of good fortune was that, through the kind efforts of Dr. McKay, the Company's agent in charge of the post, we secured the services of a native Chippeweyan Indian, named Moberly, who claimed to know the country for a hundred miles or more to the north-east of Lake Athabasca, into which we were proposing to travel. The assistance of such a man to act as our guide could not fail to be of great value to our party. He would be able to save us much time through knowing the trails, by taking us straight to the portages and in finding the best camping places. Of course, Indian-like, he had to be advanced a month's wages in goods from the store. Then he required an assistant to accompany him in his canoe, and finally he wanted an increase in wages. In consideration of the advantages which we hoped to derive from him as an escort, these matters were finally arranged to his liking; and on the morning of the 20th of June, with our little fleet of four canoes all well loaded, and a good-bye to civilization and all its formalities, we hoisted our sails—having a fair breeze—and set out on the traverse of the north shore of the lake.

Distances were measured with the "log," and when landings were made, courses were taken with the prismatic compass, though occasionally they were taken with the fluid compass without going ashore. As frequently as possible, without entailing too much delay, the solar instrument was set up, the magnetic variation determined, and rounds of angles taken. Thus a continual check was kept upon the magnetic compass readings.

Latitude observations were taken every day when the sun could be seen at noon, or the stars at night; and from time to time, at initial points on our route, observations were taken for longitude. When portages were met with, measurements were made by pacing, and on river work the distances were estimated by the time occupied in making them. As our general course on all river work was nearly north, the proper correction for each day's work was known from the determinations of our latitude, and with a little practice very close approximations, even on the streams, were found to be obtainable.

Thus, briefly stated, is the outline of the system of survey adopted by us.

On the 29th instant we reached Fond-du-lac, a winter outpost of the Hudson Bay Company. It was now deserted by all but an Indian family, who appeared to be in a very destitute condition.

From here to the eastward, a distance of fifty miles, the lake is quite narrow, having much the appearance of a broad river.

It is only from one to five miles in width, and across on the south shore could be seen a large group of Indian tepees. Here, it was found, was the home of our guide, and to it, of course, we all had to go. Our own canoes were not landed, but Moberly went ashore and

deliberately hauled out and overturned his. For some time we patiently awaited his return, but as he came not, a message was sent to him to make haste as we had no time to spare. After a while he did make his appearance, but only to inform us that he thought he would not go any farther. What could we do? We could not force him to come against his will, and it would do us no good to shoot him—though I confess I felt a little like doing so. We tried to persuade him to come with us, but the best we could do, after supplying his family with tea and sugar, was to get his promise that he would follow and overtake us on the morrow. We did not believe him, but being unable to do any better, we left him sitting on the shore smoking his pipe, and continued our course.

At noon the next day, as we were taking our lunch, sure enough, Moberly and his companion made their appearance. We had not expected them, but were glad that they had disappointed us. From this time forward, the guide, who had usually kept himself in the rear since leaving Chippeweyan, began to lag far behind and only show up at camp, or meal time. This sort of thing, he was given to understand, would have to cease. He knew his duties quite well, and was reminded that he was expected to perform them. After this, for half a day, he did better, but then, at the eastern extremity of the lake, finding some of his native friends encamped by the shore, he hauled out his canoe and joined them. Nor could he be induced to continue a foot farther, unless we were prepared to divide up our flour and bacon with his friends, and this we naturally declined to do. From the first, Moberly had proved himself to be a miserable, unreliable scoundrel, and now he and his companion, after doing all they could for ten days to reduce our provisions and securing a month's pay in advance, had resolved to desert us.

Not only this, but, as we afterwards found, he had endeavored to work further mischief by stuffing our men with all sorts of stories about the insurmountable obstacles along the route we were proposing to take, and about the savage Eskimos who would certainly eat us. Indeed, such an impression did he make on the minds of some of our men, that one came to us and made a clean breast of his troubles. He told us of the report he had heard of the country, and of our certain doom in case we should continue. He said that he had a wife and family at home, and that he did not want to leave them without any one to provide for them, etc., etc., and this we found had become about the general feeling of the party. In reply to this manly confession of fears, I assured the men that old Moberly's yarns were a pack of lies pure and simple, and to prove my assertion I informed them that I had myself lived with the Eskimos for nearly two years, and had found them to be far better people than the man who had told them the stories.

By the use of such arguments as these, confidence was again restored, and the miserable, lying, skulking, intriguing Chippeweyan guide—no doubt feeling that he had acted very cleverly—was left with his friends, and we continued our journey, now up the Stone River, the eastern feeder of the lake.

Sunday, the 2nd of July, found us in camp on the bank of this river, at the foot of the lower fall—a wild and beautiful cataract. The weather was very warm and the black flies and mosquitoes swarmed in the woods and about camp, nor did they appear to have the customary aversion to a smudge, for dense smokes were made, and the flies only appeared to revel in them.

Some photographs were obtained of the flies and the falls, whilst during the morning at the foot of the rapids our fishery department secured a number of magnificent white fish and trout, two of which latter measured 3 ft. 2 in. and 3 ft. 1 in. in length respectively.

Our camp was not only situated at the foot of a beautiful waterfall, but in consequence was at the lower end of a rough and rocky portage, which was found to be three miles in length.

We had, at this early stage of our journey, in the neighborhood of four thousand pounds of cargo to be transported, and unfortunately one of our men, Jim, was laid up with a gash in his leg; but on Monday morning, being fresh and in high spirits, the men went at their work with a rush, notwithstanding a 200 feet rocky hill which had to be climbed and a deep muskeg which had to be waded through. Before night, spirits were away down, and every man's feet in the party, excepting those of Jim, who had already a game leg, were fearfully blistered.

Each packer had carried six loads to the opposite end of the portage, representing a walk of thirty-three miles, eighteen of which were travelled under heavy loads.

Camp was pitched with some satisfaction at the upper end of the portage. Two more loads for the party, however, remained at the foot of the rapids. On the following morning these were carried by our limping, back-aching packers to camp, and thence our traverse of the river was resumed.

Early on the afternoon of the same day we reached the upper fall of the Stone River, and found ourselves at the foot of a second long portage. On account of the condition of the men, camp was now ordered to be pitched so as to give them a chance to rest, but my brother and I walked across the portage, which we found to be three and one-half miles in length. Its upper end terminated upon the shore of Black Lake, where it was thought we might see some native Indians who could be hired to assist us across the portage; but in this we were disappointed, finding, instead of Indians, only old forsaken tepee poles and blackened fireplaces.

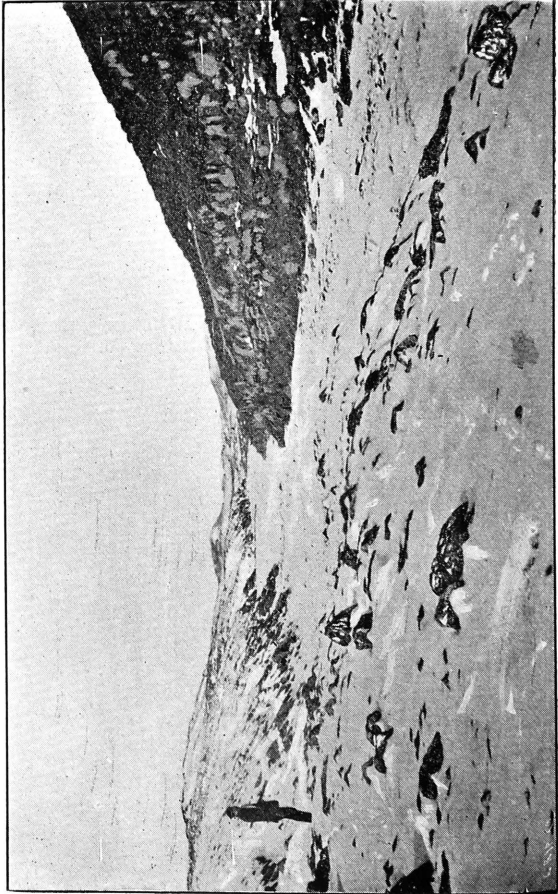
The weather being extremely warm, and ourselves very weary, we tried to rest for a while upon the shore of the lake, but the flies swarmed about us with such frightful fury that we were obliged to beat a retreat and seek rest where alone it could be found, viz, beneath our mosquito nets at camp.

By the way, there is a Chippeweyan tradition which credits the Great Spirit with having first made black flies upon this very portage. (I have not the slightest doubt as to the truth of the legend.)

About two days were occupied in portaging our outfit to the shore of Black Lake; then on the 7th instant, starting out in a north-



J. W. TYRRELL, O.L.S. C.E.



VALLEY IN THE BARRENS

easterly direction and traversing the coast for a distance of sixteen miles, we reached the landing place of an Indian hunting trail, of which my brother had previously been informed by the natives. This place, up to the present time, had been our objective point, and our way to it was known to us ; but beyond, nothing was known of our road or of the country through which it would lead us, excepting for a few days' journey, regarding which portion we had the following Indian directions :—" From Black Lake make a long portage northward to a little lake. Then cross five or six small lakes and as many portages, when a large body of water called Wolverine Lake will be reached. Pass through this lake and ascend a river flowing into it from the northward, until a second large lake called ' Active Man ' is reached. This lake will take two days to cross, and at its northern end will be found the height of land. Across this there is a portage to another large lake, from the north end of which a great river flows to the northward through a treeless country unknown to the Indians, but inhabited by savage Eskimos."

As to where this river flowed to we did not know, but were resolved upon making the discovery.

On the morning of July 8th, therefore, without guide or map, we commenced our survey into the great unexplored wilderness. Our road started with a two-mile portage, through thickets, swamps, and over rocky hills. Then in turn, day after day, numerous lakes, streams, and portages—very much as described by our Indian informer—were discovered and traversed.

After getting into a lake on several occasions, much trouble was experienced in finding the portage from it ; but altogether less time was occupied in trail hunting than might have been expected. Timber, chiefly black spruce and tamarack, becoming more stunted and thinly scattered as we proceeded northward, extended to the height of land and some distance beyond.

One evening, after a long and miserable day's work up stream, in a cold, chilling rain, one of those little incidents occurred which serve to vary the daily routine of life upon a surveying party. As I was standing by the camp fire trying to dry my clothes and enjoying a cup of hot tea, my brother appeared from over a ridge at the back of the camp—where he and his geological hammer had been at war with the rocks—and announced that he had just heard a cariboo calf not far back in the swamp at the foot of the ridge. Being always ready for sport, I picked up my " Marlin," and, getting him to point out the direction from which he had heard the sound, started out, though already nearly dark, for some venison. The dense spruce swamp was found to be very wet, and literally alive with mosquitoes, which at every step rose up from the wet grass in swarms, and beat into my face. A " run-way " was soon found, and then, thinking that I was likely on the right track, I hurried noiselessly along, hoping soon to hear something of the calf. After travelling some distance without any signs of success, I was about to return for fear of losing my way in the darkness, when, a little distance ahead, I heard the cracking of a stick. Feeling that it was assuredly caused

by the foot of the fawn, with eyes and ears alert I glided silently on. Again and again the noise was heard, and each time nearer than the last; so my advance was continued cautiously until soon in a thicket of scrub, only a few yards ahead, the disturbing of some branches was noticed. Still no deer could be seen; but in creeping up closer, at the distance of only a few yards, I suddenly came within full view of an immense black bear. Although taken by surprise at the proportions of my supposed calf, I levelled for the back of bruin's head, and fired. Several delirious tumbles, followed by a bolt into the gloom of the swamp, completed the entertainment so far as I was concerned. It was too dark to follow the wounded animal; so I groped my way back to camp, and related my adventure with the "cariboo calf."

On the 18th of July the height of land was reached, and over this a portage of a mile and a quarter took us to a large body of water, which we have named Daly Lake, the level of which stood at an elevation of fifty feet below that of the one we had crossed just south of the divide. The height of land, from our barometric readings, was found to be about thirteen hundred feet above the sea; and upon this summit, to the top of a tall spruce tree, before we departed, I took occasion to nail the "flag that has braved a thousand years the battle and the breeze."

Daly Lake was found to be sixty miles in length, and from its north shore, after a good deal of searching in many deep bays, the outlet—our informant's "Great River flowing to the north"—was discovered.

It was indeed a great, broad, and rapid river, broken up into several channels, not deep, but as it were the waters of the lake spilling over the edge in the lowest places.

This was the river we had determined to descend; so with nothing more than conjectures as to where it would bear us, we pushed our canoes into the stream, and sped away to the northward.

Landings were made when necessary, in order to carry on the survey and examination of the country; but otherwise our canoes were kept in the current and our men at the paddles.

Though outlying groves of spruce and tamarack might still be found here and there in the most favored localities, we were now well into the barren lands; and the change from the wooded district was found to be anything but desirable.

An alcohol lamp for the purpose of making a hot cup of tea is an excellent thing; but, to a party wet and cold by rain or spray from the rapids, it is a miserable substitute for a roaring camp-fire.

The weather became very wet and cold, and storms, which swept the open country with frightful fury, began to be of very frequent occurrence; so that now our camp outfit was seldom if ever dry, and the progress of our survey was much interrupted.

On the 29th of July, as we were traversing the shores of Carey Lake, we were permitted to witness a sight which, as long as I live, I shall never forget. The land, as far as we could see, was

here, there, and everywhere covered over large areas, by moving masses of reindeer. No estimate could be arrived at as to their numbers. They could only be described in acres or square miles. After killing as many as we considered necessary for making dried meat for the rest of our journey, we walked into the solid herds, armed only with a camera, and secured a number of photographs. These now afford me a great deal of satisfaction; for when I begin to talk "deer," and people smile a look skeptical, all I have to do is to produce a photograph.

On the 7th of August we reached a great lake—probably Samuel Hearn's Doobaunt or Tobaunt Lake—which was then, as it perhaps always is, covered by a field of heavy ice. We were able to proceed in our canoes, without much obstruction, in an open channel of water along the shore, though sometimes we were blocked and had to portage past the ice, which in several places I measured and found to be as much as seven feet in thickness.

The weather experienced in the vicinity of this lake was most inhospitable. Five days were spent in traversing the one hundred miles of shore line from inlet to outlet; but seven days were unwillingly spent upon the rocky ice bound shore, where we were forced to await the abatement of two terrific storms accompanied by rain and snow. The lack of sufficient shelter contributed greatly to our discomfort throughout our entire Barren Land work; for unfortunately our tents, though admirably adapted for woodland districts, were here of comparatively little use, the rains being continually driven through them by the terrible force of the gales.

When the outlet of Tobaunt Lake was discovered, it was not found to be obstructed by ice as it was feared it might be, but as before, the clear cold waters of the great river rushed on to the northward.

A few miles down from the lake we first met with the Eskimos, of whom our men had been told such blood-curdling stories by the Chippeweyans. Had our men been disposed to believe the reports, they must have been pleasantly disappointed by the cordial, demonstrative receptions which from time to time we received at their hands.

(In a paper of this kind, it is necessary to be brief; otherwise I might be able to speak of many incidents, or characteristics of the country which would be of interest; but to give anything like a full account of our journey would trespass entirely too much upon your patience, and the pages of our Report.)

About the time we entered the Eskimo country, we also came across the first signs of Musk Oxen; but from this time forward the appearances of game of any description began to be rare, and with the month of August we parted company entirely with the deer.

Towards the end of August, judging from our geographical position and our north-westerly course, the indications were that our destination was to be the Great Fish River instead of Hudson Bay as we had hoped; but after following a very winding course, on the

evening of the 2nd September, we found ourselves on the waters of Baker Lake, which is emptied by two rivers into Chesterfield Inlet, the north-west arm of Hudson Bay.

Baker Lake as well as the Inlet was originally discovered and crudely mapped by one Captain Christopher in 1770, so that we were now again on waters not entirely unknown.

Since the commencement of our canoe journey we had altogether travelled a distance of fourteen hundred miles. We had carried on our survey for one thousand and fifty miles, of which distance eight hundred had been through entirely new country.

The balance of our route lay through Baker Lake and Chesterfield Inlet, and down the coast of Hudson Bay, which represented, to Churchill—the nearest habitation of man—a distance of seven hundred miles.

For this trip we still had three weeks' rations on hand. This it appeared would be scarcely sufficient, but we resolved to make the best possible use of our time. On the morning of the 3rd we continued our traverse.

On the evening of the 6th, having been much delayed by head winds, the northerly of the two outlets was discovered. At first no current could be detected in the river, but when we had followed its course a short distance, a strong flow, almost approaching a rapid, was met with, setting against us. Could it be possible that we were ascending a large river thus flowing in from the eastward? The canoe-men were all confident that we were, and wished to turn back; but thinking it possible that we had already reached tide water, they were instructed to proceed, though very much against their inclinations. Soon, to their astonishment, and our mutual satisfaction, we were privileged to witness the seemingly strange occurrence of the river ceasing to flow, and then turning strongly in our favor. We had thus reached the tide water nearly two hundred miles in from the Bay. A week later we obtained our first view of the "big sea water;" on the morning of the 13th of September we turned southward; and during the succeeding three days, having fortunately fair weather, we traversed the bleak rocky shore of Hudson Bay for a distance of one hundred miles.

This run along such an exposed coast was most encouraging, for it took us across the mouths of several deep inlets which would have required days to traverse had the weather been unfavorable.

During the night of the 15th, however, as we were encamped on a little island in the mouth of Corbet's Inlet, we were overtaken by one of the many severe storms of the season, and for two days we were imprisoned there upon the sand bar. The gale was, as usual, accompanied by a chilling rain, which penetrated our tents and made our lives generally miserable.

On the afternoon of the 17th the wind fell, and though a heavy sea continued to roll in from the east, the waves ceased to break. Not wishing to lose any time, as the bottom of the "grub sack" was

already very visible, we launched upon the heaving waters, and started across the mouth of the inlet on an eight-mile traverse.

As we pulled out beyond the shelter of the islet we found the seas running fearfully high, but so long as they did not break upon us we had little to fear.

But when we were well out in the inlet, the wind began to come in gusts from the opposite direction to which it had been blowing, and speedily increased in strength to a full gale. The falling of the wind had been but the lull of a storm centre, and we were evidently in for a struggle. The waves became "choppy;" were again broken by the gale, and their crests swept over us.

Our position was indeed perilous. Every effort was made to guide our canoes in such a way as to brook least danger, but in spite of all we could do the seas dashed in upon us, and it appeared as if we would never reach the shore. My brother and I laid down our paddles and with tin kettles did our utmost to dash out the water and keep ourselves afloat. Many times the great tumbling billows seemed as if they would certainly roll over us, but, like ducks on the water, our little cedar crafts ever rose with the waves, though often half filled with spray.

At length we neared the land, but only to find it skirted by a long continuous line of shoals upon which the full force of the sea was breaking with frightful fury.

What was to be done? It was impossible for us to retreat in the teeth of the gale, and without a harbour we must certainly be smashed upon the rocks. On we were borne by the force of the storm for the breakers, but just as the crisis appeared to have come—thanks to a kind Providence—a way of escape was presented. One rock was found standing out a short distance in advance of the others, thus forming a little cove, and with a pull for our lives we managed to guide our canoes so that one after the other they were dashed into this shelter, where the force of the seas being broken, we all jumped from our canoes into the shallow water, and succeeded in landing them safely. Every particle of our outfit was thoroughly soaked, but we were well pleased to escape with no worse misfortune.

The country here was very barren, comparatively level, and of a most dreary aspect, without a sign of vegetation. The gale continued for two days longer, so that we were not able to launch our canoes.

As provisions were now about exhausted, the attention of our party, whilst ashore, was chiefly devoted to hunting; but our efforts were not very fruitful, resulting only in the capture of one little duck and two gulls.

On the morning of the 20th, the wind having fallen, camp was called at four o'clock, and, without breakfast, our journey resumed. Later in the day each man had a small piece of dried meat, quite insufficient to satisfy his appetite; but, hungry though we were, the motto plainly inscribed on every man's face was "Speed the paddle."

Thus we pressed on for two days, and made very good progress, but, having scarcely anything to eat, we began to feel weak.

On the morning of the 22nd we were again storm bound by a heavy gale and snow, which lasted four days. During this time we suffered considerably from the violence of the storm as well as want of food. As soon as it had abated sufficiently, all hands went off hunting, and fortunately several hares and ptarmigans were secured and thoroughly appreciated.

On the morning of the 26th, the wind having fallen considerably, our canoes were loaded—though not with one bite of provisions—and a fair run made. Several sea ducks were shot during the day and thus our supper was secured.

The next day, again wind bound by a gale from the south-west, the whole party started out to hunt for food. We were not altogether unsuccessful, assembling in the evening with five marmots, a kind of ground squirrels

The next morning, the 28th, though a strong breeze was blowing, we determined to make a start at least, for to remain where we were, meant that we must soon starve to death. We were already much reduced and weakened from the effects of cold and hunger, and the condition of the weather had of late been most disheartening. We were still fully 300 miles from Churchill—the nearest habitation of man. We had not one bite of food, the country was covered with snow, the climate piercingly cold. We had no fire, and worst of all, the weather was such the greater part of the time that we were unable to travel. It was difficult to be cheerful under such circumstances, but we kept up a brave exterior and pushed on. As we were bending to our paddles and had made perhaps seven or eight miles south-westerly along the coast, a band of deer was observed upon the shore, so our course was quickly altered and a landing effected; though with some difficulty, as the tide was falling and the water rapidly receding. The men were left to keep the canoes afloat, and from being damaged by the rocks, whilst my brother and I, with our rifles, went off in pursuit of the deer, which were now very different animals to hunt than when in great bands earlier in the season. Another fact which rendered them difficult to approach, was, that the country was now a vast and dreary plain, affording no cover for the hunter save that of a few scattered boulders. Behind some of these we crept for long distances, but found it impossible to get within any kind of medium range. Several times we got within 400 or 500 yards of the band, but could get no closer, and so opened fire at that distance. At first they trotted about in confusion, but then, locating their source of danger, fled straight across the plains. For several hours we followed them, vainly seeking for some opportunity of nearer approach, but being unsuccessful we retraced our weary steps to the shore, where we arrived faint and exhausted. We found the men had been unable to keep the canoes afloat. They were now high and dry, and the water of the bay barely visible in the distance.

As it was impossible to launch our canoes until the return of the

tide, two of the Iroquois, Peter and Louis, were given our rifles and sent off to try their fortune. As they departed and left us lying in the shelter of a rock, we sincerely wished them success. We had done our utmost and had failed, if they also should fail it was too apparent what must soon be the result. Two of the other men were sent off with shot guns, and then anxious hours of waiting followed. No shots were heard, but towards evening Peter and Louis and afterwards the other men were observed returning in the distance. None of them carried loads, as we had hoped they might, and at the prospect I confess my heart sickened. As they came nearer, however, Louis, holding up something in his hand, exclaimed, "I got um." It was the claw of a polar bear, and we soon learned, with much joy, that he had, sure enough, killed a bear, which he had unexpectedly come upon at the edge of a little lake whilst following the deer.

It was about six miles inland that the encounter took place, and Louis was alone at the time. The meeting was a mutual surprise, sprung at close quarters, when our hunter's footsteps aroused bruin from his bed in the snow. Without wasting time in useless reflections the bear made straight for Louis, who met his charge with a slug and brought his assailant to his knees. The Indian then ran out upon the ice of the lake, but finding himself at a disadvantage there, instead of the bear as he had thought, he turned upon his pursuer, fired, and again knocked him down. Only for a moment, however; he got up and with a roar of desperation made again for Louis who had now regained the shore. They were already within a few feet of each other, so, realizing his situation, the Indian turned and this time shot his enemy dead at his feet. It was a happy shot for our whole party. Being unable to do anything with the carcass himself, he had returned—meeting his brother by the way—for assistance. All gladly followed him to the scene of the combat, where some moss was also found by which a fire was made, and some of the meat roasted.

The reviving effect produced upon the spirits of our party was marked. Though the flesh of the polar bear is famed for its rankness, we would not have exchanged it at that time for its weight in silver. I remember one of our western half-breeds being so exultant that he affirmed "He would not own the Queen as his uncle."

No part of the carcass was wasted, but every scrap, amounting to about 200 lbs. of meat and half as much blubber, was put into sacks and carried to the canoes, where, arriving long after dark, camp was made.

The next morning a strong east wind was blowing, driving a wild surf in upon the shore and making it impossible to launch. We were thankful, however, during our delay, to have a supply of meat, and advantage was also taken of the opportunity afforded for obtaining moss to cook it. Though several miles distant a quantity of this was gathered, and several large kettles of meat boiled, almost sufficient, it was hoped, to take us to Churchill. But alas for our hopes! The gale, which had been blowing, increased in fury until it became

a terrific storm accompanied by sleet and snow, and continued for five days.

One of the nights, during a wild snow storm, the tent which my brother and I occupied was ripped up the back by the force of the gale, and with difficulty secured from being carried away. So piercingly cold was the wind that without shelter we must soon have perished. We were already numb with cold, but midst the snow and darkness I managed to find a sail-needle and some twine, and then having lowered the tent to the ground—whilst my brother held the canvas together—I, with stiffened fingers, stitched up the rent. When the tent was again raised our bedding was buried beneath a snowdrift, but our blankets being our only comfort the snow was shaken off, and in a half perished condition we again crept beneath them to await results.

After this great storm, which lasted until the 4th of October, the whole country was buried in snow, and every possibility of finding even a little moss to burn was excluded.

Winter had indeed overtaken us. Ice was forming all along the shore of the Bay, and it was evident that within a few days canoe travelling must be at an end.

On the above date, though light snow was still falling, the wind had gone down sufficiently so that we were able to launch our canoes after a long portage out to meet the tide. By the most vigorous exertion all we were able to make during the day was ten miles, and that through a chilling spray which froze upon us and encased canoes and men in an armour of ice. We had great difficulty in getting ashore to camp at night, having again to portage a long distance over the low-tide boulder flats.

On the morning following the water of the Bay was out of sight, and it was not until about noon, when the tide flowed in, that we could get into the water. Then we were so obstructed by the new ice along the shore and a head wind, that we were not able to make more than a mile or two before we were again forced to struggle to the shore. At this rate of travel we would be a long time in reaching Churchill. We had now been more than three weeks on the coast and were still at least 250 miles from our haven.

Some different mode of travelling must be adopted or we could never get in. The shore ice was forming rapidly and might now block us at any time. We had not more than meat enough for another day or two, and the game had all left the country. What was to be done? My brother and I talked the matter over during the night. The plan suggested itself to abandon everything but rifles and blankets and to start down the shore on foot. But then how could the numerous large rivers, which were still open, be crossed? Again, to this plan there was the objection that having been in canoes all summer and though still strong enough to paddle, our party was in very poor condition to walk. The only other feasible plan was then suggested. It was to abandon dunnage, instruments, rock collection, etc., everything except note books, photographs, plant collection,

rifles, blankets, and two small tents; and thus with these to start out with only two canoes, and an increased force of one man in each of these, to travel for our lives.

This plan was decided upon, and in the morning the men were set to work to make as secure a cache as possible of all our stuff, excepting the articles above mentioned. This occupied the whole morning, and to us it was an unpleasant task, but as it seemed to be the only way by which we might hope to escape from this dreary ice-bound coast, it was felt to be a necessary one. Having made as snug a cache as we could build, with heavy heart we turned our steps towards the shore.

After launching our two canoes it was with great danger and difficulty that we were able to force our way through the broken but heavy shore ice to the open water beyond. Having got clear of the ice we were able to make good progress, and so, even at great risk of being smashed upon some of the many rocks, we paddled far into the night; but at a late hour, being sheathed in ice from the freezing spray, we reached the shore and without supper lay down to sleep upon the snow.

Eight more dreary days passed, six of which were spent in battling with the elements, and two in lying storm-stayed upon the shore. During this interval our party suffered much from cold and lack of food, and to make matters worse dysentery attacked us.

The shore ice had been steadily forming, rendering it more and more difficult to launch or get ashore. Our frail crafts had been badly battered and several times broken through by the ice, and the low character of the coast had not improved. Still, with hollow cheeks and enfeebled strength, we struggled on, sometimes making fair progress, and at others very little, until on October the 14th as we advanced the ice became so heavy and extended so far out to sea, that in order to clear it we could not see the land. Towards evening we began to look about for some opportunity of going ashore, but nothing could be seen but the sea and a vast field of ice with occasional protruding boulders. We pushed on hoping to find some bluff point or channel of water by which we might reach the shore, but the appearance of things did not change in the slightest. We stood up in our canoes and climbed upon boulders, vainly hoping to at least get a glimpse of land. Of course we knew the direction in which the shore lay, but it was so low and we were so far out that it was beyond our view. Soon the shades of night began to fall about us, our canoes were leaking badly and the weather was bitterly cold. We tried our utmost to reach the shore, but failing, resolved to await the time of high tide, which was 10 p.m., when it was hoped we might do better. Ten o'clock came, however, and we were still in the same condition, no more able to penetrate the ice or gain the shore than before. Indeed before this it had become intensely dark, and now we were in great danger of being smashed by ice or rocks. We were utterly helpless, and so could do nothing but remain where we were or go where the tide chose to carry us until the return of daylight.

The hours of that night were the longest that I have ever experienced, and the odds seemed to be against us surviving until morning; but at last the day returned and we were all alive. My brother was nearly frozen, having been obliged to sit or lie in icy water all night. Poor little Mitchel had both of his feet frozen, and several others of us were badly used up. Still we were in the same position as we had been in the night before. We could not hold out very much longer, we must gain the shore or perish. At the time of high tide, the ice having somewhat loosened, our canoes were thrust into the pack, and by great exertion as well as much care we succeeded about one o'clock in reaching solid ice upon which we were able to land, and, for the last time, haul out our noble little crafts. We had been in them just thirty hours, battling with the ice, exposed to a chilling winter blast, our clothing saturated and frozen, and our bodies faint and numb with starvation and cold. But we were now within reach of the land, and all of us who were able gladly scrambled out upon the ice to stretch our cramped and stiffened limbs. My brother was not able to walk, but was in a perishing condition from the exposure of the night. He had barely been able to keep his canoe afloat by bailing, and had been sitting in water for seventeen hours. I wrapped him up as warmly as I could in one of the canoes and administered half a bottle of Jamaica ginger, the last of our stock. We then set about hauling the canoes over the ice to the shore, which we soon reached and where we were so fortunate as to find driftwood. A fire was soon made, camp pitched, and, still more, a meal prepared. On the previous day a seal—the only one secured on the trip—had been shot and was now about to be appreciated. Camp being pitched my brother was moved to our tent, whilst the weaker of the men sought shelter in theirs. The three western men were still fairly strong, but the remaining five of us were very weak and badly used up. We knew now, however, that we could be no very great distance from Churchill, for we had again reached the wooded country, and two or three miles back from the shore could be seen dark clumps of spruce trees. This was a most consoling fact, for, besides having meat for several days, we now felt that we would have shelter and fire.

As to again launching our canoes, that was entirely out of the question, so that if we would reach Churchill at all it must be by land. As most of us were unable to walk, the only course open appeared to be to send on some of the stronger men to, if possible, reach the Fort and bring back a relief party. This plan was proposed, and two of the western men, Jim and John, volunteered to undertake the walk. We thought the distance could not be more than fifty miles and might be considerably less. On the following morning, the 16th of October, the two men set out on their journey, whilst those of us remaining proceeded to move our tents back from the shore about two miles to the nearest woods, where we might make ourselves more comfortable to await the success or failure of our relief party. A sheltered spot was selected for our camp, in a thick grove of spruce trees, and after

clearing away about two feet of snow which covered the ground, the tents were pitched, then well carpeted with spruce boughs, and a big camp fire made. This was indeed a happy change from lying in our canoes in the ice pack. Clothing and blankets were now dried, and with the seal meat besides some ptarmigans which we shot in the groves, we were soon very comfortable, with the exception, perhaps, of poor Mitchel who suffered much from his frozen feet.

About one o'clock on the afternoon of our third day at this camp, as we were all seated within our tents enjoying our dinner of boiled ptarmigans, my brother and I were startled by hearing some one exclaim "Halloo, Jim?" The eagerness with which we scrambled over dinner and dishes to our tent door, can better be imagined than described, and upon looking out, sure enough there was Jim returning.

Was he alone? No, thank the Lord! Behind him, a moment later, emerged from the woods, other strange men, followed by teams of dogs and sleds. One after the other there came scampering along no less than four teams hauling long, empty sleds, capable of furnishing accommodation for our whole outfit. As they drew up at our camp, Jim advanced and handed us letters from the trader and Mr. and Mrs. Lofthouse—the missionary and his wife—whose acquaintance I had the pleasure of making on two former visits to Churchill. The letters were not mere expressions of sympathy, but were accompanied by such provisions as we might require until we should all reach the Fort. It would be difficult to describe our feelings upon this occasion, the termination of our many hardships.

After a hard two days' tramp through the deep snow, Jim and John had reached Fort Churchill, where they had found kind friends ready to send us assistance.

Dog teams had been placed at their disposal, provisions supplied, and early on the morning of the same day on which they had found us, the train had set out for our relief.

With light sleds they had travelled at a rapid pace over the thirty miles of snowy plains which were found to still separate us from our haven. Another day of good travel in our canoes would have taken us in, but this was not afforded us.

With as little delay as possible preparations were begun for our sled journey to the Fort on the following day. Canoes were hauled up from the shore—where we had been obliged to leave them—and loaded upon two of the sleds; camp outfit and provisions were loaded upon the others, and as far as possible everything was made ready for an early start in the morning.

Long before daylight camp was astir, breakfast was partaken of by the light of the camp fire, and at the first streaks of dawn our crippled party, loaded upon the dog sleighs, was wending its way to Churchill.

The snow being very soft at this early season, the travelling was heavy and comparatively slow, but being anxious to make the Fort in the one day, the teams were urged on. At a sheltered spot, rather

more than half way to Churchill, a brief halt was made for dinner, and to rest the dogs ; but without allowing the usual time for a smoke, we again pushed on.

At three o'clock in the afternoon we reached the bottom of Button's Bay, and thence shaping our course north-easterly, we arrived about two hours later, at the base of a long range of rocky hills. For some time we skirted the foot of these, until, reaching a low place in the ridge, we turned up the steep path, and after a short climb to the crest, we found ourselves within full view of Fort Churchill. Though consisting of only four or five old frame buildings, the sight to us was one of profound satisfaction, and for a moment we paused on the summit of the ridge to take in the realities of the situation.

Little time, however, was afforded for reflection, for at the crack of the driver's whip the teams bounded forward, galloped down the steep slope, and without slackening their pace, sped across the plains below, until they came to a halt in front of the house of the Hudson Bay Company's trader. Presently a tall young Scotchman came out to receive us, introducing himself as Mr. Matheson, the master of the Fort. We felt a little taken back upon at once being asked how long we expected to remain ; however we arranged with him for quarters and rations for our men and board for ourselves until such time as we might be able to continue our journey on foot.

DISCUSSION.

Mr. E. Stewart—You speak of the barren country. Is it barren, no timber? Are there any minerals?

Mr. Tyrrell—Yes. To the north of Doobaunt Lake and to the west of the end of Chesterfield Inlet it was cut up everywhere by great quartz veins and it was a promising looking mineral country. Marble Island is white quartzite.

[*This Association is not responsible as a body for any opinions expressed in its Papers by Members.*]

FIELD TESTING OF MINERALS AND THE VALUE OF A COURSE OF INSTRUCTION.

By W. HAMILTON MERRITT, Assoc. R.S.M., M.E.,

Toronto.

(Lecturer on Mining Engineering—Kingston School of Mining.)

Mr. Chairman and Gentlemen,—It may seem peculiar to you that, not having the honour of being a member of your Association, I should give an address before you this morning on "Field Testing of Minerals and the Value of a Course of Instruction." I might mention in connection therewith that last summer, while conducting some prospectors' classes, I met an eminent member of your Association who asked if I would read a paper before you, and as his suggestion has been supplemented by a request from your Council I am only too glad to be able to give a few notes on the subject. I must say, however, I am very sorry that other affairs have so interfered with my plans that I have not been able to give the matter that attention which the importance of this occasion would warrant. Nevertheless, I will endeavor to give you as much of the subject before indicated as I can in a short time.

We all recognize the Province in which we live is an extremely large one, and I generally emphasize the fact when I wish to impress outsiders by inviting them to recollect that Ontario stretches past parts of the great States of New York, Pennsylvania, Ohio, Michigan, a small portion of Illinois, Wisconsin and Minnesota, and when they realize that fact they begin to believe Ontario is something.

But unfortunately I think we must also recognize that Ontario is in a very partially prospected condition, and in a very partially surveyed condition too. Now, how many mines are actually operating to-day in that enormous expanse of country? We can really count the mines that are operating I think almost on the fingers of one hand. Therefore, it certainly should impress anyone that the amount of mineral development to the south of us in those States which bound Ontario is out of all proportion to the natural mineral possibilities of the two areas, that, considering the gigantic mineral development that is going on there, there is certainly field in Ontario for more than the number of mines that you can count on one or two hands or a very great number of hands. And this partial development is in a country which is really nothing short of a kingdom in itself, full of immense possibilities. There is no need of mentioning that to you, gentlemen, who have come in personal contact with this great field in many places, where you have seen indications of a diversity and richness in mineral products which some day must form the largest proportion of the wealth of this Province.

To-day we are only commencing to prospect.

It is a well known fact that no class of men in the country come in such close contact with the prospector as the Ontario Land Surveyor (in this province), and there is no one who is in a position to assist him so materially, and without doubt he does assist him very greatly. Oftentimes the Land Surveyor himself might be a Prospector. We know that it is not always the persons who are actually prospecting for certain minerals that are the discoverers. As a rule "chance" plays a very important part in the discovery of minerals. Most finds in the very first case are discoveries by chance. For instance, close at hand you will remember that the nickel-copper deposits were discovered entirely by chance, through building the Canadian Pacific Railway. And it is not long ago that I met in the Kootenay one of the Hall Brothers, who in hunting for their horses were the first men that discovered any mineral of value in the West Kootenay—"The Silver King," and from that date intelligent prospecting has brought about an enormous development. It is at present I may say enormous, but it is a very trifling thing to what it will be. So that a Land Surveyor may by chance be just as likely to come across a new mineral district as anyone else. While "chance" governs the discovery of many new fields we do not know how many misses are made for every hit. We are not aware how many deposits of one kind and another may be passed over without their value being recognized. We well know the copper-nickel deposits in Sudbury were in the first place merely opened up for copper, and that nickel was not recognized. Of course that ore was not a usual thing for a prospector to discover, but at all events want of experience in that class of ore prevented the discoverer from recognizing its' value in the first place. So there can be no doubt that it is advisable to have as much information as possible of all classes of minerals. Another very old story about the value of an ore not being recognized, most of you will remember in the case of the great Comstock lode in Nevada. The men who discovered it were only panning for gold in the first place, and did not recognize that there was silver in the ore (which was a good deal decomposed at the surface). They were throwing it away in heaps and continued to do so for a long time, while a very little prospecting knowledge and a very small outfit, would have enabled them to have tested for silver, which is an advisable thing to do in almost any kind of stuff, because silver may frequently be present in a decomposed condition as silver chloride, and look like so much mud in the outcrop or oxydized portions of any veins.

While it cannot be denied that a knowledge of common minerals, and the means of testing them in the field, is desirable, yet it is possible to go to the other extreme, and think we can rely on very imperfect tests under disadvantageous surroundings, to take the place of the chemist and the assayer. That is essentially a mistake. Where it is possible to bring any samples to be assayed or tested by the chemist and the assayer it is always desirable to do so. I may say that, with one exception, the assayer's tests as usually made, are naturally superior to those you can make in the field, while both tests are

extremely desirable. The one exception is the test for gold. The reason being that in an assayer's fire-test he gets all the contents of the ore without discriminating between the free milling gold and gold which is not extracted by mercury, but which requires some more expensive operations, such as smelting, chlorination, cyanide treatment, etc., while you can make a field test which will give you practically just the same test as a mill test, if you do it carefully. "Old timers" are generally satisfied with the pan test. They do not bother with the refractory portion of the ore at all. If they cannot get a good showing with their pan they probably drop the prospect and go on to something else.

Now, as an example of a field test of gold, applicable to either alluvial or quartz, we will take an auriferous quartz. Sampling is the first consideration. Nowhere have so many mistakes and regrets arisen as through improper sampling. Fair sampling of any deposit, not only of gold but any other deposit is a fundamental preliminary of immense importance. Bringing in little pieces, and getting an assay (of course the assay will show you what the specimen contains) will give no clue as to whether you can get hundreds or thousands of tons of it, which is the ultimate object of mining. This will remain distinctly to be proved, and therefore unless there is a certain amount of sampling done on the spot there will be difficulty in obtaining a proper result. Especially is that the case in gold ores, which being of such high value a very little piece will throw an assay one way or the other tremendously. It is always better to get as much as one can and make a heap on a level place and divide it up by quartering it down, or making channels through it and taking some out of the four remaining segments. It does not require much discrimination to get a fair sample, and then break the pieces to somewhat similar size and get another sample, and again break smaller and get another, until it is quartered down to a reasonable bulk. Now in the case of the gold ore we will take two pounds of it, when we have got a fair sample in the manner indicated.

For this test we use an ordinary miner's pan kept for that purpose. The pan you use for panning for free gold never should have any mercury put into it. Then we must have a balance. We are supposed to be in the field of course. It is very difficult now to get one of these cheap spring balances because they are prohibited by law. Still if you can get hold of one it will be serviceable. These could weigh two pounds of quartz. If you cannot get anything better you certainly need not be at a loss while you can get one of these book or paper balances that cost about 30 cents and which weigh up to 12 ounces. With that balance you can easily weigh out a couple of pounds, and it will also weigh out your ounce of mercury. After you have weighed out your rock in the first place, the two pounds, you pound it up to pulp in a mortar. I am describing an outfit with which you can carry on this test; and arrive at the result that I am coming to, and which you can take away anywhere. The mortar costs about 90 cents to a dollar, a small mortar. Larger mortars are naturally preferable, but weight,

as you well know, is a matter of consideration when you have to "pack" your outfit. Then you get the sieve for 50 cents to sieve the pulp with. In sieving it you should be very careful to notice whether there is any free gold left on your sieve. After you have sieved the pulp you put the final part on a piece of paper, and with your magnet you take out the iron, and then with your glass you can easily see the free gold. If there is any free gold you probably will put it in a little porcelain thimble, with a little nitric acid to clean it. You then throw it in with the rest of your pulp. When you have sieved your pulp and got your two pounds in the pan you then weigh out one ounce of mercury with your little scales.

The cheapest and best carrier of any kind of liquid is made by the "Patent lightest weight United States Mail Case Company." These cases are lined with cork and are very light and convenient. You can put any liquid in them and can even throw them about without danger of breaking. The mercury can be carried in one of these cases. You weigh out your ounce of mercury, and then you throw it in with the pulp, or, what is still better, you put a little metallic sodium (which is a good thing to have with you in panning when you want to collect the globules afterwards if they are at all scattered, or even if the mercury is somewhat floured) to the amount of a small pea, in the mercury. After you have heated the mercury in a porcelain dish you throw the resulting sodium amalgam into the pulp in your pan and then stir the pulp around with the mercury for about an hour, preferably with a wooden pestle. The use of a porcelain mortar and pestle is sometimes advocated, but that is awkward for taking in the field, and at all events it gives a grinding effect, whereas we have already ground and sieved the pulp and really have it as fine as a mill would get it. All you want to arrive at in a test is about what you would get in the mill, so after you have stirred the pulp around for about an hour with a wooden pestle you pan off the pulp into another pan, because you want to get the concentrates in order to know what amount of concentrates there is in the ore as well as the free milling property of the ore. You therefore pan off the concentrates and tailings and get all the mercury back; pan it a couple of times to make sure you have got all your mercury, then you pan for the concentrates and get your concentrates. So you have got the concentrates in one pan and the mercury in the other, and the pulp or tailings has been panned away. Then comes the question of retorting the mercury. Of course cheapness is the main thing for a prospector's method, so the outfit must not cost more than is absolutely necessary. You may therefore use ordinary Russian sheet-iron and get it bent up into a little cup, which you can get for about ten cents, and you can unbend it open again afterwards if you like. If you are anxious to save your mercury in the field you can do so if you take a good sized potato and hollow it out and use it to cover the little retort; all the mercury will then be caught in the potato and you get your little gold button, or gold sponge, left in the bottom of the retort. With your penknife you very easily scrape it

loose, and you empty it out. Then you take a little assay lead and melt it with the gold sponge on charcoal. A little clay-holder, which costs 25 cents, can be used with prepared charcoal buttons. The other side of the holder is for scorifying capsules. A charging spoon is a handy thing to have. The gold and lead are mixed together in the spoon and then you carefully pour into the charcoal cavity and fuse together the gold and the lead. Now you have got the bullion in with the lead button, by means of your blowpipe and candle. You then mix some borax and a little soda and fuse them with the lead button to purify it. Next you put a little bone ash in the other side of the clay holder, or in a clay pipe, shape it with the head of an iron bolt, and then you cupel the lead button and get your gold bead. The great point is in the cost. Balances costing \$130 and all that sort of thing simply makes a prospector sick when you mention it. It fairly paralyzes him, he loses heart and hope of anything in the future. But where you have got a \$3 balance, it makes a good deal of difference. Every one of those beads I am exhibiting has been weighed on this \$3 balance, which weighs to five grains and is divided into a tenth of a grain. If two pounds of ore is taken every grain of gold we get gives a result of approximately two ounces of bullion to the ton of ore. A tenth of a grain is two-tenths, or one-fifth, of an ounce to a ton. If the bullion is \$18 bullion, one grain means \$36 to the ton. One little division is a tenth of that, that is \$3.60. With this balance you can quite easily weigh to half of that. Therefore you can with no difficulty get the result of a gold ore running \$1.50 to \$2 a ton free milling with this balance, by using the two pounds of ore, and it is far better to use two pounds for a result than to use an assay ton (29.16 grammes). Therefore, in many respects, this field test is superior in its result to a fire assay. When you can get an ore down to \$1.50 to \$2 a ton, and up as high as you like of course, it is very satisfactory. Take the case of a large button from an ore that showed \$174.50 in free gold, a very rich ore, which nearly exhausted the balance in weighing, 4 $\frac{3}{10}$ grains in the balance. You have got the concentrates, you weigh them easily on the letter-weight balance. Having ascertained the number of ounces, or the decimal of an ounce, which they weigh, divide that amount into thirty-two (number of ounces in two pounds) and thus you get the proportion of the concentrates to the ore. Therefore you see how many tons of ore it takes to make a ton of concentrates. So that finally you have your free gold and you know how many tons of rock you have got to mill to get a ton of concentrates, which is about all a prospector is very keen to know.

As regards the value of the concentrates. Roughly in the field you may say you can roast the concentrates and either pan them directly, or, if you have two pounds, you can treat them as above described for free gold. Or take two to three grains of raw ore, roast, then mix with litharge, soda and borax, cupel the resulting lead button, and if you get any gold at all, which you can see, it is worth making an assay of. But you can do still better. You can go a step further and use a little outfit which is very portable, namely, a Fletcher's furnace, and

a little crucible. The furnace has got a hole on the side and you blow in and smelt anything in it, and then use a capsule for your scorification, if you prefer to reduce the lead button in that way before cupellation. Take the case of some concentrates for illustration. They are roasted and three grains taken and smelted in the little furnace. Then you get it in the form of a lead button which is cupelled down, and you obtain a little button of gold, which you measure on the Plattner's scale. You will see it better as a rule if you use a glass. Suppose it opposite the figure 6 on the scale. A table in Fletcher's little book gives you the number of grains of gold there are in the concentrates to the ton of ore, so that finally now you have got the free gold and the gold in the concentrates, and you have got the number of tons of ore to make a ton of concentrates. Therefore, you see, in this case we have got \$163.40, or something like that, per ton from the ore, free milling, then there is \$38 to the ton of concentrates, and by the amount of concentrates we get, it shows that it takes 42 tons of ore to make a ton of concentrates. Therefore, a ton of ore yields about 90 cents to the ton in concentrates and \$163.40 in free gold. You find all that out with this outfit which is quite portable. It weighs only some 19 or 20 lbs., including 11 or 12 lbs. for mortar and pestle.

Naturally the more refractory the gold ore is the more valuable this test is. An assayer may give \$50 a ton to a ton of ore. When you come to mill it perhaps it is all refractory and you cannot get out anything at all. If you had made this test in the field, for instance, and you find out it is all refractory and you cannot get the gold by mercury, it entirely alters your whole base of calculation about the ore. It costs quite a different sum to treat.

Silver ore is very much easier to test by the blow-pipe. Any galena that is found should be tested for silver, because you may say the only value there is in the lead is in the silver associated with it. At least you get the lead to the good, as it were, and it is safer not to reckon on any value except the silver.

Now, we mix fluxes according to the class of ore. There are different charges given in the little manual by Fletcher. The book costs about \$1 30, and is a very excellent work.

As an example take an argentiferous galena. We mix three grains with a certain amount of nitre and carbonate of soda and then fuse them in the little furnace. It gets to white heat and readily fuses all down, and then the next thing after we have got it reduced is to take out the bead by breaking the little crucible. You lose less silver in scorifying than you do in cupellation. So that next we scorify the lead button down smaller. All you need do is to put one of the little capsules in the clay holder, blow on the lead, and gradually it oxidizes down. The little silver-lead button breaks out perfectly clean. The lead button is then cupelled in the bowl of a clay-pipe on some bone ash.

A small silver button is obtained as the result. Place the silver button on the Plattner's scale and see how many ounces to the ton it

goes. By a table in Fletcher's book we see the button gives a result of 54.26 ounces to the ton of galena.

COST AND DETAILED DESCRIPTION OF APPARATUS.

The *panning* outfit catalogued below, including sufficient supplies of reagents, etc., for any ordinary prospecting-trip, will cost about \$7.50.

1. Glass-stoppered bottle, containing strong nitric acid. (This can be carried in a "patent lightest-weight liquid-mailing case.")
2. Two gold-pans; one to be used for mercury only.
3. Mercury, about 1 pound.
4. "Travellers' letter and parcel-balance" hand-scale, weighing 0.25 to 12 ounces, for weighing mercury and pulp; cost, 30 cents.
5. Balance, hand-scale with sliding weight, very sensitive, from 0.1 to 5 grains; cost, \$3.
6. Small Russia sheet-iron retort, and sheet of Russia iron 1 foot square (with hole for retort in the center), for supporting the retort.
7. Small porcelain dish or thimble.
8. Iron mortar and pestle; cost, 90 cents.
9. Brass wire 60-mesh sieve; cost, 50 cents.
10. A little sodium carried in naphtha, in a wide-mouthed bottle, in a "patent lightest weight liquid-mailing case."
11. Wooden pestle.
12. Sheet or shot-lead (pure, if possible).
13. Borax.
14. Soda.
15. Blowpipe, cost, 25 cents.
16. Bone-ash.
17. Clay pipe for cupelling.
18. Charcoal.
19. Candles.

For *quantitative* determination of value of concentrates by measurement with Plattner's ivory scale (cost \$3), a sufficient outfit, including the scale, can be obtained for \$5, if the prospector makes his own little anvil, pestle and guard and pincers, and gets a small cheap hammer. He will need in addition (included in the \$5) only a Fletcher blowpipe furnace, clay crucibles and capsules, a spirit-lamp and some litharge.

For *qualitative* work a prospectors' simple blowpipe outfit might comprise:

1. Knife.
2. Magnifying-glass.
3. Blowpipe.
4. Charcoal.
5. Candle.
6. Old scissors.
7. Pincers.
8. Steel anvil, $\frac{1}{2}$ by $1\frac{1}{2}$ by 2 inches.
9. Pestle and guard.
10. Small hammer.
11. Magnet.
12. Borax.
13. Soda.

14. Litharge.
15. Bone-ash.
16. Clay pipe for cupel.
17. Round-headed bolt for making cupels.

To which may be added platinum-wire, spirit-lamp, microcosmic salt, cobalt nitrate, three-cornered file and glass tubing.

The total cost need not greatly exceed \$1.

Therefore for the entire panning, qualitative and quantitative field-outfit for purposes above indicated the cost need not exceed \$14, and with it the prospector, or indeed the mining engineer, can with practice obtain in most cases valuable information in the field concerning the ores of the precious metals.

Weight of Apparatus.—The weight of complete outfit, including the panning, qualitative and quantitative outfits (avoiding duplications in above lists, may be about :

	Pounds.	Ounces.
Two pans,	3	12
Mortar and pestle,	11	
Remaining articles, including mercury and other ingredients,	5	4
Total weight,	20 pounds	

I shall not dwell on tests for other ores. There are certain field tests for some sorts of ore that are carried on very simply. Take two ores that sometimes look so very much alike that you can hardly tell one from the other. One is the usual ore of mercury and the other common red oxide of iron, hematite. If you use a simple little test on the blow-pipe you can easily distinguish one from the other. The weight will roughly tell the value of an iron ore. Between the ores of iron which look very much alike you well know one scratches red, being hematite, and the other black, being magnetite. It is a good thing to make no mistake about having a magnet, because sometimes magnetic ores of a lean quality puzzle people. I have seen prospectors and assayers about to assay some lean magnetic ore for silver. It may not look like magnetite, but the minute you take the magnet it attracts it and you can tell at once what it is. For native copper or galena you would pan. For the presence of copper dissolve in nitric acid then add ammonia in excess and you get a marked blue colour.

There are numerous little tests like that. One of the most difficult things to test is where a mineral occurs in very small quantities, such as nickel, but I have found by using the magnet and taking away most of the pyrrhotite some of the nickel minerals remain behind in a more concentrated condition. Then with a small borax bead you can get the reddish hue nickel color. There are a number of tests of different minerals that can be done in the field, but I did not intend at all to turn this into a class of testing ores, but just to show what can be done in some directions with a very cheap and portable outfit, because that is the main object. Expensive balances and heavy things to carry are an absolute impossibility. You have got to make your testing workable so that it can be done in the field.

With regard to the consideration of the educational part of the subject, it must be granted that the facility of making simple field tests of minerals is advisable, yet it will also be conceded without doubt that it may be very valuable to have a knowledge of chemistry and mineralogy, and an acquaintance with all the common rocks and ores that may be met with in this country. It might be said it would take a very long time to acquire this knowledge, but when I tell you that an effort has been made to implant the rudiments of these subjects in the prospector's mind in two weeks, it will be recognized that, for the purpose of prospecting, it is not deemed necessary to go very deeply into science. Yet when we come to the actual facts of the case in the field we do not want to go into the minute divisions of controversy, but we wish to know roughly what we see. There are very few minerals that are common in rocks, and there are not many ores that are common. Rocks puzzle people, yet when you recognize that in a little more than a dozen specimens we have all the common rocks in Ontario you will imagine it is not a hopeless thing to acquire a knowledge of them in a reasonably short time. Of course the three great divisions of rocks are the ordinary sedimentary rocks, the metamorphic rocks and the igneous rocks, which include the volcanic rocks. The only common ones we have in the mineral districts of the metamorphic class are crystalline limestone, gneiss, talc schists, what are called hydro-mica schists, mica schists, chloritic schists, and quartzite. And then the common igneous rocks are granite, syenite, and the green-stones, diorite and diabase. A very marked form of diabase is a rock which you are quite familiar with, viz., gabbro. There are not a great many minerals that compose these few rocks, and you can soon learn their characteristics.

With this elementary knowledge you will be able to tell all the common rocks you are likely to meet with in the field in Ontario.

We attempt to give this information in the Prospectors' classes in mining centers in two weeks. A course, however, of two months has been carried on for the last three years at the School of Mining at Kingston, especially designed to give prospectors, mine foremen, and mining men generally, a mixed theoretical and practical course which will fit them better for work in the field, in the study, and in the laboratory. It is merely designed to lay a foundation from which a man attending the class can proceed for himself, on whichever line or lines he may find desirable. It has been found possible in this course to give a foundation in chemistry. It fits the student to study mineralogy and to understand what a mineral is, chemically speaking. Mineralogy in a particularly practical form is fully dealt with to fit a man for field geology and prospecting. Geology, ore deposits, prospecting and mining, are all given attention, and the practical work of panning, blow-pipe, assaying and assisting at the running of the mill, etc., are part of a course made as practical as possible to assist a man in the field. It has occurred to me that this two month's course would be exactly the thing that many land surveyors would gladly have taken up,

especially before they entered upon the active operation of their profession, after which I well know it is often difficult to get away for two months at a time.

The course is held in the winter at Kingston, during January and February. I do not know of another School of Mining anywhere that is holding a similar course of instruction, and perhaps you would add to the usefulness of your indispensable Association if you made it obligatory for a man to hold a certificate of having attended this two month's course before he could put O.L.S. after his name.

In conclusion, I would like to draw your attention somewhat away from the immediate subject of my paper, and would ask the question, are there any causes, besides the lack of capital and the lack of mining experience, which act as retarders on mineral development in our great Province? It appears to me that there are at least two causes besides the deficiencies alluded to. One is that large blocks of unexplored land are held by individuals and companies which should be made impossible in the future, so far as the mineral is concerned. The other serious defect is that the prospector or discoverer, who, above all men, is deserving of consideration, does not receive the same liberal treatment as in British Columbia, Nova Scotia or the United States. Instead of being able to stake out his find and hold it for some years, subject to development work, he has to find the money for a survey and pay a dollar an acre in rent besides his development work. This may seem a small thing to men with money, but it is an insurmountable difficulty in the path of a man who has been "grub-staked" by a partner nearly as "dead broke" as himself.

If the Government did more surveying half of the difficulty might thereby be overcome. I believe it is generally conceded that the Government should do much more surveying, and that a very much too small proportion of the Province has been surveyed. The present situation appears to me to be a hardship to the surveyor. I would like to know how many cases are known to my hearers where the necessity of this law has induced men to deceive them in connection with remuneration for surveys, on which never a cent has been paid to this day. A very small proportion of surveyed claims ever amount to anything. In British Columbia the surveying comes after the development work has been done, and after the claim has been proved to be some good. With us the cart is before the horse.

DISCUSSION.

Mr. Butler—I would like to ask one question, whether Mr. Merritt thinks there is any probability of finding the clay shales through the Trenton or Laurentian formation suitable for clinker brick or that class. It is a clay shale from which paving brick is made.

Mr. Merritt—You find clay shales through almost any formation. But in the Laurentian, in the older rocks, these are generally meta-

morphosed into gneisses, and as you find them there they would not be in a workable condition. You should find them in the Huronian and Cambrian. There are lots of clay shales in the Silurian, but the Trenton is carbonate of lime. Near here, at the Humber, there are clay shales.

APPENDIX.

THE PEARY LECTURE.

Association Hall was crowded, on the evening of March 27th, to hear the Arctic explorer Peary and hundreds were turned away from the doors. Owing to the blundering of the door-keepers and ushers who were employed by the managers of the hall, the amount realized from the sale of seats was not what it should have been by at least \$100. There was however a surplus and the association benefited thereby to a small extent. The committee having charge of the Lecture, desires to thank the members of the Association for their hearty support in making the lecture a financial success, and to express the hope that all who heard the lecture were well repaid. If any such lecture be undertaken again by the Association or any committee thereof, the members themselves should personally superintend the sale of seats and seating of ticket-holders.

The following from the *Globe* is a fair report of the lecture, but without the pictures no one can realize the dreariness of the journey :

Lieut. Peary has a sociable, conversational style of delivery, and carries the listener along so facilely through the splendid panorama of pictures that one comes almost to imagine that the trip is being actually taken in company with the explorer.

In discussing the recent rumors of Dr. Nansen's discoveries Lieut. Peary stated that the rumors were probably unfounded. The more recent statements to the contrary had not changed his opinion. Were they based on fact he felt confident that later news would show that, instead of having triumphed in his attempt to accomplish the feat of reaching the north pole, Dr. Nansen had met with disaster, his ship been crushed in the arctic ice, and he and his party had journeyed backward over the ice to the land of northern Sibera.

The lecture dealt with his latest expedition, that of 1894-5, from which he arrived home, or at least at St. John's, Newfoundland, on September 21, 1895, in the whaler *Kite*, several pictures of which vessel were given in the course of the lecture. The Lieutenant's expedition of 1891-2 to the same region was incidentally referred to here and there, as, for instance, to point out the routes taken each time the journey had been made across northern Greenland from Whale Sound on the west to Independence Bay on the east.

After a view of the *Kite* sailing out of St. John's harbour, and many scenes of Esquimaux, oomiacks, kiacks and villages, of Greenland landscapes, glaciers, cliffs, fiords and icebergs had been thrown upon the screen, Lieut. Peary went on to describe that terrible journey across the ice-cap. It was a narrative of terrible hardships encountered, mainly because they failed to discover a cache of food which had been made by Lieut. Peary the year before. Lieut. Peary's headquarters at Whale Sound and Ingfield Gulf had been named Bowdoin Lodge, and it was from there that a start was made on April 1, 1895, with the object of getting as far toward the northeast as possible to explore the country on the eastern coast of Greenland. Six Esquimaux accompanied the party during the initial one hundred miles. Four of these men then went back, and when discovery of the cache of supplies failed to be made Lieut. Peary sent back the remaining two Esquimaux with a message to say that he, with Mr. Lee and the Lieutenant's coloured man, Henson, had determined to go on, and trust to replenishing their supply of provisions by shooting musk oxen when they should arrive on the other side of the ice-cap. Those provisions which

they carried along consisted of frozen deer meat, some tinned biscuits, and walrus flesh for the dogs. Coal oil was taken as fuel instead of alcohol.

During the first fortnight the explorers covered 200 miles, and attained an altitude of 7,000 feet above sea level. Here violent winds were encountered and the cold became intense, the thermometers registering nearly 60 degrees below zero Fahrenheit. Rations had to be reduced for both men and dogs, with the result that numbers of the dogs died.

The incidents of his tramp across the great snow cap or dome of snow at altitudes of from 5,000 to 8,000 feet above the sea level, keeping his course in the same way that a ship is navigated at sea, from the western to the northeastern shore of Greenland, was listened to with thrilling interest. Speaking of his experiences after struggling for weeks across the trackless expanse of snow he said :

" Never shall I forget that time and scene. Three weakened men and nine nearly starved dogs standing there in the gaunt, frozen desert ; these and the glistening snow, the steel-blue sky, and the cold white sun. Five hundred miles in an air line across a waste of snow to the nearest human being, with insufficient rations for even that distance, yet we were still facing the other way. I think that as we started each of us felt an unspoken prayer. I felt then, as I feel now, that in that cool, deliberate moment we took the golden bowl of life in our hands, and that the bowl had suddenly grown very fragile. And I feel now, as I felt then, that we were not rash nor foolhardy, but simply followed the dictates of temperaments which could not act otherwise, and would do the same again under the same circumstances."

After they had crossed the snow-cap they would certainly have perished had not Lieut. Peary and Henson succeeded in shooting ten musk oxen. They were also considerably handicapped by the fact that Mr. Lee had fallen ill. Independence Bay was reached after incredible suffering, but the possibility of further exploration was precluded by the absence of food supplies and the enfeebled condition of the men. Then began the terrible return journey, which was made in twenty-five days, notwithstanding the fact that the outward trip had occupied forty-three days. Food completely failed, and the final march of forty-six hours was made without a bite to eat. Poor, faithful Panikpah, the sole survivor of the magnificent dog train, was so weak and emaciated that, thoroughly exhausted, he had to lie down before the lodge was reached. They left him knowing that when he had rested somewhat he would follow them in. So he did, and Lieut. Peary cut slices of reindeer meat and fed them to him, before taking a mouthful himself, until the faithful animal became quite satisfied. In spite of the truth that Panikpah has never since gone hungry, yet, said Lieut. Peary, he can never forget that dreadful journey of starvation. For months afterward Panikpah would gather up every particle of venison, blubber or bone that he could find and hide it carefully away for future necessity which he feared.

Lieut. Peary's anecdotes about the natives and their habits were very entertaining, especially one which he told about an Eskimo wishing to exchange his wife and two children for Lieut. Peary's 25-cent jackknife. To give an idea of the stature of those people a view was thrown upon the screen showing that Eskimo and his family standing with Mrs. Peary. She is by no means a tall woman, but the Esquimaux were dwarfs in comparison. Notwithstanding that they are so short, they are stout and very firmly knit, for the man who wished to barter his family for a penknife weighed nearly 190 pounds. The females dress almost like the men, even to the " high-water " boots, so that if they ever take to the bicycle their costumes will require no " adapting."

It would be a difficult task to describe all the splendid pictures which followed each other upon the screen with such rapidity, and much of the interesting matter of Lieut. Peary's lecture must perforce for want of space be passed over. There is not a doubt that he has done and is doing good service in the cause of science, that he has increased our geographical knowledge of hyperborea, that our authentic geological and glacial information he has added to, and that he has demonstrated that even yon disparaged country has desirable flora and fauna. He deserves credit for trying to spread this knowledge by his entertaining lectures.

WILLIS CHIPMAN,
Chairman of Committee.

BIOGRAPHICAL SKETCH OF SAMUEL HOLLAND, THE
FIRST SURVEYOR-GENERAL FOR THE NORTHERN
DISTRICT OF NORTH AMERICA. FROM A.D. 1752 TO
A.D. 1802.

Major Samuel Holland was a native of Canada, and was the first to occupy the position of Surveyor-General for the Northern District of North America. He was born early in the eighteenth century, and about the year A.D. 1758 we find him actively occupied in assisting General Wolfe, as a military engineer, in his operations against Quebec and Louisburg. He seems at this time to have occupied the position of Major of Royal Engineers. During the war, in conjunction with Captain Simcoe, R.N., of H. M. S. "Pembroke," the father of Governor General Simcoe, and Mr. Cook (afterwards the famous explorer, Captain Cook), he made a chart of the Lower St. Lawrence, including the Bays of Chaleur and Gaspé, which was of much service to the British fleet while the war continued. Major Holland was an intimate personal friend of General Wolfe, and it is recorded that the General presented him with a pair of duelling pistols on the Heights of Abraham. A sad page in his family history is connected with this event. His eldest son, Samuel, was shot in a duel while using one of these pistols. In 1780 the subject of these memoirs purchased the Holland Farm, a beautiful estate and mansion, situated near Quebec, between the St. Louis and St. Foy Roads, and bounded on the north by the St. Foy Heights. Here was the "Holland Tree," so well known to the old inhabitants of Quebec; it marked the site of the burial place of Major Holland and his eldest son. This estate has now passed out of the hands of the Holland family.

Major Holland was a member of the Executive and Legislative Councils; he filled the office of Surveyor-General for fifty years. He prepared a very valuable Plan of Canada and the Province of Quebec, which is now at Ottawa, and which having been reproduced by the Canadian Government, is a great boon to the students of early Canadian geography and history. The Holland River, which enters Lake Simcoe from the south-west, and the Holland Landing, preserve the family name. He has left the following publications behind him:

1. Observations Made on the Islands of St. John and Cape Breton for Latitude and Longitude—1768.
2. Astronomical Observations—1769.
3. Eclipses of Jupiter's Satellites observed near Quebec—1774.
4. Astronomical Observations—1774.

He died January 28, 1802.

NEW BY-LAWS.

By-law No. 43. “ To provide for the exemption of certain Surveyors from the operations of the Act to incorporate the Association of Ontario Land Surveyors.”

“ Whereas, under section 10, sub-section 4, the Association may by by-law exempt from the operations of the said Act any Land Surveyor who has been in the actual practice of his profession for a period of thirty-five years or more as a duly qualified Surveyor ; and whereas Charles Unwin, William R. Rombough, and Henry Winter have represented to the Council that they had been in practice as aforesaid for a period of not less than thirty-five years previous to the date of the assenting to the said Act, viz , 14th April, 1892 ; be it resolved that the said Surveyors be and are hereby exempted under the said Act.”

Passed by the Council of Management, April 9th, 1896.

By-law, No. 44. “ To amend by-law number 12 of the Association of Ontario Land Surveyors.

Whereas, under By-law number 12, of the Association of Ontario Land Surveyors, it was enacted that the Council of Management of the said Association should annually appoint certain Standing Committees ; and whereas one of the Committees so to be appointed was designated in the said by-laws as ‘The Committee on Topographical Surveying,’ and whereas it is deemed advisable in the interests of the said Association to alter the name of the said Committee ; be it resolved that the said by-law number 12, is hereby amended by striking out the name ‘The Committee on Topographical Surveying,’ and substituting therefor the name, ‘The Committee on Topographical Survey.’”

Passed by the Council of Management, April 9th, 1896.

NOTES OF COUNCIL MEETINGS.

At the April meeting Mr. Sankey was re-elected unanimously as Chairman of Council for the ensuing year.

By-law No. 43, exempting Messrs. Charles Unwin, William R. Rombough and Henry Winter, from the operations of the O L.S. Act, was passed by the Council on 9th April.

By-law No. 44, amending By-law No. 12, by striking out the name "Committee on Topographical Surveying" and substituting therefor the name "Committee on Topographical Survey," was passed by the Council on the same date.

A deputation from the Canadian Society of Civil Engineers composed of Sir Casimir Gzowski, Messrs. Alan Macdougall and M. J. Butler, was received by the Council. A copy of draft of proposed bill to incorporate that Society was presented, Sir Casimir Gzowski and Mr. Macdougall explaining at length the objects sought. The Council afterwards appointed a Special Committee to discuss the bill and to report. (See page 6.)

The Secretary was instructed to publish a report of the Peary lecture, also notes of Council meetings, in the forthcoming annual report.

The question of holding but one meeting of the Board of Examiners in each year was discussed, and was referred to the Board of Examiners for report at the next meeting.

A. J. VANNOSTRAND,
Secretary.

OBITUARY.

FRANCIS BOLGER.

It is with regret that we have to record the loss of another of the first members of this Association. Mr Francis Bolger, O.L.S., who died at his home in Lindsay on Nov. 3, 1895, was the fourth son of Edward Bolger, of Ballanabarna, Justice of the Peace of the County of Kilkenny, Ireland. Coming to Canada in 1858 Mr. Bolger worked as engineer under the late Mr. Tate on the construction of the Grand Trunk Railway. Subsequently he studied his profession under the late Mr. George Dean, P.L.S, and received his commission as Provincial Land Surveyor on Oct. 10, 1863, commencing the practice of his profession at Elora. He afterwards held the position of assistant engineer on the Intercolonial Railway under Mr. Peterson, now chief engineer of the Canadian Pacific Railway. He afterwards practised in Toronto, St. Catharines, and Penetanguishene, in the latter place for some fourteen years. He was employed at various times by the Ontario and Dominion Governments. In April, 1895 Mr. Bolger removed to Lindsay and was appointed engineer for the Township of Ops. Not dismayed by a painful malady from which he had suffered for the last few years of his life, he continued his work until some three days before his death-summons came. A widow and son are left to mourn.

LEANDER MEYER BOWMAN.

The death of Mr. Leander Meyer Bowman, O.L.S., whose name has for some years appeared in the "withdrawn" list of the Association, occurred on Sept. 20, 1895.

Born at Berlin, Ont., on Dec. 29, 1863, and educated in the schools of that town, Mr. Bowman for about a year successfully taught school in his native county, and afterwards decided upon surveying and engineering as his life work. With this end in view he took a course at the School of Practical Science, and in the spring of 1887 went to Kansas City, Mo., where he was employed in bridge engineering work for the Chicago, Santa Fé and California Railway. While there his health so suffered from the climate that, although he returned to Canada on that account, he never fully recovered.

A practice in engineering and surveying was then established at Lindsay, Ont., conjointly with his brother, Mr. A. M. Bowman, and was carried on with success until May, 1891, when the subject of this sketch received the appointment of Chief Sanitary Inspector in the Medical Health Department of Toronto, which position he continued to occupy up to the time of his death.

During the period of his practice in Lindsay, Mr. Bowman's firm was awarded a contract for a survey of Dominion lands in Manitoba, and he was also employed under his father, Mr. Isaac Lucius Bowman (whose obituary notice appears in the 1893 Annual Report of the Association), on the survey of Crown Lands for the Ontario Government.

On April 14, 1892, Mr. L. M. Bowman was admitted to practice as a Provincial Land Surveyor, and registered as an Ontario Land Surveyor the same year, but at the same time withdrew from the list of practitioners.

Energetic and persevering, he was too unsparing of himself in his work, and succumbed to a complication of diseases before the prime of life had been reached.

A widow and two small children are bereft of their mainstay by his early demise.

WILLIAM HASKINS.

Another of our members, Mr. William Haskins, has passed away. The deceased has for the past forty years been Engineer for the City of Hamilton. Mr. Haskins was born May 29, 1828, at Coolkeno Hall, county Wicklow, Ireland. He was a son of Abraham Haskins, who came from England and settled in the county of Wicklow, and Margaret Fitzmaurice, daughter of Col. Fitzmaurice. Mr. Haskins was educated in Dublin, Ireland, where he studied his profession of civil engineer at Trinity College, under Sir John McNeill. In 1852 he married Catherine Murray, daughter of Hugh Murray, of the county of Carlow, Ireland, a gentleman of Scottish ancestry. He came to Canada in 1852, and obtained a position as assistant engineer on the survey and construction of the Great Western Railway. On 5th July, 1855, he received his commission as Provincial Land Surveyor. In 1856 he was appointed City Engineer for Hamilton. With the exception of Mr. Beasley he was the oldest civic official in that city. He rendered the city valuable service during his long term of office, all the important public works being constructed under his supervision. Mr. Haskins was a member of the Institute of Civil Engineers, London, Eng., and of the Canadian Society of Civil Engineers. He died suddenly at his residence in Hamilton on July 5, 1896, leaving a widow and five sons to mourn his loss.

ALFRED HOWITT.

Mr. Alfred Howitt, O.L.S., was taken from amongst us on May 6, 1896. The deceased gentleman was born in Nottinghamshire, Eng., in 1829, and came to this country with his father and mother in 1833. He commenced his studies in Guelph, and was afterwards sent to the Rockwood Academy, where he entered on his professional studies under the late Hugh Black, P.L.S. He went to Hamilton about the year 1848, and was employed professionally at Stratford after that time. In 1863 he married Miss Elizabeth Parks, of Puslinch Lake, and moved to the farm of Wingfield, near Gourcock, where he practised his profession until the time of his death. He leaves one son, Dr. J. A. Howitt, of Morrision, and five daughters to regret his departure.

HEAD NOTES OF REPORTED LAND CASES.

H. L. ESTEN, O.L.S.,

Toronto.

SURVEY AFTER PATENT—PATENT GOVERNS.—TOWNSHIP OF HARWICH.

The plaintiff claimed a piece of land as part of lot ten in the first concession west of the Communication road in the township of Harwich; the defendants claimed it as part of lot nine, and the plaintiff was entitled to recover if the line between the lots was to be run as in the case of a double not a single-fronted concession. It appeared that lots nine and ten were described for patent by metes and bounds in 1793, and letters patent were soon after issued in accordance with this description. The original survey of that part of the township was not completed on the ground, but the surveyor laid out the Communication road as directed and returned a plan shewing it, and, as the learned Judge who tried the case without a jury found, he gave the information upon which the description for these lots and for others about the same time were prepared. The principle of survey with double-fronts was not in use before 1820. In 1821 another surveyor was instructed by the Government to complete the survey of this township with double-fronted concessions, and to explore and survey the road, but not to interfere with the lands ceded intersecting it. No posts on the ground were found along the Communication road, and he laid out the lots along it as double-fronted.

McGregor vs.
McMichael
et al.

Held, that the latter survey, made after the patents for these lots, could not affect them: that the principle of survey with double-fronts could not be applied to the grant made long before it was adopted; and that the plaintiff therefore could not succeed. *McGregor v. McMichael et al.*, 41 Q.B., 128.

SINGLE FRONT CONCESSION—NOT ALTERED BY SUBSEQUENT SURVEY.

The first five concessions of a township were surveyed in 1797, the lots being 29 chains 87 links in width. About 1813, an original post was found by a surveyor in front

Murphy vs.
Healey.

of the fifth concession by which he determined the limits of the lots, and they had been settled on accordingly. In 1821 the remaining concessions were surveyed, under instructions from the Surveyor-General, which directed the several concession lines to be produced beginning with that between the fifth and sixth concessions, and from the centre of each line at the distance of 50 links each way, right and left, at right angles thereto, the several lots of the width of 29 chains 37 links were to be posted. The surveyor, under these instructions, double posted the line between the fifth and sixth concessions, making the lots 29 chains 37 links wide and patents were afterwards granted for half lots in the concession. It was contended that this made the fifth concession double-fronted, having the lots 29 chains 87 links wide in the front, and 29 chains 37 links in rear. One of these patents however made the rear half 29 chains 87 links wide, and the Government plans shewed no jog in the side lines of the fifth concession.

Held, that the concession was not double-fronted, for the evidence shewed that the whole of it had been surveyed as a single fronted one in 1797, and the surveyor in 1821 had no authority to change it, if he so intended. *Murphy v. Healey* 30 Q.B., 192.

SINGLE OR DOUBLE FRONT CONCESSION — HOW TO RUN
SIDE LINE. TOWNSHIP OF CUMBERLAND.

Holmes vs.
McKechin.

The township of Cumberland is bounded to the north by the Ottawa, and has a range of lots on the river, with their rear boundaries irregular, corresponding to the course of the stream in front, the remainder of it being laid out into concessions running north and south, numbering from the east, and into lots running east and west numbering from the north.

The instructions for the original survey were to leave one chain as an allowance for road between each concession, to be double posted at the distance of 50 links right and left from the centre of the road. The surveyor however planted only a single row of posts in rear (*i.e.*, at the west side) of each concession, and he stated in his evidence that the west halves of lots in the concession were to be measured from these posts, and the east halves of lots in the next concession westward by beginning at the distance of one chain from each post westerly, parallel to the side line of the township. No line therefore was run or posted at the front of the eighth concession.

The plaintiff sued for trespass on the west half of lot B, in the eighth concession, and the question was how the course and starting point of his side line were to be de-

terminated? His surveyor took the line dividing Cumberland from Russell, the adjoining township to the south, as governing the course of the side line, because, though the lots numbered from the north, there was no continuous straight line at that end of the concession. He found an original monument on the rear line of the 7th concession, intended to mark the limit between lots A. and B. there, and ran the side line from a point one chain west of that monument to the rear of the 8th concession, which if correct, shewed that the plaintiff should recover; while if the township was to be treated as double-fronted, the line should have been run from the post at the west side of the concession, and in that case the defendant should succeed.

It appeared that whole lots had been granted in several of the concessions, and the north halves of two lots and the south half of one, all before 1854, but that many more grants had been made from 1821 to 1858 for the east and west halves of lots separately described.

Held, 1. That the course of the side line was under the facts proved correctly ascertained, the case being within the proviso to sec. 71, Consol. Stats. U.C., ch 77, and the principle of *McDonald v. McDonald*, 11 C.P. 374.

2. That sec. 85 could not apply, for no line in front of the 8th concession had ever been run or posted. As to the starting point for the side line, the precise case of this survey is unprovided for by the Act: the concessions were not single-fronted for the lines had been run and posted in rear not in front, and very few whole lots had been granted; and they were not within the definition of double-fronted concessions, or within sec. 28, for only a single row of posts had been planted, and the grants had not all been by half lots; but *Held*, looking at the instructions, the evidence of the surveyor and the grants made, that the weight of evidence was much in favour of treating the township as one with double rather than single-fronted concessions, in which case the plaintiff's side line had not been correctly determined.

Held, also, that if a single-fronted concession as the posts in rear of the seventh were intended to govern the front angle of lots in the eighth concession, the plaintiff's line might properly be as it did by his survey. *Holmes v. McKechin*, 23 Q.B., 52.

TOWNSHIP OF CUMBERLAND, SURVEY OF—SINGLE OR DOUBLE-FRONTED CONCESSIONS—EVIDENCE—SECOND NEW TRIAL GRANTED—12 VIC., CH. 35, SEC. 37.

See this case reported on a previous motion for a new trial.

The jury having again found for the plaintiff, the court granted a second new trial, holding that upon the facts proved the township should clearly be treated as one with double-fronted concessions.

Held, also, that as all the grants before the passing of the Surveyors' Act, 12 Vic., ch. 35, sec. 37, had described the land in half lots, that feature of a double-fronted concession was established by the retrospective words of the Act, and subsequent grants, therefore, could not affect the question.

There are several townships with double-fronted concessions in which the posts have not been planted on both sides of the allowances for roads between the concessions, though the statute makes that a part of the definition of such townships. *Holmes v. McKechin*, 23 Q.B., 321.

DOUBLE FRONT CONCESSION—ADJALA ROAD, TOWNSHIP OF ALBION.

McLachlen vs.
Dixon.

In the township of Albion, the lots in the different concessions were originally surveyed and laid out with double fronts; but the Adjala road, which forms the northern boundary of the township of Albion, cuts lots numbers 30 and 31 in the 7th concession diagonally, leaving the eastern halves of these lots broken, and not corresponding with the front or west halves, and no posts or monuments were placed to mark the angles of the east halves.

Held, in appeal, that the side or division road between lots numbers 30 and 31 should not run direct from one front to the Adjala road in a direct line, but that the side road should be run from each front to the centre of the lots.

Macaulay, C. J., C. P., V. C. Esten, V. C. Spragge, and Richards, J., dissentiente. *McLachlen v. Dixon*, 4 C. P. 307.

DOUBLE FRONT.—PATENTED IN HALF LOTS.

Marrs vs.
Davidson.

The 12 Vic., ch. 35, sec. 37, Consol. Stat. U. C., ch. 93, sec 28, which prescribes the rule for drawing the side lines in double-fronted concessions, applies to townships therefore surveyed.

Held, following *Warnock v. Cowan*, 13 U. C. R. 257, and *Holmes v. McKechin*, 23 U. C. R., 52, 321,—that the lands having been described in half lots is made by that section part of the definition of a township with double front concessions.

Held, also, that the rule prescribed applies to all lands in such concessions, not to the grants of half lots only, and that it is brought into application by the granting of any half lots.

Semble, however, that the section is on both points open to doubts, which it is desirable to remove by legislation. Where land was described as commencing at a post planted four chains and fifty links from the north-east angle of a lot; *Held*, that the post (the existence and position of which were satisfactorily established) was the point of commencement, though its distance from the true north-east angle was inaccurately given.

The declaration charged the trespasses breaking down fences, etc., as committed on divers days and times. Defendant pleaded leave and license, which the plaintiff traversed. It appeared that part of the fence was removed under a license, and the remainder after it had been revoked, the interval from the first to the last removal being two or three years.

Held, that the plaintiff was entitled to succeed, though it would have been otherwise if the declaration had only charged the trespasses as committed on the same day, for the defendant could then have applied the license to the only trespass charged. *Marrs v. Davidson*, 22 Q. B., 641.

DOUBLE FRONT CONCESSION LINE BETWEEN LOTS, TOWNSHIP
OF OPS.

In *trespass quare clausum fregit*, to try the boundary line between lots 28 and 29 in the 5th concession of Ops, the plaintiff described in his declaration by metes and bounds the piece of land trespassed upon, alleging it to be part of 28, to which lot his title was not disputed: *Held*, that "not guilty" was the only plea required and that the other pleas pleaded and set out below were unnecessary and inappropriate.

Dark vs.
Hepburn et al.

The land in question was situated at the rear of the concession (the concessions running north and south and numbering from the west), and plaintiff claiming that it was a double front concession, had the division line run from a point on the concession line in the rear, or, what he claimed to be the east front, of the concession; but there was no proper evidence of the concession having, in the original survey, been laid out as a double front concession, and of posts being planted in the rear, while the lots were granted by the letters patent as whole, and not as half lots.

Held, the fact of 28 and 29 having been granted as whole lots, was *prima facie* evidence of the concessions being single-fronted, and that the grant of half lots in the adjoining concession could not affect it.

Held, also, that the fact of defendants attempting to prove a post in rear, from which they contended the line should be run, did not estop them from asserting that the concession was single-fronted.

The jury were asked to find :—1. Is the point contended for by the defendants the place where the original post stood? 2. Did the plaintiff, when he moved his fence, do so on the understanding with the defendants that they acknowledged his right; or, Was his possession to be subject to the correct adjustment of the line? They found, that the post had not been proved, and that the plaintiff was given possession by the defendants: *Held*, that on the first answer the verdict should have been for defendants, for the fact that defendants had not proved the post did not relieve plaintiff from proving the true line; and that the second question was not presented by the case. *Dark v. Hepburn et al* 27 C. P., 357.

SPECIAL CASE—DOUBLE FRONT CONCESSIONS—POSTS NOT ALL PLANTED. TOWNSHIP OF EMILY.

Dyell vs.
Millage.

By 36 Vic., ch. 60, sec. 1, O.,—after reciting that great inconvenience had resulted from the concessions in the township of Emily, having been intended to be made double-fronted, but posts not having been in many cases planted at the front and rear angles of the lots—it is enacted that notwithstanding anything in secs. 28-31, inclusive, of C. S. U. C., ch. 93 :—1. Where posts were in the original survey planted at the front, but not at the rear angles of any lot, the side lines should be run from the posts at the front angles to the rear of the concession, parallel with the governing line. 2. Where posts were in the original survey planted at the rear angles of any lot, the side lines should be run from the front angles of such lot parallel with the governing line to the centre of the concession, and thence direct to the post at the rear angle. 3. In all other cases, the side lines should be run from the front angles of the lots to the rear of the concession, parallel to the governing line. In trespass, to try the boundary between lots 15 and 16 in the 14th concession, it was admitted that the original survey of the township was intended to be in double-fronted concessions, and that there was satisfactory evidence of the original posts at the north or rear end of the concession, between lots 14 and 15 and lots 17 and 18, but not of the intermediate posts. It was admitted, also, that a post had been planted in the rear, in the original survey between the two lots in question; and the post in front was agreed upon.

Held, that the case came within the third sub-section, and that the line must therefore be drawn from the front to the rear of the concession parallel with the governing line. *Dyell v. Millage*, 27 C.P., 347.

BOUNDARY LINES AND SIDE LINES.

The Eastern side line of lot 24, in the front or first concession of the township of Kingston, cannot be run as it is described in the grant from the crown, or parallel to the Western limit of the township, according to 59 Geo. III., c. 14, because that would carry the concession beyond the line which was originally run out as its eastern boundary. *Doe dem. Stuart v. Forsyth*, 1 Q.B., 324. Stewart vs.
Forsyth.

SIDE LINES OF LOTS, HOW ASCERTAINED—SURVEY—12 VIC.
CH. 35, CASE WITHIN THE 36TH SECTION OF—CONSTRUCTION OF 32ND SECTION.

In the original survey of the township of K. which was made by alternate concessions, the lines in front of the first and rear of the second concessions, were run, and a single row of posts planted along the latter to divide the space into two hundred acre lots. The line between the first and second concessions was afterwards surveyed under instructions from Government, and divided off into lots of the same size. McDonell vs.
McDonell.

Held, A case within the 36th section of 12 Vic., ch. 35; and therefore that the side lines of lots in the second concession should be ascertained by the posts of the original survey on the line in rear of that concession, and not by those of the subsequent survey on the division line between the first and second concessions. *McDonell v. McDonell*, 10 Q.B., 530.

BOUNDARY LINE—MODE OF ASCERTAINING WHEN IMPERFECTLY SURVEYED.

On the original survey of a township a base line had been run, but the concession lines had not been run through from one side of the township to the other, and the surveyor had also run the side lines, planting a post at the measured depth of each concession, to mark the line of the concession; but it appeared impossible the concession lines so marked could be straight, and one of the angles of a lot could not be discovered by any stake or monument. Davis vs.
Waddell.

Held, that the statutes 12 Vic., ch. 35, and 18 Vic., ch. 83, do not provide a rule for determining the front of any lot in a township so surveyed, and that the proper method of ascertaining the place of a lost post was by dividing the

distance between the nearest known posts on the side line, as it was originally run past the lots, and not by running a straight line between the nearest posts on the concession line and dividing the distances by the number of lots; also, that the side lines originally surveyed were to be considered true and unalterable boundaries. *Davis v. Waddell*, 6 C.P., 442.

BOUNDARY LINES AND SIDE LINES—BOUNDARY WHERE POST MARKING SIDE LINE OF LOT HAD BEEN LOST.

Culp v. Culp.

A concession or base line had been run and posts planted on it upon a survey made on a similar principle to that referred to in *Davis v. Waddell*, but the question was how the side line of a lot was to be ascertained.

Held, that the distance between the two nearest ascertained monuments on the base line should be measured and divided proportionately between the lots, making the due allowance for roads, and that the side line required should be run from the angle of the lot so ascertained. *Mary Culp v. John Culp*, 6 C.P., 466.

SIDE LINE—TOWNSHIP OF YORK—12 VIC., CH. 35, SEC. 35.

Bell vs. White

Where the lots in a concession ranging from east to west were not numbered all the way from the boundary line of the concession on the east, but two blocks of five lots each had been laid out in the original survey fronting on and towards that line, and the remainder of the concession in blocks of five lots each, fronting as usual on the concession line, and numbering westward, beginning at No. 10.

Held, that the 35th section of 12 Vic., ch. 35, would nevertheless apply, and that the side line of the lot in question (32) must be determined by the course of the eastern boundary line of the concession.

Held, also, that the last proviso in that section would not apply, so as to make the boundary line of the block in which lot 32 was the governing line, because the township was surveyed before the 27th of March, 1829. *Bell v. White*, 15 Q.B., 171.

SURVEY—BOUNDARY LINE—NUMBERING OF LOTS—APPLICATION OF STATUTE.

Macdonald vs. McDonald.

Two surveyors being employed to divide the gore of land marked in the plan in the statement of case ran lines as are therein dotted and named McLaurin's and McLeod's lines. The parties apparently acquiesced in the McLeod's line for a time, but subsequently disagreed, and this action was brought to contest the division.

Held that the rule in the statute, that the course of the boundary line in each concession, on that side from which the lots are numbered shall be the course of the division or side line, not being applicable to the case as these lots purport to number from the east, while the gore at the east of the concession is not numbered, the defendant is entitled to recover. *Macdonald v. McDonald*, 11 C.P., 374.

TRESPASS ON HIGHWAY.

On the 8th of January, 1836, a surveyor, in compliance with instructions from the government agent, laid out a road or street on the northern limit of the town of London, two chains wide, a portion of which was then, and had for some time been, in the actual possession of the Episcopal church, to which body a patent subsequently, and on the 18th of January, 1836, was issued, granting to them all that parcel or tract of land, "on which the Episcopal church now stands, and containing four acres and two-tenths of an acre or thereabouts." Upon an indictment for a nuisance in stopping up the highway:—

Held, that this survey, although made after the grantees had gone into possession, must prevail against such possession. *Hagarty, J*, diss. *Mountjoy v. Regina*, I. E. & A., 429. See *Regina v. Bishop of Huron*, 8 C.P., 253, from which this case was in effect an appeal.

WHEN NUMBERING OF LOTS ON PLAN IS ALTERED BY GOVERNMENT, ORIGINAL PATENT HOLDS AGAINST NEW NUMBERING.

In regard to a survey made before the 50 Geo. III., ch. 14, the provisions of that act will not have the effect of necessarily confining the grantee to the land designated by the posts planted in the original survey, if the plan of survey had been altered by the government before the issuing of the patent, and before the passing of that statute; therefore, when the government had added to the ends of the several concessions a strip of land which the surveyor had left unsurveyed between his concessions and the adjoining townships, and in consequence of such addition had changed the numbering of the lots throughout the concession.

Held, that the patents issued in accordance with such reformed survey would cover the land which the government intended to be included within the boundaries expressed in the patent, though the number of lots would not correspond with the posts set by the surveyor. *Doë d.*, *Talbot v. Paterson*, 3 Q.B., 431.

WORK ON GROUND—LICENSES TO CUT TIMBER—INCONSISTENT SURVEYS—“GENERAL COURSE” OF A RIVER.

*White et al.
vs. Dunlop.*

The plaintiffs held a license dated September, 1860, to cut timber within certain limits, commencing “at the south branch of the Indian River, at the extremity of a limit licensed to A. & Co., ten miles above the forks.” In 1842 a survey had been made by the Deputy Inspector of woods and forests, to determine A. & Co’s limits, when the upper end, where the plaintiffs began, was marked by blazed trees; and in 1844 the survey was completed by one R., under instructions from the Department, and the line previously marked was then adopted, and recognized until March, 1867. In that month a surveyor was instructed by the department to determine the defendant’s limits, which were the same as those of A. & Co. and he made the upper boundary not so far from the forks as the previous surveys. His plan was returned to the Department, but no action taken on it. The plaintiffs then sued the defendant for cutting timber on the strip between the two surveys, trespasses complained of having been committed apparently before the last survey was made.

Held, that they could not recover, for R.’s survey having been adopted and acted on by the Government, the boundary marked on the ground in accordance with it must govern until changed by competent authority.

Quære, how a boundary line following “the general course of the river” for a given distance is to be ascertained, and whether it is properly done by drawing a straight line from the starting point to a point on the river at that distance.

Quære, whether, as was assumed in this case, the holder of a license which has expired may sue for trees cut during its currency. *White et al. v. Dunlop*, 27 Q.B., 237.

CHANGE OF PLAN—INCONSISTENT DESCRIPTIONS—ADMISSIBILITY OF DESCRIPTIONS TO EXPLAIN PATENTS.

*Hagarty v.s.
Britton.*

One R. in 1829 first surveyed part of the township of Plympton fronting on Lake Huron, and his plan returned shewed the lots fronting on the lake with an oblique line in rear, following the general course of the lake but no allowance for road. Afterwards a plan of the whole township was compiled in the Crown Land office, from surveys of three separate portions of it made by different surveyors. The descriptions of the lots were made from this plan, all the lots having been granted after it had been completed, and the distances in the descriptions contained in the

deeds were according to the scale on which the plan was compiled. This plan shewed a road in rear of the front lots, and made their depth greater than in R.'s plan. There was no proof of any work on the ground shewing that R. had ever run out or posted the rear lines as it appeared on his plan.

Held, that it was competent for the Government to make such allowance for road, not being inconsistent with any work on the ground.

Held, also, that in order to give effect to the change made by such allowance—to avoid an irregular rear boundary for such front lots—and to reconcile the plans, and the grants for one of the front lots and two gore lots in rear of it, which could not all three be carried out owing to a deficiency in the land—a proportionate reduction should be made in each of such lots.

The description of a lot by metes and bounds, from the Crown Land Department, is admissible in evidence to explain the patent for the lot, in which it is described only by the number and concession. *Hagarty v. Britton*, 30 Q.B., 321.

See also, *Keeley v. Harrigan, et al* 3 C.P., 173.

TITLE BY POSSESSION.

TOWNSHIP OF HAMILTON—SURVEY UNDER 29 VIC., CH. 72, EFFECT OF.

The plaintiff owned lot 28 and the defendant lot 27 in third concession of Hamilton, between which there was no road allowance, and the plaintiff, previous to the survey of that concession made under 29 Vic., ch. 72, had occupied the land in question for more than twenty years. By this survey it belonged to lot 27. *Taylor vs. Croft.*

Held, Morrison, J., dissenting, that the effect of such survey was to fix conclusively the division line between the lots, but

Held, also, that the plaintiff's title by possession was not taken away by it.

The above survey was made by Surveyor E. C. Caddy. It was admitted that Caddy made a survey of concessions A and B, and of the first and third concessions of the said township, in accordance with the said Act, and did all in accordance with the act he was required to do; that in making his survey of the third concession, he found two original monuments, one on the east and the other on the west side of lot 27, and from the monument on the west side of the lot he ran a line as a division line between lots 27 and 28. There is no road allowance between the two lots.

The questions for the Court were, whether the survey of Caddy, under the facts stated, made by virtue of the Act, fixed conclusively the division line between lots 27 and 28. If conclusive, then the further question was, is the plaintiff entitled to recover by right of possession, notwithstanding the provisions of section 3, and the other provisions of said Act. *Taylor v. Croft*, 30 Q.B., 573.

TOWNSHIP OF SCARBOROUGH—24 VIC., CH. 64, 25 VIC., CH. 38,—EFFECT OF SURVEY UNDER—PROOF OF ORIGINAL MONUMENTS—STATUTE OF LIMITATIONS.

Palmer vs.
Thornbeck.

In ejectment to try a question of boundary, the plaintiff claimed the north half of lot 31. Defendants limited their defence to a piece described by metes and bounds, giving notice that they claimed it as part of lot 32.

Held, that the plaintiff was not entitled to succeed on proving his title to lot 31; but that it was for him, seeking to change the possession, to shew that the piece in dispute was part of that lot.

In this case it appeared that over twenty years ago a fence was mutually erected by plaintiff and defendant's father, who then occupied lot 32, as a line fence along the course of an old blazed line; though for what purpose such line had been run did not appear. The fence continued to be used as a line fence until 1862-3, when, in consequence of the survey made under the 24 Vic., ch. 64, and 25 Vic., ch. 38, the plaintiff claimed that the line was incorrect, and he procured the Surveyor, who had made the survey to run the line. The Surveyor divided equally the space in the block containing these two lots between the road monuments planted several years previously by himself at the front angles of the side road allowances; but there was no evidence to shew how he ascertained the position of such side roads in making that survey, or of any search for the original monument. In 1865-6, after this new line had been run, the plaintiff pulled down a piece of the old fence and removed it to the new line, where it remained for two or three days until put back by the defendants to the original line, where it has so remained ever since.

Held, that these statutes did not interfere with any original posts, if existing; that the evidence was insufficient to shew plaintiff's right to claim according to the statutable survey, and a new trial was granted.

Per Gwynne, J.: That the onus was on the plaintiff of proving the original monument marking the front angle of the lot, or its loss, and that there was no satisfactory evidence

of its position, before the mode adopted of dividing the space between the road monuments could be adopted.

Per Hagarty, C. J. : That on proof, which was wanting here, of the statutable directions having been obeyed in laying out such side lines and planting the monuments, then that plaintiff would be entitled to the statutory division, and the onus of proving an original monument, marking the front angle of the lot, was on the defendants.

Per Galt, J. : That under those statutes, the onus of proving the existence of original monuments was cast upon the person asserting it

Seemle, that the plaintiff's entry in 1865-6 was sufficient to stop the running of the Statute of Limitations. *Palmer v. Thornbeck*, 27 C.P., 291.

TOWNSHIP OF SCARBOROUGH—SURVEY UNDER 24 VIC., 64,
AND 25 VIC., CH. 38—ONUS PROBANDI—STATUTE OF
LIMITATIONS—EVIDENCE.

On the second trial of this case, under the judgment *Palmer vs. Thornbeck*, granting a new trial herein, reported in 27 C.P., 291, it appeared that the line between lots 31 and 32 was not run upon the original survey, and that when the line was run in 1865, no trace could be found of an original post, if any had been planted, designating the boundary line between the lots on the front of the concession. It also appeared that the position of the original monuments at the front angle of the side road allowances was ascertained by the surveyor, and that the monuments planted by him were on such site.

Held, that on this evidence the plaintiff was entitled to claim according to the statutable survey.

Held, also, that the 6th Sec. of 25 Vic., ch. 38, had not the effect of divesting any title acquired by the Statute of Limitations.

Held, also, per Gwynne, J., adhering to his former judgment, that the onus probandi, that the piece of land in question was part of lot 31, either independently or by force of the statutes 24 Vic., ch. 64, and 25 Vic., ch. 38, rested on the plaintiff. *Palmer v. Thornbeck*, 28 C.P., 117.

MUNICIPAL SURVEYS.

C. S. U. C., CH. 93, SEGS. 6, 7, SURVEY UNDER—MOTION TO
QUASH BY LAW—ACQUIESCENCE OF APPLICANT.

Sec. 6 of C. S. U. C., ch. 93, authorizing the County *Fairbairn vs. Sandwich E.* Council to apply to the Governor to cause a concession line to be surveyed, applies only where such line was not run in the original survey or has been obliterated. Where,

therefore, it appears that there were in fact two lines clearly traceable, the question being which was the original line, and the surveyor decided this upon conflicting evidence.

Held, that such survey was not binding or conclusive, and that a by-law of the township adopting it must be quashed.

Held, also, that the acquiescence by the applicant in the line thus adopted (which was a highway) could not be urged against the application, other interests than his, both public and private, being affected.

Sec. 7 directs that the surveyor shall so draw the line as to leave each of the adjacent concessions of a depth proportionate to that intended in the original survey. The depth of the concession on the north side of the line in question lay from north to south, and the concessions on the south extended in depth from east to west, so that the depth of that to the north only would be affected by the position of the line.

Seemle, that this would not prevent the application of the statute. In *re Fairbairn and the Corporation of the Township of Sandwich East*, 32 Q.B., 573.

MUNICIPAL SURVEYS.

*Boley vs.
McLean.*

A surveyor employed by the Government, under Consol. Stat. U.C., ch. 63, secs 6-8, to survey a concession line alleged not to have been run in the original survey, or to have been obliterated, instead of attempting to make a survey in accordance with those sections, satisfied himself that the original line could be found and endeavored to retrace it.

Held, following *Tanner vs. Bissell*, 21 U.C.R., 553, that such survey was not binding under the statute; and the Court, on the evidence given at the trial, affirmed the finding of the learned judge, who tried the case without a jury, that the line so run was not in fact the same as the original line.

Seemle, that in order to prove a survey which will be conclusive under the statute, the application by the county council to the Government for such survey must be shewn. *Boley vs. McLean*, 41 Q.B., 260.

ERROR IN MARKING POSTS OF ORIGINAL SURVEY.

*Jarvis vs.
Morton.*

A mistake of a surveyor in marking the number of concessions wrong on some of the posts of an original survey, will not make it proper to describe the lots so marked as being in the concession numbered on the posts. *Jarvis vs. Morton*, 11 Q.B., 431.

CONCESSIONS—SURVEYS—STATUTES.

There is no rule of law nor any statute which makes it necessary that each concession should be of the same width throughout a township, nor is there any principle by which an error in the survey of one concession entirely unconnected with the actual work and survey on the ground in another, is to affect and either contract or expand such other concession. *Johnson vs. Honsberger et al.* *Johnson vs. Honsberger et al.*, 6 C.P., 201. Also *Marrs vs. Davidson*, 26 Q.B., 641; *Dark vs. Hepburn*.

DISCREPANCY BETWEEN WORK ON GROUND AND PLAN—
HIGHWAY—FIELD NOTES—COSTS.

The question in an action of trespass being whether there was a highway between lots 20 and 21 in a township, which the plaintiff denied, it appeared that the practice of surveyors in laying out a road allowance was to plant a post on each side of it, marked on the side nearest the road with the letter R., and on the opposite side with the number of the lot, and to plant a third post in the centre of the road marked R on two or on all four sides. Stakes thus marked were found between 19 and 20, but none between 20 and 21, and it was sworn that an original post had been seen there 24 years ago, and until within three or four years, marked 20 and 21, thus far shewing that there was no road allowance between those lots. *Carrick vs. Johnston.*

On the other hand, the registered map of the township, the map in the Crown Lands Department, and the field notes of the surveyor who made the original survey, shewed such allowance. The plaintiff and defendant both claimed under grants from the Crown of separate parts of lot 21, described as commencing on the northern limit of such allowance, and without it the defendant would have no access to his lands.

The jury were told that the work on the ground must govern, but that under C.S.U.C., ch. 54, sec. 313, the fact of the Government surveyor having laid out this road in his plan of the original survey, would make it a highway, unless there was evidence of his work on the ground clearly inconsistent with such plan. The jury having found for defendant.

Held, that the direction was right, but that the verdict was contrary to evidence, and a new trial was granted on payment of costs.

The *Queen vs. Great Western R. W. Co.*, 21 U.C.R., 555, remarked upon.

A certified copy of part of the field notes of the original survey is admissible in evidence.

The defendant's counsel told the jury that a verdict in favour of the plaintiff for any sum would carry costs. Quære, as to the right to make such statement; but semble, that the objections to a verdict for the plaintiff founded upon it, would apply equally to a verdict for defendant. *Carrick vs. Johnston*, 26 Q.B., 69.

SURVEY—BOUNDARY LINE COMMISSIONERS—VALIDITY OF WORK DONE BY SUBORDINATE.

Ovens vs. Davidson.

Held, that a line run by a subordinate and adopted by the principal (surveyor) is the work of the latter, and must be treated as such.

That it is by the work as executed on the ground, and not as projected before execution, or represented on a plan afterwards, that the boundaries are to be determined. *Ovens vs. Davidson*, 10 C.P., 302.

SURVEY OF TOWNS AND VILLAGES—WORK ON THE GROUND —PLAN—C.S.U.C., CH. 93, SEC. 35.

McGregor vs. Calcutt.

Under the latter part of sec. 35, of ch. 93, C.S.U.C., the work upon the ground in the original survey of towns and villages, to designate or define any lot, shews its true and unalterable boundaries, and will over-ride any plan of such lot. *McGregor v. Calcutt*, C.P. 39.

BOUNDARIES—ORIGINAL MONUMENTS—SURVEYS.

Artley vs. Curry.

In questions relating to boundaries and descriptions of lands, the well-established rule is that the work on the ground governs; and it is only where the site of a monument on the ground is incapable of ascertainment that a surveyor is authorized to apportion the quantities lying between two defined or known boundaries. Therefore, where an original monument or post was planted as indicating that the north-west angle of a lot was situated at a distance of half a chain south therefrom, and another surveyor had actually planted a post at the spot so indicated, and subsequently two surveyors, in total disregard of the two posts so planted, both of which were easy of ascertainment, made a survey of the locality and placed the post at a different spot, the court (*Spragge, C.*) disregarded the survey, and declared the north-west angle of the lot to be as indicated by the first mentioned monument. *Artley v. Curry*, 29 Chy., 243.

EVIDENCE.

A piece of land marked out in the original plan of a township, as an allowance for road, does not lose that character, because it has never been used as a road for a period of forty years, and a copy of the original plan of the township is admissible in evidence to prove such allowance, although it does not appear by whom, nor from what materials the plan was compiled. *Badgely v. Bender*, 3 O.S.; 221. Badgely vs.
Bender.

When a witness, a surveyor, founded his evidence upon the assumption of a certain monument as the correct point to start from in running a line, and the jury gave their verdict accordingly, and such witness afterwards discovered he was in error as to the correctness of that boundary, and made affidavit of his mistake, the court granted a new trial. *Doe d. Case v. Magill*, 5 O.S., 56. Case vs.
Magill.

A surveyor cannot act independently of the provisions of the statute, 5 Geo. III., ch. 13, and arbitrarily lay on one side the evidence which neighbours are ready to give, from their own knowledge of the situation of original posts. *Sherwood vs. Moore*, 3 Q.B. 468. Sherwood vs.
Moore.

THE DESCRIPTION AND CERTAINTY OF EVIDENCE REQUIRED BY PLAINTIFFS IN EJECTMENT BROUGHT ON ACCOUNT OF DISPUTED BOUNDARIES—FIELD NOTES.

In all ejectments brought on account of disputed boundaries, the plaintiff has to shew, beyond any reasonable doubt, that he is entitled to some land at least of which the defendant is in possession; where the point is a doubtful one, the plaintiff must be prepared to shew that he has had a survey carefully made, and that the proper steps have been taken which the law requires for ascertaining the exact position of any posts along the line which can still be discovered by inspection or can be established by evidence, in order that the court and jury may see whether the two lots in question are, by the proof which the plaintiff is seeking to establish, made to occupy their proper position on the concession line. Strong vs.
Jones.

Semble, that an admitted copy of the field notes from the Crown Lands Office may be received in evidence. *Doe d. Strong v. Jones*, 7 Q.B., 385.

EVIDENCE.

A person not being a licensed surveyor is a competent witness on a question of boundary. *Potter v. Campbell et al.* 16 Q.B., 109. Potter vs.
Campbell.

BOUNDARY LINE—EVIDENCE.

Richmond vs.
Ferris.

In ejectment for part of a gore of land, lying between lots Nos. 12 and 13, the plaintiff rested his case on proving by the recollection of witnesses, the original movement between lots Nos. 10 and 11 and between lots 14 and 15, and claimed to have the space between these two boundaries proportionally divided according to the width of lots Nos. 11, 12 and 13; and of this gore, as designated in the field notes. The defendant gave evidence of an original monument between the gore and lot No. 12; and if this were proved defendant was entitled to a verdict; but it did not appear from the field notes that any post had been planted in the original survey between the gore and lot No. 12.

Upon verdict for defendant, the court set aside such verdict, and granted a new trial, without cost—Hagarty, J., dissentiente. *Richmond v. Ferris*, 6 C.P., 163.

See also *Ovens v. Davidson*, 10 C.P., 307; *McGregor v. Calcutt*, 18 C.P., 39.

CROWN SURVEY—ALLOWANCE FOR ROADS—PROFESSIONAL
EVIDENCE.

Stock vs.
Ward et al.

An original Government survey of part of a township, made no mention of roads, and it was apparently the surveyor's intention the roads should be taken out of then (wild land) adjacent. The surveyor who afterwards surveyed the adjoining lands, treated the road allowance as included within the lines of the original survey, whereby the plaintiff's lot would be diminished one chain in breadth. The jury having found for the detendants, the court ordered a new trial, considering such verdict against the weight of evidence.

The weight attached by the court to the evidence given by professional witnesses is diminished by efforts to sustain the views of the party who may call them—it should be given free from bias. *Stock v. Ward, et al.*, 7 C.P., 127.

EVIDENCE—AFFIDAVITS TAKEN BY SURVEYOR—TRESPASS TO
LAND—PLEADING—AFFIDAVITS TAKEN BY SURVEYOR—
HOW FAR EVIDENCE—C.S.U.C., CH. 93, SECS. 50, 51—
CONSTRUCTION OF.

Manary vs.
Dash.

To an action of trespass on lot 11, in the 5th concession of Saltfleet, defendant pleaded, among other pleas, that the alleged trespass was committed on lot 12, and on defendant's land. *Semble*, that the allegation of title to lot 12 was superfluous, unless equivalent to

liberum tenementum; that the averment that the trespass was committed there was in effect not guilty; and that if the fact that the trespass took place on lot 11, and on the plaintiff's property, was intended to be put in issue, it should have been done in another form. The question in dispute at the trial being the boundary line between 11 and 12, affidavits were offered in evidence as to the line between lots 4 and 5, and 14 and 15, in the same concession, taken by the surveyor employed by defendants to run this line in 1860, and filed with the registrar under C.S.U.C. ch. 93, sec. 51. Held that such affidavits were properly rejected.

Quære, as to the effect of the words in that section, "subject to be produced thereafter in evidence in any court of law or equity within Upper Canada."

One of these affidavits went to show that none of the side lines in this concession had been run in the original survey, owing to a large swamp.

Held, not an affidavit within the statute, for evidence "concerning any boundary" does not mean evidence that no such boundary ever existed; and on this ground, also, such affidavit was rightly rejected. *Manary v. Dash*, 23 Q.B., 580.

ALIQUOT PARTS OF LOTS—EJECTMENT—SURVEY—ALIQUOT PART OF A LOT—C.S.C., CH. 77, SEC. 68.

In ejectment by the patentee of the south-east quarter of a lot, to try a disputed boundary, defendant owning the north-east quarter, the plaintiff's surveyor stated that he ran the east side-line of the lot, divided it into equal halves, and drew a line across the lot on a bearing corresponding to the concession line in the rear, and that of the quarter so ascertained defendant was in possession of eleven acres. He said, however, that he did not know the quantity in the whole lot, which fronted on a river, and there was a jog in the concession line in rear, for which he made no allowance.

By the Survey Act, C.S.C., ch. 77, sec. 68, every grant of an aliquot part of a lot shall be construed as a grant of such aliquot part of the whole, whether more or less than expressed in the grant.

Held, that the plaintiff had not clearly shown his right to the land claimed and was therefore not entitled to succeed; but a new trial was granted instead of a non-suit. *Babaun v. Lanson*, 27 Q.B., 399.

BOUNDARY LINES—EVIDENCE.

Held, that the entries in the diary of the surveyor, together with a small piece of map, also produced, supposed

to be his (which was all that remained in the Crown Lands office shewing the lines in question run), and the trace of a blaze for a great part of the way, were evidence of the fact of the lines having been run by him in the manner in which he was directed to run them by his instructions (which were produced), although there was no further evidence upon the ground that the original lines had been run. *Smith v. Clunas, et al.* 20 C.P., 213; *Dark v. Hepburn, et al.*, 27 C.P., 357.

SPECIFIC PERFORMANCE—STATUTE OF FRAUDS.

*Stretton vs.
Stretton.*

An agreement for sale of lands referred to them as certain lots in "Stretton's Survey." No survey had in fact been then made, but a rough sketch of the proposed survey was in existence.

Held, that such sketch could not be considered as the survey referred to in the agreement; and as parol evidence was necessary to show the particulars as to size and position, without which such sketch was unintelligible, the Court refused to enforce the agreement, but offered to make a decree for performance of the agreement admitted by the answer without costs; or dismiss the bill without costs—the defendant having improperly denied the agreement alleged by the plaintiff, which was clearly established by the evidence, though incapable of being enforced owing to the defence of the Statute of Frauds. *Stretton v. Stretton*, 24 Chy., 20.

SURVEY UNDER ORIGINAL PLAN, ETC., AND PRIVATE AGREEMENT.

*McEachern vs.
White et al.*

It appeared that no survey had been made on the ground of the 10th or 11th concessions of the township of Eldon, north of the Portage road, but the patents had been granted according to a plan returned by the surveyor instructed to make the original survey; and by taking this plan, with the original instructions and field notes, the lots could be found upon the ground. One D., a P.L.S., made a survey in accordance with this plan, by which the plaintiff's lot, 32, 10th concession, contained 200 acres, and defendant W.'s lot 32, 11th concession, 30 acres. While a dispute as to this line was pending the defendant W. induced the plaintiff to sign a document under seal, agreeing that the portion of the line between the 10th and 11th concessions opposite lots 32 be surveyed upon the same bearings as that portion of said line lying south of the Portage road. Defendant W., who was a sharp, intelligent man, knew that the effect of this would be to deprive the plaintiff's lot of 50 acres and add it to his own, while

the plaintiff, who was illiterate and dull, was quite ignorant of this; and defendant W. assured him that if the effect of the agreement should be to reduce his, defendant W.'s, lot to 20 acres he would be satisfied. The agreement was prepared at W.'s instance, and the plaintiff signed it without taking any advice.

Held, that the plan and survey must govern, and that there was nothing in the agreement, if binding upon the plaintiff, to prevent him from asserting his title in accordance with them, or to divest him of any portion of his land.

Seemle, however, that under the circumstances plaintiff would not be bound by the agreement.

The plaintiff claimed under a patent for the east half of lot 32, in the 10th concession, as expressed in the patent, "according to the original survey of said township of Eldon," containing 100 acres more or less, issued on 1st of May, 1868, to the plaintiff. The patent for the west half of the same lot as expressed by the patent, "according to the original survey thereof," containing by admeasurement 100 acres more or less, was issued on the 3rd of February, 1873, to one James Sweeny. The defendant claimed under a patent to one Joseph Fee, dated 17th of October, 1853, of lot 32, in the 11th concession of Eldon, containing by admeasurement 30 acres more or less. *McEachern v. Somerville, et al.*; *McEachern v. White et al.*, 37 Q.B., 609.

AS TO THE TOWNSHIP OF KINGSTON—BOUNDARY LINE.

Appeal from the decision of the Boundary Line Commissioners of the Midland District upon an application of Edmund Murney, Esquire, to have the eastern boundary line of lot 25 in the first concession of the township of Kingston determined. *Murney vs. Markland.*

Seemle, that the eastern boundary line of lot 25, in the first concession of the township of Kingston, is a line drawn from the north-west to the south-east angle of the said lot. (See *Stewart vs. Forsyth.*)

Award set aside, no further information having been given during term. *Murney v. Markland et al.*, 6 O.S. 220.

RE-SURVEY OF TOWNSHIPS—CONSOL. STAT. U. C., CH. 93—
RIGHT OF ACTION BY THE COUNTY.

Declaration that the plaintiffs, pursuant to the statute, *Peterboro' Co. vs. Smith Tp.* applied to the Governor to have the concession lines in the defendants' township re-surveyed, which was ordered accordingly and the expense paid by the plaintiffs; that the plaintiffs thereupon directed the defendants to levy and

collect the moneys so paid ; but, although they did levy part, they refused to pay the same to the plaintiffs.

Plea, that the only direction was by the plaintiffs' by-law, which before suit was quashed.

Held, on demurrer, that the declaration was bad for not showing a by-law, as the plaintiffs could proceed only in that way ; and that the plea was good.

Quære, whether the money can be levied before the survey has been actually made. The Corporation of the County of Peterborough *v.* the Corporation of the Township of Smith, 26 Q. B. 40.

TRIVIAL CASE—AS TO THE TOWNSHIP OF VAUGHAN.
BOUNDARY BY AGREEMENT—DIVISION FENCES—STATUTE OF
LIMITATIONS—SMALLNESS OF INTEREST.

Bernard *vs.*
Gibson.

The plaintiff and defendant were owners of adjoining lots in the township of Vaughan. An Act of the Legislature of Canada (23 Victoria, chapter 102) had been passed, providing for a new survey of the township ; and, according to a survey made under the provisions of that Act, a strip of land containing about two acres and three-tenths, occupied by the defendant, it was alleged belonged to the plaintiff. On that strip there had recently been standing nine pine trees, seven of which the defendant had cut down. It appeared that some years before 1851, a fence from the front or easterly side of these lots, for a distance of about 60 or 70 rods, had been put up and was then standing on the supposed division line between the two lots : and also another fence running from the rear or westerly side of the lots to a distance of about 25 or 30 rods, leaving a space of about 600 yards in the centre unenclosed ; but the parties respectively in occupation of the lots had always used the land on either side of the supposed line as belonging to them, up till about the year 1858, when the father of the plaintiff and the then owner of the defendant's lot procured a survey to be made and a fence to be erected on the division line then laid out, which was paid for jointly by them, and which corresponded with a line which had been run and blazed by the same surveyor in 1851. The plaintiff, in 1873, filed a bill seeking to restrain the further cutting of timber, and for a declaration that the strip in question was his property.

Held per Curiam, that there had been a sufficient occupation of the lands on either side of the line for such a length of time as bound the parties under the Statute of Limitations, even if the survey made and fence erected in 1858 were not sufficient acts to compel the parties to abide by that line as the true boundary ; Blake, V. C., being of

opinion that they were. Spragge, C., dubitante as to the parties being bound under the Statute of Limitations; but, being clear that the matter in dispute was too insignificant to call for the interference of this Court by injunction, he concurred in dismissing the bill, with costs.

Held, also, that the Statute of 1860, directing a survey of the township to be made, had not the effect of creating any new right or title as between parties who had been in undisturbed possession for the statutable period of twenty years before action or suit brought. *Bernard v. Gibson*, 21 Chy. 195.

TOWNSHIP OF SMITH—LOTS FRONTING ON A RIVER—
C. S. U. C., CH. 93, SEC. 27.

The three easterly lots only of one concession in a township (Smith, in the county of Peterborough) were bounded in front by a river, and the line had been run in the original survey in front of such concession, up to though not past these lots, but the township itself fronted upon another township.

Held, clearly not a township bounded in front by a river, within the C.S.U.C, ch 93, sec. 27, so that resort might be had to the posts in the concession in rear to determine the side lines of these three lots.

Quare, whether such a case is provided for by the Statute. *Johnson v. Hunter*, 25 Q.B. 348.

TRESPASS—BOUNDARY LINE.

Trespass to try the boundary line between plaintiff and defendant. The former claimed title to part of N.W. part of lot No. 20 in the sixth concession of South Dumfries, by metes and bounds; the defendant claimed the east half. The descriptions in the deeds did not conflict; a line was originally run by a Mr. Ball for the prior holders of the property, one of them at the time claiming title through the original patentee, under an agreement for purchase, but was not acquiesced in by the plaintiff. In 1849 one M., a Provincial Land Surveyor, at plaintiff's request, ran a line supposed to be acquiesced in by the defendant; but upon the erection of a fence thereon by the plaintiff the defendant objected, and it was removed. In 1863 a Mr. Peters ran a line, claimed by the plaintiff as a true line, and which caused this dispute.

Messrs. P. and J., being present at the time on defendant's behalf, concur in opinion that this line is correct.

The jury having found for the plaintiff with leave reserved to the defendant to move against it, upon motion—

*McNaught vs.
Turnbull.*

Held, that the line originally run, and now contended for by the defendant, was not binding upon the parties, and that the evidence showed the line run by Peters, and acquiesced in by the defendant, to be the correct one; therefore the verdict for the plaintiff was correct. *McNaught v. Turnbull*, 13 Q.B. 426.

BOUNDARY—ESTOPPEL—AGREEMENT TO ABIDE BY SURVEY.

Crosswaite vs. Gage.

In action of trespass, *q.c.f.*, it appeared that defendant conveyed to the plaintiff 19 acres of lot 2 in the fifth concession of Barton, described by metes and bounds, commencing at the N.E. angle of the lot. This starting-point upon the ground was undisputed, and it was admitted that the description given enclosed the land claimed by the plaintiff.

Held, that defendant was estopped by his deed, and could not set up any question as to the boundary between lots 1 and 2.

It appeared also that about twelve years since, one W., defendant's tenant, having moved the fence between plaintiff and defendant, an agreement in writing was entered into between W. and the plaintiff that they would employ B., a surveyor, to establish the original line between lots 1 and 2, and would be bound by it; and defendant, by a memorandum signed by him at the foot of this agreement, agreed to abide by it. The land in dispute was then in W.'s possession, and it was alleged that B. had not completed his survey.

Held, no evidence to support defendant's plea of leave and license.

Held, also, that upon the evidence, set out below, B., the surveyor, had proceeded properly to establish the line. *Crosswaite v. Gage*, 32 Q.B. 196.

Also *Holmes v. McKechin et al*, 23 Q.B. 52.

LOTS FRONTING ON RIVER—POINT OF LAND IN FRONT SEPARATED BY WATER.

Thomson vs. Sherwood.

In an action of trespass, defendant claimed as part of lot 16 in the broken front of Escott that part of Cary's point in the river St. Lawrence which would be included within the side lines of the lot, if projected from the main shore across a small bay, to and across the point to the river in front of it. In the original plan of the township the line across the point from west to east, showing an intention to include it in the broken front was continued only as far east as lot 14, though the point extended far enough to cover the fronts of lots 15 and 16. In scaling

the front on the river posts appeared to have been put down on the main land, but none could be traced on the point. The jury found that these posts were intended to mark the width of lots, not the front angles of lots in the broken front, and that the front of lot 16 was upon the main shore, and not on the river in front of the point.

Held, that upon the evidence the verdict was right as no part of the point appeared to be included in the lot. *Thomson v. Sherwood et al.* 21 Q.B., 174

ALTERNATE CONCESSIONS, RUNNING OF—DISPUTED BOUNDARIES—ORIGINAL SURVEYS.

In the first government survey of a township (Loughborough), the lines between alternate concessions only, as the 2nd and 3rd, 4th and 5th, 6th and 7th, had been run and staked out, numbering from south to north. These lines were not straight but curved or bended southward in the centre of the township. It appeared (though not very satisfactorily) that several persons had, under government, settled according to these lines. Subsequently, a surveyor was employed by Government to run the concessions omitted on the first survey, viz., 1st and 2nd, 3rd and 4th, 5th and 6th concessions. He did so; but instead of running them parallel to, or diverged, as the lines formerly surveyed, he ran them in straight lines, thus cutting off part of the rear of the northerly concessions and adding them to the front of the southerly concessions. *Held*, that such last mentioned survey could not be adopted as the governing one. *Martin Keeley v. Cornelius Harrigan, Cornelius Burk and James Ryan.* 3 C P., 173. *Keeley vs. Harrigan et al.*

BOUNDARY LINE COMMISSIONERS—SURVEY CONFIRMED BY STATUTE, 12 VIC., CH. 35.

The judgment of the boundary line commissioners under 1 Vic., ch. 19, when not appealed against. *Held*, binding when not appealed against within six months as required by the statute. And the decision of this court in *Keeley v. Harrigan*, 3 U. C. C. P., 173, confirmed. *Raile v. Cronson*, 9 C. P., 9. *Raile vs. Cronson.*

SURVEYS UNDER SPECIAL ACTS.

TOWNSHIP OF BINBROOK—ERRONEOUS SURVEY—ACTS 1, WM IV., CH. 8, 7 WM. IV. CH. 59, REMEDYING SAME—MARRIED WOMAN OWNING LAND IN BINBROOK.

Under the statutes 1 Wm. IV., ch. 8, and 7 Wm. IV., ch. 59, passed for the purpose of remedying an erroneous public survey, an inhabitant living in the front concession *Crooks vs. Calder.*
Crooks vs. Ten Eyck.

of the township of Binbrook, cannot be dispossessed by an ejectment brought, after a prior submission to arbitration, by the husband of a married woman, owning land in the adjacent township of Saltfleet—the husband not being the owner of the land—to whom alone these acts apply. *Doe d. Crooks v. Ten Eyck*; *doe d. Crooks v. Calder*, 7 Q. B., 581.

TOWNSHIP OF CUMBERLAND.

23 VIC., CH. 101—EJECTMENT—COMPENSATION FOR IMPROVEMENTS.

Smith vs.
Sparrow.

The 23 Victoria, ch. 101, declares the mode in which the side lines in the 1st concession of Cumberland shall be run, and provides a particular method by which those injured by the change from the original plan of survey may obtain compensation.

Held, that the provisions of the general statute, 20 Vic., ch. 78, were thereby excluded, and that the defendant was confined to the remedy pointed out by the Special Act. *Smith v. Sparrow*, 21 Q. B., 323.

AS TO THE TOWNSHIP OF MONAGHAN.

16 VIC., CH. 228, SEC. 1—LIMIT BETWEEN 12 AND 13, 1ST CON. MONAGHAN—BIRDSALL'S LINE.

Otty vs. Davis.

Ejectment for part of lot No. 12 in the 12th concession of the township of Monaghan, described by metes and bounds.

Held, that under 16 Vic., ch. 228, sec. 1, Birdsall's line as laid out on the ground, must govern as the allowance for road between lots 12 and 13 along their whole extent, and not merely up to park lot 10 on lot 13; and that it was immaterial whether such line was correctly described in the statute. *Otty v. Davis*, 12 Q. B. 454.

AS TO THE TOWNSHIP OF NIAGARA.

STAT. 18 VIC., CH. 156, SEC. 3—APPLICATION OF.

Clement vs.
Clement.

This was an action brought by the plaintiff for trespass by the defendants, upon a road allowance between lots numbers 110 and 111 in the township of Niagara, which the plaintiff claimed as his, by operation of the statute 18 Vic., ch. 156, sec. 3.

Held, that the preamble and enacting clause of the statute 18 Vic., cap. 156, apply to all that part of the township of Niagara which lies between the east and west lines of the township to the Queenston and Grimsby macadamized road, and should not be limited to the first concession only. *Clement v. Clement, et al*, 14 C. P., 146.

MUNICIPAL SURVEY, SUFFICIENCY OF PETITION FOR—NUISANCE
—DISPUTED SURVEYS—C. S. U. C., CH. 93, SEC. 6

On an indictment for nuisance in obstructing a highway, the Crown put in the application by way of petition, under C. S. U. C., ch. 93, sec. 6, to the County Council of the County of Kent, in these words: "We, the undersigned freeholders of the fourth ward of, etc., humbly show: That your humble petitioners are labouring under a most weighty grievance in consequence of a dispute having arisen out of the different surveys of the, etc., and as it would appear that no final adjustment can be brought about other than is provided by the 31st clause of the 12 Vic., ch. 35, your petitioners humbly pray that the County Council of, etc., will give this our prayer due consideration, and by acting upon the above named clause of the 12 Vic., ch. 35, you will further and preserve the best interests of your petitioners. As the matter now stands it is impracticable for us to expend our public money or perform our statute labor, having no guarantee than the same will prove to be properly applied." There was also produced a memorial by the County Council of Kent, to the Governor-General, under the same Act, stating that over two-thirds of the freeholders, etc., had petitioned the council for a survey to be made of the line in dispute, in order to clear up a doubt that existed as to the site of the concession in question, owing to the dispute that had arisen out of the different surveys, and referring His Excellency to a copy of the petition, by which it would be seen that the petitioners bound themselves to be governed by the conditions of 12 Vic., ch. 35, sec. 31 (C. S. U. C., ch. 93, sec. 6), and praying that the said line might be surveyed. It was proved and not disputed that the necessary number of resident landholders under the Act had applied for the survey, but it was objected that the petition did not show this:

Regina vs.
McGregor.

Held, following *Cooper v. Wellbanks*, 14 C. P. 364, that everything was to be presumed to be done correctly until the contrary was proved, and here it had been proved that the necessary number of persons under the Act had applied for the survey.

Held, also, as to the other objections, viz., that the petition did not show any want or obliteration of the original survey, and that neither petition nor memorial prayed for placing monuments, that the two documents could not be read in any other sense than as containing an application to the Governor requesting the making of a survey under the Act, and if to be made under the Act, then that the marking by permanent stone boundaries

under the direction of the Commissioner of Crown Lands, in the manner prescribed by the Act, was an incident to the survey necessarily involved in the application for the survey; and—therefore, *Held*, that the petition was sufficient. *Regina v. McGregor*, 13 C. P., 69.

MUNICIPAL SURVEYS WHEN ILLEGAL, LEVYING RATE FOR—
SURVEYS MADE UPON APPLICATIONS BY MUNICIPALITIES
SURVEY—12 VIC., CH. 81, SEC. 31—18 VIC., CH. 83,
SEC. 8—LEVYING RATE.

Walker vs.
Municipality of
Burford.

The statute 12 Vic., ch. 35, sec. 31, provides for a survey of *concession lines* being made, on application to the Governor by the municipal council, which application need not be at the request of the landholders. The 18th Vic., ch. 83, sec. 8, provides for making a survey, and placing monuments *to mark the front and rear angles of lots*, on application to the Governor by the municipality, made at the request of one-half the resident landholders to be affected.

An application was made under the first Act, without any request of the landholders, to mark out concession lines, and under it the survey provided for in the second Act was afterwards made, *to define the boundaries of lots*: *Held*, that such survey was illegal.

The rate to pay for a survey, made under these Acts, must be levied, not upon the assessed value of the land, but in proportion to the quantity held by the respective proprietors. *Walker and the Municipality of Burford*, 15 Q. B., 82.

MUNICIPAL SURVEY BY-LAW.

C. S. U. C., CH. 93, SECS. 6-9—C. S. C., CH. 77, SECS.
58-61.

Scott vs.
Peterboro' Co.

The county council passed a by-law directing a township municipality to levy and collect from *the patented and leased lands* of the township, a certain sum required to reimburse the expenses incurred in a re-survey of the township. *Held*, that the by law was illegal, for the statute directs that such expense shall be defrayed by the "*proprietors*" of the lands interested.

Semble, that the jurisdiction to pass such a by-law should appear on the face of it, by shewing a survey such as the statute contemplates.

Quare, whether the Act authorizes the re-survey of a whole township. In *re Scott and the Corporation of the County of Peterborough*, 25 Q. B., 453.

MUNICIPAL SURVEY BY-LAW.

BY-LAW OF UNITED TOWNSHIPS—SEPARATION—APPLICATION
TO QUASH—PRACTICE—SURVEY.

A by-law was passed by the united townships of Smith and Harvey to levy a certain sum on lands in Harvey, to defray the expense of a re-survey of that township. The union having been dissolved. *Held*, that an application to quash was properly made by a rule calling on the corporation of Harvey, upon a certified copy obtained from the clerk of Smith, the senior township. *Scott vs. Harvey Tp.*

The certificate was under the corporate seal of Smith, but there was no seal to the copy of by-law, nor anything but the certificate to shew that it had been sealed.

Held, sufficient.

The by-law directed the money to be levied "on all lands patented, leased, sold, agreed to be sold, and located as free grants" in the township of Harvey. *Held*, bad, following Scott and the Corporation of Peterborough, 25 U. C. R., 453. In *re* Scott and the Corporation of the Township of Harvey, 26 Q. B., 32.

MUNICIPAL SURVEY, BY-LAW, LEVYING RATE.

C. S. U. C., CH. 93—RE-SURVEY OF TOWNSHIP.

The County Council, under Consol Stat., U. C., ch. 93, sec. 6, having caused the re-survey of an entire township, and directed a certain sum to be levied for the expenses, by a by-law which had been quashed, by a subsequent by-law directed the collection of a further sum for the purpose, to be levied on the proprietors of land in the township in proportion to the quantity of land held by them respectively in such township. This by-law was quashed, on the grounds: 1. That the Statute does not authorize the re-survey of a whole township, 2. That it directs the expense of each concession to be borne by the proprietors of land there. In the matter of Scott and the Corporation of the County of Peterborough, 25 Q. B., 36. *Scott vs. Peterboro' Co.*

MUNICIPAL SURVEY—IMPROPER APPLICATION FOR CON-
CESSION LINE.

A concession line having been laid out by a Provincial Land Surveyor under instructions from the Commissioner of Crown Lands, upon the petition of the corporation of the township, based upon the assumed application of one-half the resident land-holders to be affected by the survey, the petition being in the following words:—"To the *Cooper vs. Wellbanks.*

Reeve and Councillors in council assembled,—We, the undersigned freeholders in the 2nd and 3rd concessions, south side of Black River, west of Point Travers, in Marysburg, beg to ask your honourable body to petition the government to send a surveyor to establish the concession line according to law between the 2nd and 3rd concession commencing at the township line running towards South Bay, and by complying with this request your petitioners in duty bound will ever pray. Milford, April 14th, 1860." On receipt of this petition the corporation passed a resolution in these words: "Resolved, That in accordance with the statute 18 Vic., ch. 83, sec. 8, and the prayer of the petition of a majority of the householders to be affected thereby, that there be a survey made between the 2nd and 3rd concessions south of Black River from the township line of Athol, to lot number one in the third concession of Marysburg." On the 29th of May, 1860, the corporation of the township of Marysburg petitioned His Excellency to cause this survey to be made, and on the 9th of July, 1860, the Honourable the Commissioner of Crown Lands gave instructions to a Provincial Land Surveyor to survey and establish the concession line between the 2nd and 3rd concessions of the township of Marysburg, commencing at the township line, and running towards South Bay in accordance with the provisions of the Provincial Statute, 12 Vic., ch. 35, and 18 Vic., ch. 83.

Held, that the application to the corporation, and the resolution by the corporation not being such as the statute requires to authorize an application to the government to cause the survey to be made, that the survey made by the instructions of the Commissioner of Crown Lands, dated the 9th of July, 1860, was therefore unauthorised. Cooper v. Wellbanks, 14 C.P., 364.

SURVEY—WHEN LEGAL IF NOT MADE BY CROWN—MAPS,
CUSTODY OF—EVIDENCE—ABBUTTALS IN DEEDS.

VanEvery vs.
Drake.

A survey made by a private party of an unsurveyed block granted by the Crown is the "original survey and shall have the same force and effect thereof as though the said original surveys and plans thereof had been made by government authority." See 12 Vic., ch. 35, sec. 34.

When the description in a deed which was supposed to contain half a lot, in giving metes and bounds, stated as a measurement 40 chains as the length conveyed. *Held*, it was necessary for the grantee to prove the whole lot contained more than 80 chains from front to rear, to entitle him to any greater quantity, for the production of the deed alone would entitle him to 40 chains only.

A map produced from the custody of the son of the original owner of the lot and sworn to be the map upon which the township was originally sold.

Held, to be properly admitted in evidence. *VanEvery v. Drake*, 9 C.P., 478. *McGregor v. Calcutt*, 18 C.P., 39.

ERRONEOUS SURVEY—MAGNETIC BEARING AND ASTRONOMICAL BEARINGS.

Defendant claimed under a timber license which described his limits as bounded on the south by “the continuation of a line from the head of Mud Lake on the course North 54° E., formerly the boundary between T. C. and A. R. M.” The plaintiff claimed under a license which gave his northerly limit as the same line, describing it also as running N. 54° E. Both licenses were renewals of previous licenses from about 1839.

Held, that the boundary between them was the true astronomical line N. 54° E.; and that the plaintiff could not claim according to a line run in 1874, N. 54° E. magnetically, making no allowance for the variations of the compass. *Thibaudeau et al v. Skead*, 39 Q.B. 387.

TRESPASS BY SURVEYORS IN MAKING PRIVATE SURVEYS.

The declaration stated that the defendant broke and entered the east half of lot No. 20 in the sixth concession of the township of South Dumfries, and there cut down and destroyed the trees and underwood, to-wit, etc. The fourth plea alleged that as to the breaking and entering, and cutting down and destroying a small quantity of underwood, he, the defendant, at the time when, etc., was in the lawful possession and seised in fee of a part of the west half of the same lot; that the boundary between the two parts was a straight line through the centre of the lot from the front to the rear; that the boundary was in dispute between the plaintiff and the defendant, and they could not agree upon the same; and that the defendant, in order to discover and ascertain correctly the boundary, employed and instructed a duly authorized land surveyor to run the said line and establish the said boundary, who, with certain chain-bearers and other necessary assistants, in pursuance of such instructions and in discharge of their duty as such land surveyors, necessarily entered into and upon the land in the first part of the plea mentioned, for the purpose of running the said line and discovering and ascertaining the said boundary, and necessarily and unavoidably cut down and destroyed a small quantity of brush and underwood then growing upon the said land

Thibaudeau et al. vs. Skead.

Turnbull vs. McNaught.

first mentioned, in order to run such line and to discover and ascertain such boundary as they lawfully might, doing no actual damage on the occasion, which are the same trespasses complained of.

Held, on demurrer to this plea, that a surveyor has no power to enter upon the lands of one neighbor for the purpose of making a mere private survey for another neighbor. *Turnbull v. McNaught*, 14 C.P., 375.

SPECIFIC PERFORMANCE UNDER ERRONEOUS SURVEY—
LACHES.

Paul vs.
Blackwood.

The defendant had for some time used part of the plaintiff's land as a mill-pond, and differences existed between them in relation thereto, to put an end to which they entered into a written agreement that the plaintiff should sell to the defendant as much of the land as was, or had been, overflowed by the water of the mill-pond, for a price which was proved to be much beyond the intrinsic value of the piece of land so sold. To carry into effect this contract, the plaintiff had the ground surveyed; but the survey was erroneous, and the deed which the plaintiff thereupon tendered comprised, in consequence, less land than the defendant was entitled to have. The defendant refused this deed, procured a new survey to be made, and tendered a new deed for execution by the plaintiff; and this deed the plaintiff refused to execute. When the first instalment of the purchase-money became due, the defendant tendered it, but did not pay it in consequence of the non-execution of the conveyance. The defendant continued to use the land for a mill-pond, and gave no intimation of his intention to abandon the contract; and twelve-month afterwards the plaintiff filed a bill for a specific performance of the contract, which was decreed without costs. (Blake, C., diss.) *Paul v. Blackwood*, 3 Chy., 394.

AS TO DEBT LYING AGAINST THE TOWNSHIP COUNCIL FOR
EXPENSE OF A SURVEY MADE UNDER THE 38 GEORGE III.,
CHAPTER I.

Roach vs.
Council of
Hamilton.

Held, per Cur., that the township council of Hamilton coming in the place under the 12 Vic., ch. 81, sec. 31, heads 26 and 31, of the trustees of the Newcastle district in quarter sessions assembled, could not be held liable *in debt* to the surveyor who had been appointed under the 38 George III., chapter 1, to re-survey the township of Hamilton. *Roach v. Municipal Council of Hamilton*, 8 Q.B., 229.

SURVEY MADE AFTER GRANT.

The question in dispute was what quantity of land was granted by the patent issued in 1797, the description which was: "Beginning about 18 chains below a small creek which empties itself into the river Thames, in lot No. 17; thence west to the eastern boundary of lot 16, two chains, more or less; thence north 45 degrees west to the north-east angle of lot 16, 28 chains, more or less; thence south 45 degrees west to the river Thames; and thence along the bank of the river against the stream to the place of beginning, being the broken fronts of 16 and 17." The lots were supposed to contain 150 acres. There were two creeks, and the point of commencement contended for by the plaintiff (the upper creek) would give him a much larger quantity of land than the defendant claimed he was entitled to, while that sought to be upheld by the defendant would reduce it to about 50 acres. An old map from the Surveyor-General's office was put in evidence, under which the lot had evidently been granted; and a surveyor called for the defence stated that the ground contended for by the plaintiff corresponded best with the old map.

Held, that as the description contended for by the plaintiff corresponded best with the oldest plan to be found in the Surveyor-General's department, and with a survey since made for the purpose of tracing out or completing parts not fully surveyed before, he was entitled to recover. *Horne v. Munro et al*, 7 C.P., 433.

Seemle, per Draper, C. J., the crown may grant a tract of land by a sufficient description to designate the portionment, although the township within which the land lies has not been surveyed and laid out into lots and concessions; and the grantee will be entitled to hold it, although a subsequent survey made by authority of the Crown makes it by name a different lot, or places it in a different concession from that named in the patent, or the surveyor laying it out projects a road through it. *Ib*.

HIGHWAYS, INDICTMENT FOR OBSTRUCTING.

In September, 1852, a tract of land upon the River St. Clair, adjoining the town plot of Sarnia to the south, was ceded by the Indians to the Crown, to be disposed of for their benefit. In the same year this tract was surveyed under instructions from the Government, and three streets laid out upon the plan, one called Front Street, running north and south, parallel with the river, and the others, Wellington and Nelson streets, running westerly through

the track, crossing Front street at right angles, and continuing to the river bank, which was distant only 1 chain 50 links from Front street along Nelson, and 50 links along Wellington street. This plan was reported to the Government, with the surveyor's field notes, but Nelson and Wellington streets were not laid out upon the ground west of Front street, and that portion of them had never been opened or used so as to give access to the water—the river bank there being abrupt. A sale was held in 1853 at which some lots were sold with reference to this plan, one on Nelson street, but none west of Front street.

In 1854 the Great Western Railway Company purchased from the Government the tract west of Front street, along the river between Wellington and Nelson streets, and beyond them to the north and south, including the water lots in front, for which they paid the sum awarded by arbitration. Afterwards a public sale of lots in the tract ceded by the Indians was held by Government, at which a plan was referred to, made for the company by the same surveyor who first laid out the tract, showing the ground which the railway and its terminus would occupy, but exhibiting no streets leading through it to the river; and this was the plan used before the arbitrators, and upon which their award was made.

The company, without objection on the part of the municipality entered upon the land bought by them, made new ground in front by filling up the river, and completed their buildings and other works which obstructed Wellington and Nelson streets running through the land purchased to the river, according to the first plan mentioned. After this the municipality by letters applied to them for compensation for the injury caused the town in consequence of the access to the water by these streets being cut off, claiming that they should be paid a fair value for the streets thus taken and remunerated for a purchase of land which it was proved they had made higher up at a cost of \$3,200 in order to obtain access to the river. They made no complaint, however, that the defendants had acted illegally.

Defendants being afterwards indicted for obstructing these streets, it was left to the jury to say, with reference to the 15th clause of 22 Vic., ch. 116, whether the municipality or the government had permitted defendants to occupy the streets before that act, and if so, to find for defendants. The jury gave a general verdict of guilty, and being asked how they found as to the permission, said only that they thought the municipality ought to be compensated for the land.

By 22 Vic., ch. 116, sec. 15, it is enacted, in substance, that all highways occupied by this railway with the written assent of the municipality within which they are situated, shall be declared vested in them to the extent of the user permitted or enforced by the municipality; and all proposed or contemplated streets occupied by the company, or which they have been permitted to occupy by the license of the owner in fee, and which shall not lead to any place beyond the said railway, shall be deemed closed, and the occupation by the said railway shall be lawful.

Held, that defendants were clearly entitled to an acquittal under this clause, for, first, as to the first part of the clause, a written assent given afterwards by the municipality would suffice, and might be inferred from their letters, in which they asked only for pecuniary compensation; and, secondly, these were proposed or contemplated streets occupied by the company, and not leading to any place beyond the railway, in which case no assent was required.

Held, also, that the Consol. Stat. U.C., ch. 54, sec. 333, had no application, for it could not be said that these streets had not been opened by reason of any other road being used in lieu thereof.

That under 16 Vic., ch. 99, sec. 4, and 16 Vic., ch. 101, defendants had clearly a right to take possession of this land for their railway, with any easement thereto. *Quere*, whether the 4 W. IV., ch. 29, sec. 9, which requires this railway company on intersecting any highway to restore it to its former state, or in a sufficient manner not to impair its usefulness, could have been applied to this case; the streets in question never having been opened or used, being covered by the works of defendants, so that they could not be restored without dispossessing them, and leading to no place beyond. *Semble*, that at all events a mandamus would not, under the circumstances, have been granted at the instance of the municipality.

Under Consol. Stat. U.C., ch. 54, sec. 313, these streets, being laid out on the original plan made by the Crown surveyor, would be public highways, though not staked out upon the ground, and never opened or used.

Semble, that under 12 Vic., ch. 35, sec. 41, the Indians, or the government acting for them, had power to alter and amend the survey by striking out these streets where they ran through the land sold to defendants. *Regina v. The Great Western Railway Company*, 21 Q.B., 555.

PROHIBITION TO COUNTY JUDGE—AMENDING REGISTERED
PLAN—STATUS OF APPLICANT—OWNER—ASSIGN—R.S.O.,
CH. III, SEC. 84.

Chisholm and
Town of
Oakville.

Held (reversing the judgment of Proudfoot, J., 9 O.R., 274), that the status of C., as a person, or the assignee of a person, who registered a plan, was a question of law and fact combined for the county judge to determine upon C.'s application to him, under R.S.O., ch. 111, sec. 84, to amend the plan, and that his decision was not examinable in prohibition.

Semble, a person not the owner of the property may register a plan, and although this would be at the time a futile proceeding, yet if he afterwards became the owner of the property and adopted the plan, he would be entitled under the Act to have it amended. In *re* Chisholm and the corporation of the town of Oakville, 12 A.R., 225. In *re* the Hon. G. W. Allan, 10 O.R., 110.

EVIDENCE—SURVEYOR'S FIELD NOTES—POSSESSION—ACTS
OF OCCUPATION—STATUTE OF LIMITATIONS—R. S. O.,
C. 108.

McGregor *vs.*
Keiller *et al.*

To determine a disputed boundary line between two lots, the field notes of S., a land surveyor, were offered in evidence, but objected to on the ground that they were not made by S. in the execution of his duty as such surveyor:

Held, that the objection was good, and the evidence inadmissible. The plaintiff and M., his next adjoining neighbour, in 1868, employed a surveyor to run the line between his land and that of M. The line drawn ran through a wood. For more than ten years the plaintiff was in the habit of cutting timber up to the said line, and he and the owners of the adjoining land recognized it as the division line.

Held, that this was sufficient occupation by the plaintiff to give him a good title by possession up to the said line, whether it was the correct line or not.

Harris *v.* Mudie, 7 A.R., 414, distinguished. McGregor *v.* Keiller *et al.*, 9 O.R., 677.

SURVEYOR'S LIABILITY—PROVINCIAL LAND SURVEYOR—IM-
PROPER SURVEY—LIABILITY FOR DAMAGE.

Thp. of Stafford
vs. Bell.

A surveyor in making a survey is under no statutory obligation to perform the duty, but undertakes it as a matter of contract, and is liable only for damages caused by want of reasonable skill, or by gross negligence. The

defendant, a provincial land surveyor, who was employed by the plaintiffs to run certain lines for road allowances, proceeded upon a wrong principle in making the survey, and the plaintiffs sued him for damages which they had paid to persons encroached upon by opening the road according to his survey.

Held, reversing the judgment of the Common Pleas, 31 C.P., 77, that the plaintiffs could not recover, as although the survey was made by the defendant on an erroneous principle, the evidence failed to prove that the lines as run by him were not correct.

Quære, per Patterson, J. A., whether the fact that the plaintiffs knew that the correctness of the survey was questioned before opening the road did not make them guilty of contributory negligence.

Remarks upon the impropriety of receiving the opinions of surveyors as experts as to the proper mode of making a survey under a statute. The Corporation of the Township of Stafford *v.* Bell, 6 A.R., 273.

SURVEYOR'S WITNESS FEES, TAXATION OF—COSTS—PROCURING EVIDENCE—TAXATION—LOCAL MASTER—FEES.

Expense incurred for surveys and other special work of that nature made in order to qualify witnesses (surveyors) to give evidence are not taxable between party and party, the English Chancery Order 120 (1845) not being in force here. McGannon *vs.* Clarke.

The taxing officer refused to allow charges for maps prepared to identify the details of the line mentioned in the judgment as that which the judge considered the true line, and also for a certificate of the state of the cause, for a letter advising of judgment, and for instructions on motion for judgment.

Held, that there being no error in principle, but only an exercise of discretion by the taxing officer, the Court would not interfere with his ruling.

Held, also, that the Local Masters, who are paid by fees instead of salary, are entitled to charge one dollar per hour in money under Chancery Tariff of 23rd March, 1875, when taxing costs. (June 18th, 1883.—Boyd, C.) *McGannon v. Clarke*, 9 P.R., 555.

UNSKILFUL SURVEY—COMPENSATION FOR IMPROVEMENTS UNDER R.S.O., CH. 51, SS. 29, 30.

Where S., having purchased a lot of land, employed a public land surveyor to mark out the boundaries of it for him and the surveyor, by reason of an unskilful survey, Plumb *vs.* Steinhoff.

included in the lot, as marked out by him, land which should not have been so included, and S., misled thereby, effected improvements upon the land so erroneously included.

Held, on recovery of the said land by the rightful owner that S. was entitled to compensation for the said improvements under R.S.O., ch. 51, ss. 29, 30. *Plumb v. Steinhoff*, 2 O.R., 614.

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LIST OF OFFICERS OF THE ASSOCIATION OF SURVEYORS

1886 To 1892 (BEFORE)

OFFICERS.	1886-7.	1887-8.	1888-9.
President	Geo. B. Kirkpatrick	Geo. B. Kirkpatrick	A. Niven
Vice-President	John Galbraith	John Galbraith	Villiers Sankey
Secretary-Treasurer	Willis Chipman	Willis Chipman	Willis Chipman
Councillors	M. J. Butler	M. J. Butler	John McAree
	E. Stewart	Villiers Sankey	H. B. Proudfoot
	Villiers Sankey	P. S. Gibson	W. R. Aylsworth

1892 To 1897 (SINCE)

OFFICERS.	1892-3.	1893-4.	1894-5.
President	E. Stewart	E. Stewart	M. J. Butler
Vice-President	M. J. Butler	M. J. Butler	M. Gaviller
Secretary-Treasurer	A. J. VanNostrand	A. J. VanNostrand	A. J. VanNostrand
Members of Council.	Hon. A. S. Hardy	Hon. A. S. Hardy	Hon. A. S. Hardy
	P. S. Gibson	Geo. B. Kirkpatrick	Villiers Sankey*
	M. Gaviller	A. Niven	Herbert J. Bowman
	John McAree	P. S. Gibson	Geo. B. Kirkpatrick
	Villiers Sankey*	M. Gaviller	A. Niven
	A. Niven	J. McAree	P. S. Gibson
	Geo. B. Kirkpatrick	Villiers Sankey*	Willis Chipman

* Chairman

TION FORMED IN 1886 BY THE LAND
OF ONTARIO.

INCORPORATION).

1889-90.	1890-1.	1891-2.	1892 (to 1st July).
A. Niven	Villiers Sankey.....	Villiers Sankey.....	E. Stewart.
Villiers Sankey.....	E. Stewart.....	E. Stewart.....	M. J. Butler.
Willis Chipman	A. J. VanNostrand .	A. J. VanNostrand..	A. J. VanNostrand.
E. Stewart.....	H. B. Proudfoot....	M. J. Butler	John McAree.
John McAree	M. Gaviller.....	H. B. Proudfoot ...	M. Gaviller.
P. S. Gibson.....	T. H. Jones.....	M. Gaviller.....	P. S. Gibson.

INCORPORATION).

1895 6.	1896-7.		
M. Gaviller.....	Willis Chipman....		
Willis Chipman	T. Harry Jones ...		
A. J. VanNostrand .	A. J. VanNostrand .		
Hon. A. S. Hardy..	Hon. A. S. Hardy..		
P. S. Gibson	Geo. B. Kirkpatrick		
F. L. Foster	A. Niven		
Villiers Sankey*....	P. S. Gibson		
Herbert J. Bowman	F. L. Foster		
Geo. B. Kirkpatrick	Villiers Sankey*....		
A. Niven	Herbert J. Bowman		

of Council.

LIST OF MEMBERS.

15th August, 1896.

The names of those members granted exemption by By-laws ratified by the Association are marked*.
The names of those granted exemption by By-laws passed by Council since the annual meeting are marked†

NAME AND P.O. ADDRESS.	DATE OF ADMISSION BY BOARD.
Abrey, George Brockitt, Toronto Junction	10th Jan., 1860
<small>D.L.S., Town Engineer.</small>	
Allan, John Richard, Renfrew	6th Nov., 1894
<small>Grad. S.P.S.</small>	
Aylsworth, Charles Fraser, Sr., Madoc	2nd April, 1861
<small>D.L.S.</small>	
Aylsworth, Charles Fraser, Jr., Madoc	8th Jan., 1886
Aylsworth, John Sidney, Selby, P. O. Box 23	9th Jan., 1871
<small>D.L.S.</small>	
Aylsworth, William Robert, Belleville, P.O. Box 2	8th Nov., 1861
<small>D.L.S.</small>	
Baird, Alexander, Leamington	7th July, 1877
<small>D.L.S.</small>	
Barrow, Ernest George, Hamilton	4th Oct., 1877
<small>D.L.S., M.C.S.C.E., Assistant City Engineer.</small>	
Bazett, Edward, Burk's Falls	8th July, 1881
<small>D.L.S.</small>	
Beatty, David, Parry Sound	12th July, 1869
<small>D.L.S.</small>	
Beatty, Herbert John, Eganville	8th Nov., 1893
<small>Grad. S.P.S.</small>	
Beatty, Walter, Delta	19th July, 1858
<small>D.L.S., M.P.P.</small>	
Bell, Andrew, Almonte	6th Oct., 1866
<small>D.L.S.</small>	
Bell, James Anthony, St. Thomas	11th Oct., 1875
<small>D.L.S., Co. Engineer, Elgin; City Engineer St. Thomas.</small>	
Bigger, Charles Albert, Ottawa, 68 Daly Ave.	6th Jan., 1882
Bolger, Thomas Oliver, Kingston	6th July, 1865
<small>D.L.S., City Engineer.</small>	
Bolton, Ellsworth Doan, Listowel	7th Nov., 1895
<small>B.A.Sc. (McGill).</small>	

LIST OF MEMBERS.

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NAME AND P.O. ADDRESS.	DATE OF ADMISSION BY BOARD.
Bolton, Jesse Nunn, Toronto, 264 Major st. <small>D.L.S.</small>	6th April, 1867
Bolton, Lewis, Listowel. <small>D.L.S.</small>	9th July, 1864
Booth, Charles Edward Stuart, Kingston, 196 Colborne st	6th April, 1882
Bowman, Clemens Dersteine, West Montrose.	10th July, 1879
Bowman, Herbert Joseph, Berlin <small>Grad. S.P.S., Town Engineer.</small>	7th Oct., 1886
Bray, Edgar, Oakville. <small>D.L.S.</small>	6th Oct., 1866
Bray, Harry Freeman, Oakville	10th July, 1882
Bray Samuel, Ottawa, Dept. of Ind'n Affairs. <small>C.E., D.L.S.</small>	6th Jan., 1877
Brown, David Rose, Cornwall. <small>D.L.S.</small>	10th Oct., 1850
*Brown, John Smith, Kemptville <small>D.L.S.</small>	8th July, 1852
Browne, Harry John, Toronto, 17 Toronto st. <small>D.L.S., C.E.</small>	6th July, 1872
Browne, William Albert, Toronto, 17 Toronto st.	10th April, 1876
Burke, William Robert, Ingersoll. <small>D.L.S.</small>	5th April, 1878
Burt, Frederick Percy, New York, N.Y. <small>Manager and Treasurer Eng. News Pub. Co., Tribune Building.</small>	8th July, 1885
Butler, Matthew Joseph, Napanee, P O. Box 359. <small>M.L.C.E., M.A.S.C.E., M.C.S.C.E., C.E.</small>	11th Jan., 1878
Byrne, Thomas, Sault Ste. Marie. <small>D.L.S.</small>	15th July, 1862
Caddy, Cyprian Francis, Campbellford. <small>D.L.S.</small>	10th July, 1860
*Caddy, Edward C., Cobourg. <small>D.L.S.</small>	18th Dec., 1846
Caddy, John St. Vincent, Ottawa, 559 King st. <small>D.L.S.</small>	6th Oct., 1866
Cameron, Alfred John, Peterborough.	9th April, 1889
Campbell, Archibald William, St. Thomas. <small>Provincial Instructor in Road Making.</small>	10th April, 1885
Carre, Henry, Belleville, P.O. Box 203. <small>City Engineer, B.A. and C.E. (Trin. Coll., Dublin), D.L.S.</small>	8th Nov., 1861

NAME AND P.O. ADDRESS.	DATE OF ADMISSION BY BOARD.
Carroll, Cyrus, Hamilton, 6½ James st. s. M.C.S.C.E., D.L.S.	10th Jan., 1860
Casgrain, Joseph Philippe Bâby. Morrisburg. D.L.S., P.L.S. (Que.), C.E., A.M.C.S.C.E.	5th Jan., 1887
Cavana, Allan George, Orillia. D.L.S.	8th July, 1876
Chalmers, John, Owen Sound, 15 Melville st. Grad. S.P.S.	14th April, 1896
Charlesworth, Lionel Clare, Collingwood. Grad. S.P.C.	14th April, 1896
*Cheesman, Thomas, Mitchell. D.L.S.	11th July, 1856
CHIPMAN, WILLIS, Toronto, 103 Bay st. President of Association O.L.S., B.A.Sc. (McGill), M.A.S.C.E., M.C.S.C.E.	4th Oct., 1881
Coad, Richard, Glencoe. D.L.S.	8th Oct., 1879
Code, Abraham Silas, Alvinston.	14th April, 1896
Cozens, Joseph, Sault Ste. Marie. D.L.S.	7th July, 1875
Creswicke, Henry, Barrie. D.L.S.	8th July, 1864
*Cromwell, Joseph Miller Oliver, Perth. D.L.S.	1st Oct., 1846
*Davidson, Alexander, Arkona. D.L.S.	11th Oct., 1858
Davidson, Walter Stanley, Arkona.	9th April, 1884
Davis, Allan Ross, Napanee. B.A.Sc. (McGill).	8th Jan., 1886
Davis, John, Alton.	5th April, 1878
Davis, William Mahlon, Woodstock. Grad. R. M. Coll.	11th April, 1885
Deacon, Thomas Russ, Rat Portage. Grad. S.F.S., Town Engineer.	12th Nov., 1892
*Deane, Michael, Windsor. D.L.S.	26th May, 1848
Deans, William James, Oshawa.	11th July, 1884
DeGurse, Joseph, Windsor, P.O. Box 167. Chief Eng., L.E. & D.R.R.	5th April, 1883
DeMorest, Richard Watson, Sudbury. M.E.	9th April, 1889
Dickson, James, Fenelon Falls. D.L.S., Ins. of Crown Land Surveys.	6th April, 1867

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NAME AND P.O. ADDRESS.	DATE OF ADMISSION BY BOARD.
Dobbie, Thomas William, Tilsonburg.	11th July, 1856
D.L.S.	
Doupe, Joseph, Winnipeg, Man., 194 McDermot Ave.,	13th Jan., 1863
D.L.S., P.L.S. (Man.), C.E. (McGill).	
Ellis, Henry Disney, Toronto, City Hall.	7th April, 1877
D.L.S., Eng. in charge of Roadways.	
Esten, Henry Lionel, Toronto, 157 Bay st.	7th Jan., 1887
Evans, John Dunlop, Trenton.	8th July, 1864
D.L.S., Chief Eng., Cent. Ont. Ry.	
Fair, John, Brantford.	13th April, 1875
Fairbairn, Richard Purdom, Toronto, 127 Major st.,	7th Oct., 1876
Surveyor for Dept. of Pub. Works.	
Fairchild, Charles Court, Simcoe.	9th April, 1894
Grad. S.P.S.	
Farncomb, Alfred Ernest, London, 213 Dundas st.,	9th April, 1895
Farncomb, Frederick William, London,	
213 Dundas st.	6th, Nov. 1889
Fawcett, Thomas, Ottawa, Dept. of Interior.	6th Jan., 1881
Dom. Topographical Surveyor.	
Fitton, Charles Edward, Orillia, Drawer 31.	10th April, 1879
D.L.S.	
FitzGerald, James William, Peterborough, Box 333,	13th July, 1857
D.L.S.	
Flater, Frederick William, Chatham.	9th April, 1888
Foster, Frederick Lucas, Toronto, 157 Bay st.	9th April, 1863
D.L.S.	
Francis, John James, Sarnia, P.O. Box 304.	16th Oct., 1861
D.L.S.	
*Fraser, Charles, Wallaceburg.	5th Aug., 1847
D.L.S.	
Galbraith William, Bracebridge.	4th April, 1883
D.L.S.	
Gamble, Killaly, Toronto, 193 Bloor st. e.	6th April, 1888
D.L.S., F.L.S. (Man.), Captain R.A.	
Gardiner, Edward, St. Catharines.	6th Jan., 1866
D.L.S.	
Gaviller, Maurice, Collingwood, Box 773.	6th Jan., 1866
C.E. (McGill), D.L.S.	
Gibbons, James, Renfrew.	15th April, 1890
Grad. S.P.S.	

NAME AND P.O. ADDRESS.	DATE OF ADMISSION BY BOARD.
Gibson, Harold Holmes, Willowdale	8th Sept., 1891
*Gibson, James Alexander, Oshawa D.L.S.	7th April, 1855
Gibson, Peter Silas, Willowdale C.E., M.S. (Mich. Univ.), D.L.S., M.C.S.C.E., Engineer Tp. of York.	19th July, 1858
Gilliland, Thomas Brown, Eugenia D.L.S.	11th July, 1868
Gillon, Douglas John, Fort Frances Grad. R.I.F.C.	9th Nov., 1895
Graydon, Aquila Ormsby, London City Engineer.	8th July, 1880
Green, Thomas Daniel, Ottawa, Dept. of Indian Affairs	7th Jan., 1885 D.L.S.
Griffin, Albert Dyke, Woodstock, P.O. Box 612	11th Nov., 1890
Hanning, Clement George, Preston, Lock Box 130 D.L.S., C.E., (Trin. Coll., Dublin).	19th July, 1858
Hart, Milner, Toronto, 103 Bay st. D.L.S.	11th July, 1863
Harvey, Thomas Alexander, London, 1 Oxford st.	13th Nov., 1893
Henderson, Eder Eli, Henderson P.O., Maine Grad. S.P.S.	7th April, 1887
Henry, Frederick, London, Albion Building	7th April, 1887
*Hermon, Royal Wilkinson, Rednersville D.L.S.	13th July, 1857
Hewson, Thomas Ringwood, Hamilton, 42 James st. n. D.L.S.	6th July, 1877
Hobson, Joseph, Montreal, G. T. Ry. Office D.L.S., Chief Eng. Grand Trunk Railway System.	3rd Oct., 1855
Hopkins, Marshall Willard, Hamilton, 28 James st. s., B.A. Sc. (McGill), A.M.C.S.C.E., Chief Eng. I.R.R. Co.	13th Nov., 1893
Hutcheon, James, Guelph Grad. S.P.S.	10th Nov., 1891
Innes, William Livingstone, Peterborough, 372½ Water st C.E. (Toronto Univ.)	14th April, 1892
James, Silas, Toronto, 72 Victoria st. D.L.S.	19th July, 1858
Johnson, Robert Thornton, Toronto, 131 Wellington st. w.	9th April, 1889

LIST OF MEMBERS.

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NAME AND P.O. ADDRESS.	DATE OF ADMISSION BY BOARD.
Jones, Charles Albert, Petrolea D.L.S.	8th April, 1881
Jones, John Henry, Sarnia D.L.S.	10th Oct., 1863
Jones, Thomas Henry, Brantford City Engineer, B.A.Sc. (McGill).	10th Oct., 1878
*Keefer, Thomas Coltrin, Ottawa D.L.S., C.E.	14th Aug., 1840
Kennedy, James Henry, St. Thomas, P.O. Box 434, C.E. (Tor. Univ.), M.C.S.C.E	7th April, 1887
Kippax, Hargreaves, Huron, South Dakota C.E. (Tor. Univ.), Assistant to Surveyor-General	7th July, 1877
*Kirk, Joseph, Stratford, P.O. Box 373 D.L.S.	16th Feb., 1843
Kirkpatrick, George Brownly, Toronto, Dept. of Crown Lands D.L.S., Director of Surveys.	13th April, 1863
Klotz, Otto Julius, Ottawa, 437 Albert st. C.E. (Mich. Univ.), Dom. Topographical Surveyor.	6th Jan., 1876
Laird, James Steward, Essex D.L.S.	6th April, 1867
Laird, Robert, Toronto, 14 Russell st Grad. S.P.S.	11th Nov., 1887
Lewis, John Bower, Ottawa, Brunswick House. D.L.S.	4th Oct., 1883
Lougheed, Aaron, Port Arthur D.L.S.	12th Nov., 1888
*Low, Nathaniel Edward, Wiarton D.L.S.	11th July, 1856
Lumsden, Hugh David, Toronto, 63 Homewood ave. D.L.S., M.I.C.E., M.C.S.C.E.	4th Jan, 1866
*Lynch-Staunton, Francis Hardwick, Hamilton D.L.S.	11th Oct., 1856
Macdougall, Allan Hay, Port Arthur D.L.S.	11th April, 1859
Mackenzie, William, Sarnia, 30 Vidal st Grad. R.M.C.	11th April, 1896
MacKenzie, William Lyon, Vankleek Hill Asst. Eng. M. and O. Ry.	7th April, 1887
MacNabb, John Chisholm, Mobile, Ala., 106 St. Louis street C.E.	8th Jan., 1880
MacPherson, Duncan, Montreal Eng. Dept. C.P.Ry.	9th Jan., 1884

NAME AND P.O. ADDRESS.	DATE OF ADMISSION BY BOARD.
McAree, John, Rat Portage	6th April, 1867
<small>Dom. Topographical Surveyor, B.A.Sc. (Toronto).</small>	
*McCallum, James, Fort Frances	30th Mar., 1849
<small>D.L.S.</small>	
McCubbin, George Albert, St. Thomas, Box 423	9th Nov., 1895
McCulloch, Andrew Lake, Galt	10th Nov., 1888
<small>Grad. S.P.S., A.M.C.S.C.E.</small>	
McDonell, Augustine, Chatham, 4 & 5 Ebert's Block	11th July, 1863
<small>D.L.S.</small>	
McDowall, Robert, Owen Sound	11th Nov., 1890
<small>Town Engineer, Grad. S.P.S.</small>	
McEvoy, Henry Robinson, St. Marys	10th July, 1875
<small>D.L.S.</small>	
McFarlen, George Walter, Toronto, Court House.	11th Nov., 1889
<small>Grad. S.P.S.</small>	
McGeorge, William Graham, Chatham, 5 Sandwich st. w.	8th Jan., 1866
<small>D.L.S.</small>	
McGrandle, Hugh, Huntsville	5th Jan., 1883
McKay, Owen, Windsor, P.O. Box 167.	7th Jan., 1887
<small>Grad. S.P.S.</small>	
McKenna, John Joseph, Dublin	9th July, 1860
McLatchie, John, Ottawa, 28 Stanley ave.	9th Jan., 1864
<small>D.L.S., P.L.S. (Que. & Man.)</small>	
McLean, James Keachie, Elora	8th April, 1876
<small>D.L.S.</small>	
McLennan, Murdoch John, Williamstown	13th Nov., 1893
<small>B.A.Sc. (McGill).</small>	
McLennan, Roderick, Toronto, 115 Avenue rd	20th June, 1846
<small>D.L.S.</small>	
McMullen, William Ernest, St. John, N.B.	11th Nov., 1892
<small>Assistant Engineer, C.P.R.</small>	
McNab, John Duncan, Owen Sound	9th Oct., 1879
McPhillips, George, Windsor, P.O. Box 556	9th July, 1885
<small>D.L.S., P.L.S. (Man.)</small>	
Malcolm, Sherman, Blenheim	11th Oct., 1858
<small>D.L.S.</small>	
Manigault, William Mazyck, Strathroy, P.O. Box 300.	8th July, 1876
<small>D.L.S.</small>	
Marshall, James, Holyrood	6th Oct., 1866
<small>D.L.S.</small>	

LIST OF MEMBERS.

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NAME AND P.O. ADDRESS.	DATE OF ADMISSION BY BOARD.
Miles, Charles Falconer, Toronto, 244 Bloor st. w. D.L.S.	13th Jan., 1862
Moore, John Mackenzie, London, Albion Building	9th Oct., 1879
Moore, John Harrison, Smith's Falls Grad. S.P.S.	11th Nov., 1889
Moore, Thomas Alexander, London South	12th Nov., 1892
Morris, James Lewis, Pembroke D.L.S., C.E. (Toronto Univ.)	7th July, 1886
Mountain, George Alphonse, Ottawa M.C.S.C.E., D.L.S., P.L.S. (Que.)	9th Jan, 1884
Murdoch, William, Rat Portage D.L.S., C.E.	10th Jan., 1860
Murphy, Charles Joseph, Toronto, 157 Bay st.	6th Oct., 1886
Newman, William, Windsor, 57 Sandwich st. Grad. S.P.S.	12 Nov., 1892
Niven, Alexander, Haliburton D.L.S.	8th July, 1859
Ogilvie, John Henry, West Superior, Wis., 1810½ Tower av. D.L.S.	8th April, 1876
Ogilvie, William, Juneau, Alaska, U.S. D.L.S.	12th July, 1869
O'Hara, Walter Francis, Chatham D.L.S.	14th April, 1892
Paterson, James Allison, Toronto, 23 Adelaide st. e., C.E.	5th April, 1878
Patten, Thaddeus James, Little Current	5th Jan., 1883
Pedder, James Robert, Doon Grad. S.P.S.	10th Nov., 1891
Peterson, Peter Alexander, Montreal, P.Q. Chief Engineer Can. Pac. Ry.	16th July, 1863
Pinhey, Charles Herbert, Coteau Landing, P.Q. D.L.S., Grad. S.P.S., A.M.C.S.C.E.	12th Nov., 1888
Proudfoot, Hume Blake, Toronto, 33 Tranby ave. D.L.S., C.E. (Toronto Univ.)	6th Jan., 1882
Purvis, Frank, Eganville D.L.S.	7th April, 1875
Rainboth, Edward Joseph, Ottawa D.L.S.	11th Nov., 1887

NAME AND P.O. ADDRESS.	DATE OF ADMISSION BY BOARD.
Rainboth, George Charles, Aylmer, Que. D.L.S., P.L.S. (Que.)	11th July, 1868
Ritchie, Nelson Thomas, Kincardine	9th Nov., 1888
Roberts, Vaughan Maurice, St. Catharines	5th April, 1887
Robertson, James, Glencoe Grad. S.P.S.	11th July, 1885
Roger, John, Mitchell Grad. S.P.S.	10th Nov., 1888
†Rombough, William R., Durham D.L.S.	14th Nov., 1848
Rorke, Louis Valentine, Sudbury D.L.S.	14th April, 1890
Ross, George, Welland B.A.Sc. (McGill).	10th July, 1879
*Rubidge, Tom S., Cornwall D.L.S., Asst. Eng. Dep. Rys. and Canals.	9th Feb., 1849
Russell, Alexander Lord, Port Arthur D.L.S.	16th April, 1873
Sankey, Villiers, Toronto, City Hall D.L.S., City Surveyor.	11th Jan., 1878
Saunders, Bryce Johnston, Brockville, P.O. Box 114 B.A.Sc. (McGill), D.L.S.	7th Jan., 1885
Scane, Thomas, Ridgetown D.L.S.	7th Jan., 1865
*Schofield, Milton C., Guelph D.L.S.	28th Sept., 1843
Seager, Edmund, Fort Frances D.L.S.	8th July, 1861
Selby, Henry Walter, Toronto, 21 Lippincott st. D.L.S.	8th Jan., 1876
Sewell, Henry DeQuincy, Toronto, 29 St. Mary st., and Port Arthur; cable, "Quincy," Toronto D.L.S., A.M.I.C.E.	9th July, 1885
Sing, Josiah Gershom, Meaford D.L.S.	9th Jan., 1879
Smith, Angus, Ridgetown Grad. S.P.S.	14th April, 1896
Smith, George, Woodville, Box 77	7th April, 1881
Smith, Henry, Toronto, Crown Lands Dept. Supt. Colonization Roads, D.L.S., M.C.S.C.E.	8th Nov., 1861
Speight, Thomas Bailey, Toronto, Yonge St. Arcade D.L.S.	6th Jan., 1882

LIST OF MEMBERS.

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NAME AND P.O. ADDRESS.	DATE OF ADMISSION BY BOARD.
Squire, Richard Herbert, Brantford, Box 160. <small>B.A.Sc. (Toronto).</small>	14th April, 1896
Steele, Edward Charles, Goderich, Box 169	9th April, 1889
Stewart, Elihu, Collingwood <small>D.L.S.</small>	8th April, 1872
Stewart, John, Montreal. <small>D.L.S.</small>	11th Nov., 1887
Stewart, Walter Edgar, Aylmer	12th April, 1892
*Strange, Henry, Rockwood <small>D.L.S., C.E.</small>	30th Nov., 1838
Tiernan, Joseph Martin, Tilbury Centre	7th Jan., 1886
Traynor, Isaac, Dundalk <small>D.L.S.</small>	16th April, 1873
Turnbull, Thomas, Winnipeg, Man., C.P.R. Office. <small>D.L.S., C.E. (Toronto Univ.)</small>	6th July, 1878
Tyrrell, James Williams, Hamilton, 42 James st. n. <small>Co. Eng. for Wentworth, C.E. (Toronto Univ.), D.L.S.</small>	8th April, 1885
†Unwin, Charles, Toronto, 157 Bay st. <small>D.L.S.</small>	12th April, 1852
Ure, Frederick John, Woodstock <small>C.E.</small>	7th April, 1887
VanBuskirk, William Fraser, Stratford <small>Grad. R.M. Coll.</small>	7th April, 1888
VanNostrand, Arthur J., Toronto, Yonge St. Arcade. <small>D.L.S.</small>	30th Oct., 1882
Wadsworth, Vernon Bayley, Toronto, 103 Bay st. <small>D.L.S.</small>	9th April, 1864
Walker, Alfred Paverley, Toronto, C.P.Ry, Eng. Office <small>A.M.C.S.C.E.</small>	6th Jan., 1882
Wallace, Charles Hugh, Hamilton, 206 Bay st. s.	9th Nov., 1889
Warren, James, Walkerton, Box 190 <small>D.L.S., A.M.C.S.C.E.</small>	7th Oct., 1864
Watson, John McCormack, Orillia, P.O. Box 224	13th April, 1892
*Weatherald, Thomas, Goderich, P.O. Box 273 <small>D.L.S., C.E.</small>	12th Jan., 1856

NAME AND P.O. ADDRESS.	DATE OF ADMISSION BY BOARD.
West, Richard Francis, Orangeville.	7th April, 1881
*Wheelock, Charles John, Orangeville. D.L.S.	11th July, 1856
Wheelock, Charles Richard, Orangeville. Treasurer County of Dufferin.	7th Jan., 1886
Whitson, James Francis, Toronto, Crown Lands Dept.	9th Jan., 1886
Wicksteed, Henry King, Cobourg. D.L.S., C.E.	7th Jan., 1886
Wiggins, Thomas Henry, Cornwall. Grad. S.P.S., D.L.S., Town Engineer.	10th Nov., 1891
Wilde, John Absalom; Sault Ste. Marie.	9th April, 1889
Wilkie, Edward Thomson, Carleton Place. D.L.S.	11th April, 1891
Wilkins, Frederick William, Ottawa, Dept. of Interior. Dom. Topographical Surveyor.	6th Jan., 1877
Williams, David, Kingston. D.L.S.	9th April, 1864
†Winter, Henry, Thornyhurst. D.L.S., C.E.	11th July, 1853
*Wood, Henry O., Billings' Bridge. D.L.S.	10th Oct., 1855
*Yarnold, William Edward, Port Perry, P.O. Box 44. D.L.S.	7th April, 1854

REGISTERED AND WITHDRAWN.

The names of those who have become "Associates" under By-law No. 39 are marked *.

NAME AND P. O. ADDRESS.	DATE OF ADMISSION BY BOARD.
Apsey, John Fletcher, Baltimore, Md., 2125 N. Charles st. Grad. S.P.S.	6th Jan., 1886
Blake, Frank Lever, Toronto, Meteorological Office. D.L.S.	13th April, 1875

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NAME AND P.O. ADDRESS.	DATE OF ADMISSION BY BOARD.
Bowman, Arthur Meyer, Mahan, Beaver Co., Pa. <small>Grad. S.P.S., Staff of U.S. Engineers.</small>	11th Nov., 1887
Bowman, Franklin Meyer, Bellevue, Allegheny Co., Pa. <small>Grad. S.P.S., Engineer Structural Iron Works.</small>	11th April, 1892
Brady James, Victoria, B.C., Box 815 <small>M.F.</small>	15th July, 1862
Burnet, Hugh, Victoria, B.C. <small>P.L.S. (B.C.)</small>	5th April, 1887
Cambie, Henry John, Vancouver, B.C. <small>P.L.S. (B.C.)</small>	8th July, 1861
Coleman, Richard Herbert, Toronto, 204 King st. e.	6th Oct., 1877
Drewry, William Stewart, Ottawa, Dept. of Interior.	5th April, 1883
Ducker, William A., Winnipeg, Man., 314 McWilliam st. <small>D.L.S.</small>	6th April, 1882
Edwards, George, Thurso, Que.	6th Jan., 1866
Fowlie, Albert, Orillia <small>D.L.S.</small>	13th Jan., 1863
Galbraith, John, Toronto, Sch. of Prac. Science. <small>M.A., D.L.S., Prof. Engineering.</small>	13th April, 1875
Gibson, George, St. Catharines. <small>D.L.S.</small>	10th April, 1860
*Harris, John Walter, Winnipeg, Assm't Com. Dept <small>P.L.S. (Man), D.L.S.</small>	6th Oct. 1866
Hermon, Ernest Bolton, Vancouver, B.C. <small>P.L.S. (B.C.), D.L.S.</small>	7th Oct., 1885
Irwin, James Moore, Peterborough. <small>D.L.S.</small>	13th Jan., 1863
James, Darrell Denman, Buffalo, N.Y., 417 Nth. Division st. <small>B.A., B.A.Sc.</small>	3rd Nov., 1891

NAME AND P.O. ADDRESS.	DATE OF ADMISSION BY BOARD.
Jephson, Richard Jermy, Calgary, Alta	7th April, 1877
<small>P.L.S. (B.C.), D.L.S.</small>	
Johnson, Sydney Munnings, Rossland, B.C.	9th Nov., 1895
<small>B.A.Sc. (Toronto).</small>	
Kains, Tom, Victoria, B.C.	11th July, 1873
<small>Surveyor-General, B.C.</small>	
Lane, Andrew, Sparrow's Point, Md.	4th April, 1895
<small>Grad. S.P.S., Draftsman Maryland Steel Co.</small>	
Lendrum, Robert Watt, South Edmonton, Alta.	8th Jan., 1874
<small>D.L.S.</small>	
Livingstone, Thomas Chisholm, Winnipeg, Man.	10th Jan., 1859
<small>D.L.S.</small>	
MacLeod, Henry Augustus F., Ottawa, 340 Cooper st.	11th Oct., 1856
<small>C.E., D.L.S.</small>	
MacMillan, James Alexander, Calgary, Alta.	6th Jan., 1877
<small>P.L.S. (B.C.)</small>	
McFadden, Moses, Neepawa, Man.	13th April, 1858
<small>D.L.S.</small>	
Magrath, Charles Alexander, Lethbridge, Alta.	1st Nov., 1881
<small>B.A.Sc. (McGill), D.L.S.</small>	
Morris, Alfred Edmund, Perth	10th April, 1879
Munro, John Vicar, New York, N.Y., 359 W. 31st st.	9th April, 1895
Pearce, William, Calgary, Alta.	12th Oct., 1872
<small>Dom. Insp. of Mines.</small>	
Ponton, Archibald William, Regina, Assa.	9th April, 1880
<small>D.L.S.</small>	
Pope, Robert Tyndall, Ireland.	13th April, 1875
<small>C.E., D.L.S.</small>	
Reid, James Hales, Bowmanville, Box 35.	6th Oct., 1860
<small>C.E., F.G.S.</small>	
Reiffenstein, James Henry, Ottawa, Dept. of Interior.	16th April, 1873
<small>D.L.S.</small>	
Reilly, William Robinson, London, 361 Simcoe st.	7th April, 1881
<small>D.L.S., P.L.S. (Man.)</small>	
Rogers, Richard Birdsall, Peterborough	9th Jan., 1879
<small>B.A.Sc. (McGill), D.L.S.</small>	
Ross, Joseph Edmund, New Westminster, B.C.	11th Nov., 1890
<small>P.L.S. (B.C.)</small>	

NAME AND P. O. ADDRESS.	DATE OF ADMISSION BY BOARD.
Sanderson, Daniel Leavens, Coral, Mich.	4th Oct., 1882
Shaw, Charles Æneas, Victoria, B.C., P.O. Box 815.	6th Oct., 1877
Sherman, Ruyter Stinson, Vancouver, B.C.	12th April, 1890
P.L.S. (B.C.)	
*Silvester, George Ernest, Steelton, Pa.	12th Nov., 1892
Grad. S.P.S., Draftsman Penn. Steel Co.	
Simpson, George Albert, Winnipeg, Man., N. P. & M. R'y.	7th Oct., 1864
C.E., D.L.S.	
Spry, William, Toronto.	19th July, 1858
C.E., D.L.S.	
*Stewart, Louis Beaufort, Toronto, Sch. of Prac. Science	6th April, 1882
Dom. Top. Surveyor, Lect. in Surveying.	
Strathern, John, Vancouver, B.C.	5th Oct., 1876
P.L.S. (B.C.), D.L.S.	
Thomson, Augustus Clifford, Kansas City, Mo.	14th Jan., 1861
C.E., D.L.S.	
Tracey, Thomas Henry, Vancouver, B.C.	8th April, 1870
P.L.S. (B.C.), C.E., D.L.S.	
Vicars, John Richard Odlum, Kamloops, B.C.	5th Jan., 1887
P.L.S. (B.C.), D.L.S.	
Weekes, Abel Seneca, Wetaskiwin, Alta.	12th April, 1890
D.L.S.	
Wheeler, Arthur Oliver, New Westminster, B.C.	8th July, 1881
P.L.S. (B.C.), D.L.S.	
Willson, Alfred, Toronto, 204 King st. e.	6th Oct., 1866
D.L.S., Com. Canada Company.	

SUMMARY.

Active members subject to dues.	199
Active members exempted from dues.	24
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Dead	7
Total number enrolled since incorporation.	282

An Memoriam.

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Bolger, Francis.....	Lindsay	10th October, 18631892.....	3rd November, 1895.
Bowman, Leander Meyer.	Toronto	14th April, 1892.....1892.....	20th September, 1895.
Gibbs, Thomas Fraser....	Adolphustown	31st May, 1841.....	.....1892.....	17th April, 1893.
Haskins, William.....	Hamilton.....	5th July, 1855.....	.....1892.....	5th July, 1896
Howitt, Alfred.....	Gourcock	12th January, 1856 .....	.....1892.....	6th May, 1896.
Robinson, William.....	London	— May, 1846.....1892.....	11th October, 1894.
Walsh, Thomas William..	Simcoe.....	25th April, 1842.....1892.....	14th March, 1895.

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THE HON. SAMUEL PROUDFOOT HURD,
Surveyor-General for Upper Canada, 1830.

No. 12

PROCEEDINGS

OF THE

ASSOCIATION

OF

Ontario Land Surveyors

At its fifth Meeting since Incorporation

HELD AT

TORONTO

23rd, 24th and 25th February

1897

Being the Twelfth Annual Meeting of the Association of
Land Surveyors for Ontario.

The Sixth Annual Meeting of the Incorporated Association will be
held in Toronto, commencing on Tuesday, 22nd February, 1898.

PRINTED FOR THE ASSOCIATION BY
C. BLACKETT ROBINSON, 5 JORDAN STREET,
TORONTO

PATRONIZE OUR ADVERTISERS.

NOTICES:

Members and others can be supplied with copies of the Proceedings for 1886, 1887, 1888, 1889, 1891, 1892, 1893, 1894 or 1895, by remitting fifty cents to the Secretary for each copy required.

Extra copies of Mr. Esten's "Head Notes of Reported Land Cases" have been printed for the Association, and may be obtained from the Secretary at a cost of fifty cents.

Members are invited to inspect the many valuable contributions which have been received in the Repository during the past year.

Published annually by the Association of Ontario Land Surveyors.
Edition 1,200 copies; price 75 cents.

PATRONIZE OUR ADVERTISERS.

PREFACE.

To the Members of the Association of Ontario Land Surveyors :

The Proceedings of the Association at its Fifth Annual Meeting since incorporation are herewith presented.

We are happy to say that much zeal and earnestness has been exhibited by the members of the various committees, and we look for still more during the current year.

Respectfully submitted on behalf of the Council,

A. J. VANNOSTRAND,
Secretary.

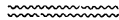
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ASSOCIATION OF
ONTARIO LAND SURVEYORS

(Incorporated 1892).

Organized 23rd February, 1886



Officers for 1897-98

PRESIDENT.

T. Harry Jones, O.L.S., Brantford.

VICE-PRESIDENT.

P. S. Gibson, O.L.S., Willowdale.

CHAIRMAN OF COUNCIL.

Villiers Sankey, O.L.S., Toronto.

SECRETARY-TREASURER.

A. J. VanNostrand, O.L.S., Toronto.

MEMBERS OF COUNCIL.

Hon. J. M. Gibson, Toronto.	}	For 3 years.
Villiers Sankey, Toronto,		
J. W. Tyrrell, Hamilton,	}	For 2 years.
Geo. B. Kirkpatrick, Toronto,		
Alex. Niven, Haliburton,	}	For 1 year.
F. L. Foster, Toronto,		
J. L. Morris, Pembroke,		

AUDITORS.

H. L. Esten, Toronto.
A. R. Davis, Wabigoon.

BANKERS.

Imperial Bank of Canada (Yonge Street Branch, Toronto).

BOARD OF EXAMINERS.

Villiers Sankey, Toronto, Chairman.

M. J. Butler, Napanee,	}	Appointed by Lieut.-Gov. in Council.
Geo. B. Kirkpatrick, Toronto,		
P. S. Gibson, Willowdale,	}	For 2 years, appointed by Council of Management.
Alex. Niven, Haliburton,		
M. Gaviller, Collingwood,	}	For 1 year, appointed by Council of Management.
A. J. VanNostrand, Toronto,		

STANDING COMMITTEES, 1897-98.

LAND SURVEYING.—M. Gaviller (Chairman), C. F. Aylsworth, Jr., C. A. Bigger, A. R. Davis, John Fair, C. E. Fitton, Wm. Galbraith, H. H. Gibson.

DRAINAGE.—W. G. McGeorge (Chairman), Jos. DeGurse, C. C. Fairchild, J. S. Laird, O. McKay, Jas. Robertson, George Smith

ENGINEERING.—A. W. Campbell (Chairman), T. O. Bolger, Jas. Hutcheon, V. M. Roberts, B. J. Saunders, W. F. VanBuskirk, A. P. Walker, T. H. Wiggins.

ENTERTAINMENT.—A. P. Walker (Chairman), R. P. Fairbairn, P. S. Gibson, C. J. Murphy, J. F. Whitson.

PUBLICATION.—Killaly Gamble (Chairman), H. J. Browne, H. L. Esten, H. H. Gibson, C. J. Murphy.

TOPOGRAPHICAL SURVEY.—Otto J. Klotz (Chairman), G. B. Abrey, M. J. Butler, Thos Fawcett, John McAree, L. B. Stewart, F. W. Wilkins.

SPECIAL COMMITTEES.

POLAR RESEARCH.—J. W. Tyrrell (Chairman), Willis Chipman, William Ogilvie, J. A. Paterson, L. B. Stewart, J. F. Whitson.

REPOSITORY AND BIOGRAPHY.—H. L. Esten (Chairman), Willis Chipman, P. S. Gibson, G. B. Kirkpatrick, F. H. Lynch-Staunton, Charles Unwin, V. B. Wadsworth.

EXPLORATION.—E. Stewart (Chairman), R. W. DeMorest, James Dickson, C. F. Miles, A. Niven, A. L. Russell, J. W. Tyrrell.

PROGRAMME OF THE
Association of Ontario Land Surveyors

(INCORPORATED),

AT ITS FIFTH ANNUAL MEETING HELD IN TORONTO,
FEBRUARY 23RD, 24TH, AND 25TH, 1897.

PROGRAMME.

Tuesday, 23rd February—Morning at 10 o'clock,

AT THE REPOSITORY, PARLIAMENT BUILDINGS.

Meeting of Council.
Meeting of Standing and Special Committees.

Afternoon at 2 o'clock.

Reading of Minutes of previous meeting
Reading of Correspondence.
Report of Council of Management (including Reports of Board of Examiners, and Secretary-Treasurer). Villiers Sankey, Chairman, Toronto.
President's Address
Report of Committee on Publication. Killaly Gamble, Chairman, Toronto.
Report of Committee on Repository and Biography H. L. Esten, Chairman, Toronto.
Report of Committee on Polar Research. J. W. Tyrrell, Chairman, Hamilton.
Paper—"Reminiscences of an Old Surveyor." Charles Unwin, Toronto.
Report of Committee on Standard Measures of Length. M. J. Butler, Chairman, Napanee.
Report of Committee on Legislation. Willis Chipman, Chairman, Toronto.
Paper—"Irrigation." A. W. Ponton, Regina, Assa.
Paper—"Irrigation in the Canadian N. W. Territories." Wm. Pearce, Calgary, Alta.

Evening at 8 o'clock.

Paper—"Electric Street Railway." T. O. Bolger, City Engineer, Kingston.
Paper—"Mines of Ontario." J. F. Whitson, Toronto.
Paper—"Hints to Prospectors." H. DeQ. Sewell, Port Arthur.
Paper—"The Proposed Sault Ste. Marie and Hudson's Bay Railway." Jos. Cozens, Sault Ste. Marie.
Report of Committee on Exploration in Ontario. E. Stewart, Chairman, Collingwood.
Report of Committee *re* Civil Engineers' Bill. Willis Chipman, Chairman, Toronto.

ASSOCIATION OF ONTARIO LAND SURVEYORS.

Wednesday, 24th February—Morning at 10 o'clock.

Report of Committee on Drainage, with Question Drawer. B. J. Saunders, Chairman, Brockville.

Report of Committee on Topographical Survey. Otto J. Klotz, Chairman, Ottawa.

Paper—"Water Works." T. H. Wiggins, Cornwall.

Paper—C. A. Jones, Petrolia.

Afternoon at 2 o'clock.

Report of Committee on Land Surveying, with Question Drawer. J. L. Morris, Chairman, Pembroke.

Paper—"Hints on Surveying and Instruments." Sherman Malcolm, Blenheim.

Paper—"Island Surveying." C. E. Fitton, Orillia.

Paper—"Land Surveying." Jas. Dickson, Fenelon Falls.

Paper—"Evidence." J. L. Morris, Pembroke.

Evening at 8 o'clock.

ANNUAL DINNER.

A. P. Walker, Acting Chairman of Committee on Entertainment.

Thursday, 25th February—Morning at 10 o'clock.

Report of Auditors.

Report of Committee on Engineering. Jos. DeGurse, Chairman, Windsor.

Paper—"Sewage Disposal." Capt. W. F. VanBuskirk, Stratford.

Paper—"Macadam Streets in Towns." A. W. Campbell, Toronto.

Afternoon at 2 o'clock.

Report of Committee on Entertainment. A. P. Walker, Acting Chairman, Toronto.

Ratification of New By-Laws.

Unfinished Business.

New Business.

Nomination of Officers (President, Vice-President, Two members of Council, Secretary-Treasurer and Auditors).

Appointment of Scrutineers.

Adjournment.

ASSOCIATION OF
ONTARIO LAND SURVEYORS

(INCORPORATED 1892).

MINUTES OF THE FIFTH ANNUAL MEETING

(Twelfth Annual Meeting of Provincial Land Surveyors of Ontario),

FEBRUARY 23rd, 24th and 25th, 1897.

10 O'CLOCK A.M., 23RD.

Meeting of Council.

Meeting of Standing and Special Committees.

At 2 o'clock p.m. the meeting resumed, the President, Mr. Willis Chipman, in the chair.

The minutes of the previous meeting were read by the Secretary and adopted by the meeting.

Reading of Correspondence.

The President then read his address.

The Report of the Committee on Publication was presented by Captain Killaly Gamble, who moved its adoption; seconded by Mr. Foster and carried.

Mr. Esten then read the Report of the Committee on Repository and Biography, and moved its adoption; seconded by Mr. Browne. Carried.

Captain Gamble suggested that an album be obtained to contain the photographs of the members.

A paper on "The Reminiscences of an Old Surveyor," by Mr. Unwin, was then read by Mr. Ager.

Mr. Butler not being able to be present, Mr. VanNostrand read a letter from him containing the Report of the Committee on Standard Measures of Length.

On motion of Mr. Niven, seconded by Mr. Foster, the report was adopted.

The President then read the Report of the Committee on Legislation, and suggested that the discussion on it be left over till tomorrow, when there would be a larger number of members present.

Mr. VanNostrand moved, seconded by Mr. Niven, that the report be held over for further consideration. Carried.

The President then called on Mr. T. Harry Jones to take the chair.

A paper on "Irrigation in the North-West Territories," by Mr. William Pearce, was then read by Mr. Foster.

At 5 o'clock p.m. the meeting adjourned.

At 8.30 o'clock p.m. the meeting resumed, the President in the chair.

There were present : Messrs. John Davis, P. S. Gibson, H. DeQ. Sewell, C. J. Murphy, H. J. Browne, G. B. Abrey, J. W. Tyrrell, E. Stewart, H. L. Esten, A. P. Walker, A. Niven, A. J. VanNostrand, K. Gamble, J. F. Whitson, G. B. Kirkpatrick, T. Harry Jones, and others.

A paper entitled "Electric Street Railways," by Mr. T. O. Bolger, City Engineer, Kingston, was read.

"The Mines of Ontario" was the title of a paper presented by Mr. J. F. Whitson, O.L.S., Toronto.

"Hints to Prospectors," by Mr. H. DeQ. Sewell, of Port Arthur, was read. He illustrated his very interesting paper with a prospector's outfit.

Mr. G. B. Abrey presented to the Association Mr. Fletcher's book on "Blow Pipe Outfit" and Mr. Chapman's Assay Book.

The Report of the Committee on Exploration in Ontario was presented by Mr. E. Stewart of Collingwood, who moved its adoption; seconded by Mr. Kirkpatrick. Carried.

The Report of the Committee on Polar Research was read by Mr. J. W. Tyrrell, Chairman, who moved that it be received and adopted; seconded by Mr. H. DeQ. Sewell. Carried.

Report of Committee re Civil Engineers' Bill: Mr. Willis Chipman, Chairman, Toronto. He presented a verbal report, and referred to page 180 of last year's Proceedings. He stated a report had been drafted in which it was recommended that no action be taken at present.

At 11 o'clock p.m. the meeting adjourned.

24th February, A.D. 1897, the meeting resumed at 10 o'clock a.m., the President, Mr. Willis Chipman, in the chair.

Among those present were: Messrs. H. J. Browne, P. L. Gibson, A. Niven, T. H. Jones, E. Stewart, H. L. Esten, A. R. Davis, G. W. Ross, H. H. Gibson, R. T. Johnson, T. H. Wiggins, Killaly Gamble and others.

Report of Committee on Drainage, with Question Drawer. B. J. Saunders, Chairman, Brockville.

The President read the report which had been presented by the committee, dated November, 1896.

It was moved by Mr. T. H. Jones, seconded by Mr. A. Niven, That the report be received and adopted as read. Carried.

"The Ditches and Watercourses Act as Applied" was the subject of a volunteer paper presented by Mr. G. Smith, O. L. S., Woodville, and read by Mr. T. H. Jones.

The President then presented to the Association Mr. Kivas Tully, Chief Engineer of the Public Works Department, who donated to the Association a chart or plan of a proposed tunnel under the western channel, between the Queen's Wharf and the Toronto Island.

Mr. Tully said—Mr. President and gentlemen: I came down to see if you were comfortable here. I think in the future we can assist you to be more so. The Commissioner of Public Works furnished these rooms, and I think at any time if you desired an extension it would be arranged.

It gives me a great deal of pleasure to meet the Board of Surveyors, for I am a land surveyor myself. I have seen a good deal of it in the Old Country but not in Canada.

What I wish to bring before you to-day is this question: you may have seen the agitation in the papers about an island railway, and it is proposed to erect a bridge with a pier in the centre of the Western Channel. The Harbour Commissioners are objecting to it because it would interfere with navigation, and I see the matter is now before the Board of Trade, and I understand they very likely will object to it also, and in all probability they will recommend a tunnel which I have recommended to the Harbour Commissioners, and I made a rough plan; the lengths are accurate but the heights I cannot quite guarantee. I made some measurements with regard to the heights, but the City Council would have to take regular levels to ascertain it accurately. A tunnel can be built for about \$10,000 more than the bridge would be built for, and then the advantage would be they would have no expense of opening and shutting the bridge during the season of navigation.

It is proposed the tunnel should be simply for the street railway, not for ordinary traffic. If they find it succeeds they could have another tunnel for ordinary traffic and pedestrians to the island, but I would not advise them to use it for pedestrians at present. The size of the tunnel would be 20 feet wide by 15 feet in height, and it would be deep enough so that the Western Channel could be deepened at any future time for vessels drawing 20 feet of water. The grade is only 5 feet in 100, and it would be less objectionable a great deal than a bridge because according to the plans prepared by the City Council for a bridge there would be embankments on either side and the embankments would rather interfere with the property of the Commissioners and the elevator that is near the Queen's Wharf which is rented to the Canadian Pacific Ry. Co.

I have made this plan, as I have mentioned, and submit it to you, and make a present of it to the Board of Surveyors, and I would be very glad if you had any discussion on it when you can spare a little time to look into it, and kindly give your opinion. There are a great many Engineers on your Board who would be able to guide the Board in the matter.

Mr. Stewart—What is the estimated cost of the tunnel, if you are at liberty to give it?

Mr. Tully—The bridge would cost about \$70,000 and the tunnel would cost \$80,000.

Mr. Jones—What length would it be?

Mr. Tully—It would not be more than a quarter of a mile, and it does not interfere with anything.

Mr. Jones—And the width?

Mr. Tully—It would be wide enough for a double track.

The President—Those are structural costs, not land damages.

Mr. Tully—Oh no, nothing to do with the right of way, or the construction of the rails or a bridge over the track at Front Street. The Street Railway Company would do half of that. It is simply the tunnel itself. It is soft rock, all Hudson River group; you can cut it out with a pickaxe; there would be very little blasting. There are some remains of hard limestone I know of, but nothing beyond that would have to be blasted. In Chicago they have two tunnels across the channel. They found out it interfered with traffic, but that is half a mile more from the entrance. In Chicago they would not allow a bridge to be put across the entrance going into the harbour, but they were forced to put in tunnels there under the river.

Mr. Campbell—What is your objection to have foot passenger traffic?

Mr. Tully—It would be rather dangerous. I went through the Chicago tunnel; it is open for traffic there, for persons who want to take the risk; but I think it should not be allowed, for the street railway runs across every five minutes.

Mr. Campbell—They would want a sidewalk?

Mr. Tully—Yes. It is quite wide enough for the two tracks of the street railway. You could not drive through a tunnel like that; a horse would be frightened out of his wits. They would have another tunnel alongside of it usually, and they could have a sidewalk for foot passengers, but that is in the future.

The Report of the Committee on Topographical Surveying, by Mr. Otto J. Klotz, Chairman, Ottawa, was read by Mr. H. H. Gibson.

It was moved by Mr. A. Niven, seconded by Mr. H. H. Gibson, and carried, That the report be received and adopted. Carried.

A paper on "Waterworks," by Mr. T. H. Wiggins, of Cornwall, was then read.

A paper on the proposed Sault Ste. Marie and Hudson's Bay Railway, by Mr. Joseph Cozens, of Sault Ste. Marie, was read by Mr. Davis.

The President suggested that Mr. Cozens should be written to and asked to prepare a sketch showing the proposed route.

At 12.50 p.m. the meeting adjourned.

At 2 o'clock p.m. the meeting resumed, the President in the chair.

The proposed amendments to the Survey Act and the Act Respecting Land Surveyors was then taken up and very fully discussed.

It was moved by Mr. John Davis, seconded by Mr. P. S. Gibson, and resolved, That the draft bill respecting Land Surveyors and the Survey of Lands, as presented by the Committee on Legislation, and amended by resolutions passed by the Association, be and is hereby approved and adopted, and that the Committee on Legislation be instructed to present the draft bill to the Commissioner of Crown Lands, and that they request that the proposed amendments be brought before the House at its present session.

A paper on "Evidence," by Mr. J. L. Morris of Pembroke, was read.

The Report of the Committee on Land Surveying, with Question Drawer, by Mr. J. L. Morris, Chairman, Pembroke, was read by Mr. A. Niven.

It was moved by Mr. Niven, and seconded by Mr. Gibson, That the report be received and filed. Carried.

A paper on "Undisputed Posts, Limits or Monuments," by Mr. Henry Carre, C. E., Belleville, was read by the Secretary.

A paper on "Hints on Surveying and Instruments," by Mr. Sherman Malcolm, of Blenheim, was read.

It was moved by Mr. Sewell, seconded by Mr. Johnson, and resolved, That the section of the Act prescribing the method of subdividing sections in townships surveyed on the Manitoba system be referred to Mr. P. S. Gibson, he to report to the secretary at his earliest convenience

At 5 45 o'clock p.m. the meeting adjourned.

At 8.30 o'clock p.m. a most enjoyable dinner was partaken of by the members at McConkey's, when toasts and speeches were the order of the hour.

25th February, 1867, at 10 o'clock a.m., the meeting resumed, the Vice-President, Mr. T. H. Jones, in the chair.

There were present: Messrs. K. Gamble, T. H. Wiggins, G. W. Ross, H. L. Esten, V. Sankey, A. J. VanNostrand, A. W. Campbell, H. DeQ. Sewell, J. W. Tyrrell, W. F. VanBuskirk, A. Niven, E. Stewart, O. McKay, J. F. Whitson, G. B. Kirkpatrick, P. S. Gibson, H. H. Gibson and others.

The Report of the Committee on Engineering, Joseph DeGurse, Chairman, Windsor, was read by Mr. A. W. Campbell, who moved its adoption ; seconded by Capt. VanBuskirk. Carried.

A paper on " Sewage Disposal " was then presented by Capt. W. F. VanBuskirk, of Stratford.

It was moved by Mr. A. W. Campbell, and seconded by Mr. T. H. Wiggins, That the paper be received and embodied in the report of the meeting. Carried.

It was moved by Mr. A. W. Campbell, seconded by Mr. T. H. Wiggins, and resolved, That the Association of Ontario Land Surveyors heartily endorse the action of the Committee on Polar Research in its endeavor to promote the exploration of our " Northern Heritage," and that a copy of this resolution together with a copy of the report of the Committee be sent to Ottawa in the hands of a deputation from this Association, who shall present the matter as forcibly as possible to the Honorable Clifford Sifton, Minister of the Interior.

A paper was then read on " Macadam Streets in Towns " by Mr. A. W. Campbell, of Toronto.

It was moved by Mr. A. Niven, seconded by M. A. R. Davis, and resolved, That the following clause be added as a sub-section to section 52 of the Survey Act :

Provided that in the following townships, viz., all townships in the Muskoka and Parry Sound Districts, all townships in the District of Nipissing south of the Mattawa River and Trout Lake, and the township of Mattawa north of the Mattawa River, all townships in the Provisional County of Haliburton, the townships of Dalton, Digby and Longford in the County of Victoria, the townships of Galway, Cavendish, Anstruther and Chandos in the County of Peterborough, the townships of Tudor, Grimsthorpe, Wollaston, Limerick, Cashel, Farriday, Dungannon, Mayo, Herschell, Monteagle, Carlow, McClure, Wicklow and Bangor in the County of Hastings, the townships of Anglesea, Effingham, Abinger, Ashby and Denbigh in the County of Addington, the townships of Barrie, South Canonto and North Canonto in the County of Frontenac, and the townships of Brougham, Grattan, Wilberforce, Alice, Mattawatchan, Griffith, Sebastopol, South Algoma, North Algoma, Fraser, Richards, Hagarty, Brudenell, Lyne-doch, Raglan, Radcliffe, Sherwood, Burns and Jones in the County of Renfrew, the lines between all lots shall from and after the first day of July, 1897, be run on the astronomical course given on the original plan and field notes of said townships of record in the Department of Crown Lands.

Provided that all lines in the aforesaid townships run prior to 1st July, 1897, shall not come under the operation of the foregoing amendment.

Every Land Surveyor shall on the 31st day of December, 1897, make a return, in the form of schedule hereto annexed, to the Township Clerk, of all lines run by him in any of the aforesaid townships during the last six months, and henceforward annually on the 31st December in each year.

At 12.50 o'clock p.m. the meeting adjourned.

At 2 o'clock p.m. the meeting resumed, the President in the chair.

The Secretary read the Annual Report of the Secretary-Treasurer.

The Report of the Auditors was presented and read by Mr. A. P. Walker.

The Report of the Council of Management with Report of the Board of Examiners was read by Mr. V. Sankey, who moved the adoption of the report of the Council of Management and of the Board of Examiners and that of the Secretary-Treasurer ; seconded by Mr. J. W. Tyrrell. Carried.

Mr. V. Sankey moved that the Report of the Committee on Entertainment be printed in our Proceedings as usual ; seconded by Mr. A. P. Walker. Carried.

RATIFICATION OF NEW BY-LAWS.

Mr. Sankey moved the adoption of the following by-laws, seconded by Mr. A. Niven : By-law No. 43 and 44. Carried.

It was moved by Mr. A. W. Campbell, seconded by Mr. P. S. Gibson, and resolved, That any omissions or clerical errors in the records of the proceedings of the meeting, now in the hands of the stenographer and the Secretary, be corrected by the Committee on Publication before publishing the same. Carried.

It was moved by Mr. A. J. VanNostrand, seconded by Mr. T. H. Jones, and resolved, That we have learned with regret of the death since our last meeting of Messrs. A. Howitt, William Haskins, A. C. Thompson and J. R. Pedder, and we desire to convey to their relatives this expression of sympathy with them in their bereavement. Carried.

NEW BUSINESS.

The President referred to the Tariff of Fees, and to the obtaining of an album for containing photographs of the members of the As-

sociation. He read Circular No. 24, issued in 1889, of Tariff of Fees.

It was moved by Mr. T. H. Jones, seconded by Mr. H. L. Esten, and resolved, That the Secretary-Treasurer be empowered to purchase a suitable photograph album for the use of the Association for the purpose of holding photographs donated to the Association, and that each member of the Association be requested to forward his photograph to the Secretary-Treasurer. Carried.

It was moved by Mr. A. P. Walker, seconded by Mr. Davis, and carried, That the Report of the Auditors be received and adopted. Carried.

It was moved by Mr. E. Stewart, seconded by Mr. A. R. Davis, and resolved, That the Secretary be, and is hereby instructed to have a number of copies of the Tariff of Fees printed, and also that copies of the same be forwarded to each member of the Association. Carried.

It was moved by Mr. A. Niven, seconded by Mr. T. H. Jones, and resolved, That the sum of \$175.00 be paid to the Secretary as a slight recognition of the very efficient manner in which he has discharged his duties during the past year. Carried.

Mr. Sankey moved that the meeting adjourn for five minutes ; seconded by Mr. Stewart. Carried.

ELECTION OF OFFICERS.

Mr. P. S. Gibson nominated Mr. T. Harry Jones as President for the ensuing year.

There being no other nomination, the President declared Mr. Jones elected.

Mr. Sankey nominated Mr. Peter S. Gibson as Vice-President for the ensuing year.

No other nomination being received, the President declared Mr. Gibson elected,

The President stated there were now three vacancies on the Council.

Mr. Gibson	nominated	Mr. Sankey.
" Niven	"	" H. J. Bowman.
" Sankey	"	" A. P. Walker.

Mr. Stewart nominated Mr. T. H. Wiggins.
 " T. H. Jones " " J. W. Tyrrell.
 " V. Sankey " " A. W. Campbell.
 " H. H. Gibson " Capt. VanBuskirk.
 " A. J. VanNostrand " Mr. J. L. Morris.

Mr. Davis nominated Mr. A. J. VanNostrand as Secretary-Treasurer for the ensuing year ; seconded by Mr. T. H. Jones.

No other nominations being received, the President declared Mr. VanNostrand elected.

AUDITORS.

Mr. Foster nominated Mr. H. L. Esten.
 " Niven " " A. R. Davis.

They were then declared elected.

SCRUTINEERS.

The President appointed Messrs. H. J. Browne and J. F. Whitson.

Mr. Stewart moved that the President leave the chair, and that Mr. Sankey take the same ; seconded by Mr. Foster. Carried.

Mr. Stewart then moved that a vote of thanks be tendered to the retiring President for his very able services to the Association and the courteous manner in which he filled the chair as President ; seconded by Mr. A. R. Davis, and unanimously carried.

Mr. Chipman replied to the vote in a few well-chosen words.

At 5 o'clock p.m. the meeting was concluded.

Mr. Niven—I would say that our Secretary has faithfully discharged his duties. It is not every one that is suited for that position, and I am aware that it takes a great deal of Mr. VanNostrand's time, and my opinion is when we have a good officer we should give him all we can afford ; \$175 is but a trifle compared to his services.

Mr. Jones—I heartily endorse all Mr. Niven has said. Anyone that has heard the report of the Secretary-Treasurer for the year, and knows the amount of his correspondence, and the other details of his

work, must think that his remuneration is a very slight recognition of his services.

The President—I may be permitted to add I know something of the work the Secretary has to do. Reading that report is a very simple matter, but if you visited his office sometimes and saw him up to his ears in work you could sympathize with him. I think the time has about arrived when we should have a fixed salary attached to the office. As it is now there is no salary mentioned in our by-laws, and I think it would be as well, at the next meeting, to take up the question of settling the salary at a fixed amount.

Mr. VanNostrand—Mr. President and gentlemen, I am very much obliged to you for this mark of esteem which you have given me. With regard to the work, it has always been a pleasure to me to do it. I would like very much to be able to do it in a more efficient manner than I have done, but so far as I have been able I have done it cheerfully, because I enjoyed doing it, and the question of remuneration is not one for a secretary to consider too much in matters of this kind. It takes a good deal of time, but unfortunately Toronto's surveyors can testify there has been some spare time in the past few years, and it has been a very pleasant way of filling it up for me.

Mr. Jones—Mr. Chairman and gentlemen, I can only say I thank you extremely for the honor you have done me in electing me unanimously to the highest office in the gift of the Association, and I can only say I will use my best endeavors to forward the interests of the Association in any way I can. (Applause.)

Mr. Gibson said—I have much pleasure in occupying the position of Vice-President, knowing the high standing of our Association at the present time. I am very much obliged to you, gentlemen, for the honor you have done me.

Mr. Stewart moved that the President leave the chair, and that Mr. Sankey take the same.

Mr. Foster seconded.

Mr. Stewart—I have much pleasure in moving a vote of thanks to the retiring President. I think if there is any one in this Association that deserves the thanks of the Association, not only for his services during past year but for the services from the very start of the Association, it is the retiring President; and without saying anything further, I move this hearty vote of thanks of the Association to him for his services.

Mr. Davis, in seconding the motion, said—I have known Mr. Chipman to be a zealous member of this Association, and I knew him

before he was a member of this Association. It may strike you as somewhat peculiar, but years ago before the gray hairs of our worthy President appeared at all, Mr. Chipman was my school teacher, and I sat at his feet for a number of years (applause), and during the succeeding years I have watched his progress with a great deal of delight; and you all know, or a great many of you know, better than I do, those of you who have been regular attendants at the Association, that Mr. Chipman has been one of the principal helpers in promoting the interests of this Association through all these years, and we are arriving at a certain status that enables us to obtain legislation that otherwise we could not get, and as the years advance there is no doubt that our Surveyors' Association in this Province will be a more important factor than it has been in the past. There is no doubt in the world that our present status is due to a large extent to the exertions of our now ex-President, Mr. Chipman.

The motion on being put to the meeting was unanimously carried.

Mr. Chipman, in reply to the vote of thanks, said :

Gentlemen, I must thank you for the very cordial way in which you have passed this resolution. It has always been a pleasure to me to endeavor to advance the interests of the surveying profession. There was a time in the early history of this Province, when the Surveyor-General was "something considerable," to use an Americanism, in the land. The Surveyor-General's office in Ontario has been abolished but the surveyors remain. In the olden times when the country was first being developed the Surveyor-General appointed the deputies. They were called D.P.S. for many years until the forties, when the term was changed to that of P.L.S., and, later since the organizing of our Association, to that of O.L.S. The work I have done in the interests of the profession has been a pleasurable one, perhaps the pleasantest one in my life. For the last eight or ten years I have not been practising surveying to any extent, but the profession of engineering is the next door neighbor to it. I hope to see a future when this Association will become also a Provincial Geological Society. We have now the nucleus of a library, and we have what I believe to be the best collection of charts on this side of Ottawa. With a very little effort on the part of a few, the number of charts will be increased yearly. I would like to urge upon the city members, especially that as they have greater advantages, and derive greater benefits from this Repository than the outside members, they should therefore exert themselves to acquire whatever plans, documents, reports and so on they can get to add to the Repository. The exploration of our northern territory has always been another fad of mine, and I hope that my dreams may be partially realized in the near future. I believe the surveyors of this country have a great future, and

a large field for exploring and developing the country to the north of the C.P.R. in our Province, to say nothing of the territory beyond. I do not believe in making Hudson's Bay the out-port for Ontario, but propose to convey from Hudson's Bay and the surrounding territory the products into Ontario and to make Ontario the out-port of the products of all that territory. The outlet to Hudson's Bay is closed for several months in the year, while the outlet this way will be open all the year round.

I thank you for your kindly feeling.

MINUTES OF SPECIAL MEETING

WHICH WAS CALLED BY THE PRESIDENT BY CIRCULAR.

HELD 30th AND 31st DECEMBER, 1896.

WEDNESDAY, DECEMBER 30TH, 1896.

The meeting opened at the Repository of the Association in the Parliament Buildings at 2 p.m. on Wednesday, 30th December; the President, Mr. Willis Chipman, in the chair.

The President stated the reasons for which he had, with the advice of the Council, convened the Association before the date for the annual meeting, as provided for in the By-laws.

The meeting was formed into a Committee of the Whole, and Chapter 34, Ontario Statutes, 55 Victoria, was discussed, also Chapter 152, Revised Statutes of Ontario (1887), as far as Section 25.

At 6 p.m. the session was adjourned until 8 p.m., when the President again took the chair.

Letters from Messrs. John Davis and Sherman, relative to obscure and imperfect sections, Chap. 152, R.S.O. (1887), were read and discussed.

The proposed changes in the dates of meetings of the Board of Examiners was discussed, and it was decided that one session in each year would meet all requirements, and that such session should begin on the second Monday in February.

The standard measure of length to be provided by the Board of Examiners was next discussed, and it was agreed that a steel band properly tested and stamped would best serve the purpose, the arrangement of the details being left to the Council.

It was also recommended that each candidate for admission to practice should be required to be the possessor of a Theodolite or Transit-theodolite.

The question of fees charged by Registrars having been found too indefinite in some particulars, it was decided to lay the facts before a representative of the Commission for the Revision of the Statutes and ask for legislation which would prevent further difficulties arising.

The survey of lines in townships laid out in sections similar to the Dominion Lands System, was brought up, and after discussion, referred to the Committee on Legislation, which was instructed to draft clauses that would cover such cases and be similar to those now in the Dominion Lands Act.

The session adjourned at 10.30 p.m.

THURSDAY, 31ST DECEMBER, 1896.

MORNING SESSION.

The President in the chair, read his address and reviewed the work already done at the session.

Moved by Mr. Foster, seconded by Mr. H. Smith, "That each clause of the Act where changes are proposed be discussed and the proposed changes voted upon." Carried.

Sec. 6, Chap. 152 (Date of Meetings of Board of Examiners). One annual meeting, commencing the second Tuesday in February, was agreed upon.

Sec. 7, Chap. 152 (*Re* Preliminary Examinations). It was decided to add the subjects of History and Geography—of Canada in particular—and English Grammar.

Sec. 10, Chap. 152 (Articled Pupils). Recommended that candidates for admission to practice be required to submit a detailed statement of the work in which they were engaged during their apprenticeship. Pupils should be allowed to break the term of apprenticeship for the purpose of taking courses in certain subjects, but with the consent of the Board.

Sec. 11, Chap. 152. Insert a new clause granting certain privileges.

Sec. 27, Chap. 152. A steel tape-measure to be furnished and certified by the Board.

Municipal Surveys. To be made unalterable after due notice served upon the interested parties by the Department of Crown Lands.

Fees of Registrars. The matter to be submitted to the Commission for Revision of Statutes, with particulars.

Compiled plans of cities, towns and villages discussed, but action deferred until the afternoon session.

Session adjourned at 12.30 p.m.

AFTERNOON SESSION, 2 P.M.

The President in the chair.

The discussion upon Compiled Plans was resumed, and it was moved by Mr. Campbell, seconded by Mr. H. Smith, that the following committee be authorized to frame such clause or clauses for the proposed legislation dealing with the question of compiled plans of municipal surveys, as they may deem advisable, viz.: T. H. Jones, Brantford; Villiers Sankey, Toronto; F. L. Foster, Toronto; H. J. Bowman, Berlin; J. W. Tyrrell, Hamilton; F. W. Farncomb, London; A. Niven, Haliburton; the President and the Secretary—five of whom shall form a quorum. Carried.

The arrangement of the proposed changes in the various Acts was then left in the hands of the Committee on Legislation, with instructions to prepare drafts and ask for legislation in the name of the Association.

The meeting adjourned at 6 p.m.

PRESIDENT'S ADDRESS.

This being a strictly business meeting, I will not take up your time with a lengthy address, but will confine myself to the problem we have in hand, the revision of the Survey Act.

Chapter 152 of the Revised Statutes of Ontario should be incorporated with Chapter 34 of the Statutes of 1892, and some important amendments are necessary. The Ontario Land Surveyors, and they only, know the defects, the incongruities, the contradictions and fossilized absurdities to be found in these Acts, and we are, therefore, the best fitted to revise them.

The Committee on Legislation will present for your consideration a draft bill, which contains little that is not to be found in the present Acts. The important amendments recommended are as follows:

1. The preliminary examination, which has not been materially changed for 40 years, has been made to conform more closely with Provincia! Educational System. (Sec. 7, Cap. 152.)

2. Owing to the indefiniteness of the present Act, the apprenticeship of students has in some cases been nominal, this being specially the case with those who are required to serve but one year. The Committee recommends that the apprentice give a written report on the work done by him during his time of service. (Sec. 10, Cap. 152.)

3. The standard measure to be supplied surveyors should be a steel band, 66 feet long, the same as that prescribed by the Dominion Government for Dominion Land Surveyors. The wooden yard sticks now supplied surveyors may have been useful when link chains were used, but they now are only objects of ridicule. (Sec. 27 and 28, Cap. 152.)

4. The sections referring to Municipal Surveys are now cumbersome and should be re-cast. It would not be unreasonable to add clauses confirming such surveys after sufficient time had elapsed for appeals, etc., to Commissioner of Crown Lands. (Secs. 34-40, Cap. 152.)

5. Compiled Plans are now frequently made by surveyors from data to be found in the Registry Office, without making any surveys or measurements on the ground. It is proposed to remedy this by introducing two new sections. (Sec. 69, Cap. 152.)

There is nothing in the proposed amendments to arouse hostility either in Parliament or out of Parliament. The question of fees has been left alone, and no changes of importance have been recommended in the present methods of survey. The draft Act will now be presented. The coming year promises well, and I hope it may prove a prosperous one for the members of our profession.

WILLIS CHIPMAN,

President.

December 30th, 1896.

MEMBERS IN ATTENDANCE AT THE SPECIAL MEETING OF 30TH AND 31ST DEC., 1896.

Abrey, G. B.	Farncomb, F. W.	Niven, A.
Bowman, H. J.	Foster, F. L.	Pinhey, C. H.
Browne, H. J.	Galbraith, J.	Sankey, V.
Browne, W. A.	Gamble, K.	Smith, H.
Campbell, A. W.	Hutcheon, J.	Speight, T. B.
Chalmers, J.	Jones, T. H.	Stewart, L. B.
Chipman, W.	Kirkpatrick, G. B.	Tyrrell, J. W.
Esten, H. L.	McKay, O.	VanNostrand, A. J.
Evans, J. D.	McLean, J. K.	Walker, A. P.
Fairbairn, R. P.	Miles, C. F.	Whitson, J. F.

MEMBERS IN ATTENDANCE AT THE FIFTH ANNUAL MEETING.

Abrey, G. B.	Galbraith, J.	Sewell, H. DeQ.
Beatty, W.	Gamble, K.	Smith, H.
Boswell, E. J.	Gibson, H. H.	Spry, W.
Browne, H. J.	Gibson, P. S.	Squire, R. H.
Browne, W. A.	Johnson, R. T.	Stewart, E.
Campbell, A. W.	Jones, T. H.	Stewart, L. B.
Charlesworth, L. C.	Kirkpatrick, G. B.	Tyrrell, J. W.
Chipman, Willis	McKay, O.	Unwin, C.
Davis, A. R.	McLean, J. K.	Van Buskirk, W. F.
Davis, John	Murphy, C. J.	Van Nostrand, A. J.
Esten, H. L.	Niven, A.	Walker, A. P.
Fairbairn, R. P.	Ross, G.	Whitson, J. F.
Fitton, C. E.	Sankey, Villiers	Wiggins, T. H.
Foster, F. L.		

RESULT OF ELECTIONS.

President T. Harry Jones (by acclamation).
Vice-President P. S. Gibson (by acclamation).
Secretary Treasurer A. J. Van Nostrand (by acclamation).

Members of the Council of Management elected for the ensuing three years:

Villiers Sankey, J. W. Tyrrell.

Auditors for the ensuing year:

H. L. Esten, A. R. Davis.

I hereby declare the above-named members of the Council of Management elected.

A. J. VAN NOSTRAND,

Secretary-Treasurer.

Certified correct.

J. F. WHITSON,

H. J. BROWNE,

Scrutineers of Ballots.

REPORT OF THE COUNCIL OF MANAGEMENT.

— — —

The Council held its regular meetings in April and November.

At the April meeting Mr. Villiers Sankey was re-elected Chairman of the Council for the ensuing year, and the several Standing and Special Committees appearing on Page 6 of the Association Report for 1896 were struck.

The question of reducing the number of examinations in each year was referred to the Board of Examiners to report to the Council in November.

It was also decided that each President should be required to present an inaugural address for publication in the annual reports of the Association. By-laws Nos 43 and 44 were passed and are now submitted to the Association for ratification or otherwise.

At the November meeting of the Council some cases of irregular practice were reported, and action is now pending in one of these.

A proposed bill to incorporate the Canadian Society of Civil Engineers by an Act of the Ontario Legislature was transmitted by that Society, but it was not considered to be in the interests of our Association to support the bill in its present form.

The reports of the Board of Examiners and the Secretary-Treasurer are presented herewith, they having been received and adopted by the Council.

Respectfully submitted,

VILLIERS SANKEY,
Chairman of Council.

— — —

REPORT OF THE BOARD OF EXAMINERS.

— — —

The Board of Examiners met in April and November of 1896, and the following candidates were successful in passing the Preliminary Examination, each receiving a certificate entitling him to be admitted to apprenticeship, viz. :—

APRIL.

MACKAY, JAMES JOHN, London.

MACLAREN, GEORGE PETER, London.

NOVEMBER.

WALLACE, JAMES NEVIN, B.A., B.E. (Dub.), Hamilton.

The successful candidates for admission to practice were as follows :—

APRIL.

CHARLESWORTH, LIONEL CLARE, Grad. S.P.S., Collingwood.
CODE, ABRAHAM SILAS, Alvinston.
SQUIRE, RICHARD HERBERT, Grad. S.P.S., Brantford.
CHALMERS, JOHN, Grad. S.P.S., Owen Sound.
SMITH, ANGUS, Grad. S.P.S., Ridgetown.
MACKENZIE, WILLIAM, Grad. R. M. Coll., Sarnia.

NOVEMBER.

HEAMAN, JOHN ANDREW, London.
SCHWITZER, JOHN EDWARD, B.A Sc. (McGill), Ottawa.
TAYLOR, WILLIAM VERNER, Grad. S.P.S., Gananoque.
BOSWELL, ELIAS JOHN, Grad. S.P.S., Peterborough.

These were duly admitted and sworn.

Articles were filed by apprentices as follows :

LIST OF ARTICLED PUPILS.

LIST OF ARTICLED PUPILS.

NAME OF PUPIL.	NAME OF SURVEYOR.	RESIDENCE.	DATE OF ARTICLES.	TERM.
McPherson, A. J., Grad. S.P.S.	H. J. Bowman, O.L.S.	Berlin	31st March, 1896	One year.
MacKay, James John	Wm. Mahlon Davis, O.L.S.	Woodstock	11th April, 1896	Three years.
MacLaren, George Peter	F. W. Farncomb, O.L.S.	London	20th April, 1896	Three years.
Fielding, J. S.	M. W. Hopkins, O.L.S.	Hamilton	1st July, 1896	Three years.
Armstrong, John, Grad. S.P.S.	T. R. Deacon, O.L.S.	Rat Portage	26th October, 1896	One year.
Wallace, J. N., B.A., B.E. (Dub.)	C. H. Wallace, O.L.S.	Hamilton	7th November, 1896	One year.
Dobbie, James S., Grad. S.P.S.	A. H. Macdougall, O.L.S.	Fort Arthur	1st December, 1896	One year.
Meadows, Wm. W., Grad. S.P.S.	T. R. Deacon, O.L.S.	Rat Portage	1st January, 1897	One year.
Robinson, Frank J., Grad. S.P.S.	T. R. Deacon, O.L.S.	Rat Portage	11th January, 1897	One year.
Dunbar, Marcus, Grad. S.P.S.	T. R. Deacon, O.L.S.	Rat Portage	5th February, 1897	One year.

The articles of William Innes Margach were transferred from H. B. Proudfoot, O.L.S., to M. W. Hopkins, O.L.S., for the remainder of the three year period.

It is recommended by the Board that the Council apply for legislation which will reduce the number of examinations to one in each year, and that the date of the beginning of such examination be the second Monday in February in each year.

VILLIERS SANKEY,

Chairman of Board of Examiners.

REPORT OF THE SECRETARY-TREASURER.

MR. CHAIRMAN,—I beg leave to submit the following report of the official business of the Association transacted in my department between February 24th, 1896, and February 23rd, 1897.

The following circulars were issued :—

No. 30	Ballot for 1896-7.....	225	copies.
" 31	Explanation of ballot, with names of candidates....	225	"
" 32	<i>Re</i> British Association for the Advancement of Science	250	"
" 33	Respecting arrears of fees	80	"
" 34	Announcing special meeting of Association	200	"
" 35	Announcing annual meeting.....	250	"
" 36	Programme for annual meeting.....	350	"
	Letters and accounts sent from the Secretary's office	949	
	Postal cards.....	94	
	Letters and postal cards received.....	606	
	Copies of 1896 Report sent to exchanges	640	
	Copies of 1896 Report sent to members.....	154	
	Exchanges sent to members	750	

The exchange of reports for members was continued with the Engineering Society of the School of Practical Science and with Michigan, Illinois, Iowa and Ohio; reports from all those societies having been sent to all our members not in arrears of dues, leaving a sufficient number on hand to be sent out as soon as arrears of dues are paid.

Our mailing list continues to increase and the receipt of valuable additions to the library shows a corresponding improvement.

We are indebted to the Provincial Executive for our more commodious and better equipped quarters. As will be seen by the report of the Committee on Biography and Repository much has been done by members of the Association in the way of adding to the Association's collection of biographical sketches, maps, charts, books, etc.

The work of the Committee on Publication was unusually great during the past year, but it was cheerfully accepted, and the results are satisfactorily shown by the '96 Report. The cost of publishing this Report was nearly \$100 greater than that of any previous year.

All of which is respectfully submitted.

A. J. VAN NOSTRAND,
Secretary-Treasurer.

STATEMENT OF RECEIPTS AND EXPENDITURES BETWEEN 24TH FEBRUARY, 1896, AND 23RD FEBRUARY, 1897.

RECEIPTS		
To balance on hand, 24th February, 1896.....		\$1,190 94
" Amount collected from advertisements in 1896 Report ...	\$ 90 00	
" Amount donated by Peary Lecture Committee	24 00	
" Proceedings, sold, 11 copies at 50 cents.....	5 50	
	119 50	
" Registration fees, 16 at \$1.00 each.....	16 00	
" Commuted back dues, 1 at \$14.00.....	14 00	
" Annual fees for 1894-5, 2 at \$4.00 each.....	8 00	
" " 1895-6, 13 "	52 00	
" " 1896-7, 154 "	616 00	
" " 1897-8, 8 "	32 00	
	738 00	
" Accrued interest on deposit in Savings Bank.....		26 56
" Receipts in Board of Examiners' account, including Government grant of \$200.00.....		714 00
		\$2,789 00
EXPENDITURES.		
By Postage	\$ 88 40	
" Bank Collections	1 80	
" Printing Circulars, wrappers, stationery, etc.....	37 10	
" Publishing Proceedings of 1896 meeting, with extra copies of parts.....	366 35	
" Freight and express charges.....	6 27	
" Customs brokerage on exchanges	3 00	
" Amount paid to Secretary-Treasurer for 1895 6.....	150 00	
" " " Stenographer for 1896 meeting	35 00	
" " " paid for Rent of rooms.....	8 00	
" " " Map mounting.....	16 24	
" " " Extra copies '95 exchanges.....	38 50	
" " " " '96 "	43 50	
" " " Expenses for Council meetings.....	22 50	
" " " Lithographing Polar map.....	45 00	
" " " Office sundries	6 95	
" " " Typewriting	8 40	
" " " Cartage	3 15	
" " " Packing and shipping to exchanges	1 00	
	881 16	
" " " Disbursements in Board of Examiners' account.....		585 75
" Balance on hand in Savings account 23rd February.....	779 04	
" Balance on hand in Current account 23rd February.....	543 05	
	1,322 09	
Total		\$2,789 00

A. P. WALKER, }
Geo. Ross, } *Auditors.*

A. J. VAN NOSTRAND,
Secretary-Treasurer.

REPORT OF AUDITORS.

To the Association of Ontario Land Surveyors:

We hereby certify that we have examined the accounts of the Secretary-Treasurer and vouchers therefor for the year ending 23rd February, 1897, as well as the financial statement, and have found them correct.

The cash in the Savings account amounts to \$779.04 and in current account to \$543.05, and we recommend that the Savings account be increased to one thousand dollars.

A. P. WALKER, } *Auditors.*
GEO ROSS, }

Toronto, 24th February, 1897.

DISCUSSION.

The President—I think the Association is to be congratulated on its good financial standing at the present time.

Mr. Sankey—I may say by way of explanation the Council of Management came to the conclusion it was unnecessary to include in their report, or refer in any way to the reports of the special committees that the Council appoints. These reports all come before the Association, they are printed in our reports, and there is no use cumbring our report with repetitions. They are all presented and discussed on their own merits, and the Council of Management have thought it wise not to encumber their report by repetition or remarks on the other reports.

REPORT OF PUBLICATION COMMITTEE.

MR. PRESIDENT,—This Committee has nothing of particular interest to draw your attention to. The usual business brought before them has, I trust, been carried out to your satisfaction.

Eleven hundred and fifty copies of the Report of the Proceedings were printed by the Presbyterian Printing & Publishing Co., at a cost of \$366.35, being rather more than last year. As an Appendix to the Report we have printed "Head Notes of Reported Land Cases," for

the compilation of which we are entirely indebted to Mr. H. L. Esten, O.L.S.

We also issued with the Report a plan of the Polar Regions, which was prepared with great care by Mr. Louis B. Stewart, D.T.S.

Members sending in "papers" for publication are requested to have the accompanying diagrams accurately drawn on a scale suitable for insertion in the Report.

We trust the members of the Association will do all in their power to forward the interests of our advertisers.

We continue to exchange our Reports with other societies.

EXCHANGES SENT TO

Iowa Civil Engineers' and Surveyors' Society.....	50 copies.
Illinois Society of Engineers and Surveyors	130 "
Michigan Engineers' Society.....	130 "
Ohio Society of Surveyors and Civil Engineers....	130 "
School of Practical Science Engineering Society.....	200 "

KILLALY GAMBLE,
Chairman of Committee.

REPORT OF COMMITTEE ON REPOSITORY AND
BIOGRAPHY.

MR. PRESIDENT,—Your Committee have to report that biographical sketches of the following surveyors have been received :

Hon. Alexander Vidal, of Sarnia, with a photograph and also a cutting from an American newspaper, containing a portrait and a short history of his life, which he has corrected.

J. O. Browne, P.L.S., written by H. J. Browne, O.L.S.

J. G. Howard, P.L.S., also written by Mr. H. J. Browne.

Chas. Unwin, O.L.S., D.L.S., written by himself. A photograph has also been sent by him.

H. J. Browne, O.L.S., written by himself.

F. L. Foster, O.L.S., D.L.S., written by himself.

V. B. Wadsworth, O.L.S., a member of your Committee, has signified his intention of writing an account of the life and work of J. S. Dennis, O.L.S., late Surveyor-General of the Dominion, but has not yet been able to complete it.

Members of the profession and others, in various parts of the Province, have been communicated with in the hope of procuring more biographical sketches; but no answers have been received to such appeals, except from John H. Jones, O.L.S., of Sarnia, who writes that he will do what he can as soon as possible.

Your Committee has made some progress in the work of arranging and preparing a catalogue, etc., of the books, maps and charts now in the Repository, and has also prepared a list of the Reports of our own Society and of those of the Societies exchanging with us.

We would recommend that either the Government be requested to furnish, or the Secretary be instructed to procure, a step-ladder for use in the Repository, as opening the windows, which is absolutely necessary frequently on account of the heat, is a work of considerable difficulty.

The catalogue and lists before referred to are attached to this report.

All of which is respectfully submitted,

H. L. ESTEN,

Chairman.

LIST OF EXCHANGES AND O.L.S. REPORTS.

Arkansas.....1887— 3 copies	Michigan.....1889—12 copies
“.....1888—13 “	“.....1890— 9 “
“.....1889—10 “	“.....1891— 5 “
Indiana.....1888— 4 copies	“.....1892— 4 “
“.....1889-90— 4 “	“.....1893— 2 “
“.....1891— 5 “	“.....1894— 4 “
“.....1892— 6 “	“.....1895— 4 “
“.....1893— 4 “	“.....1896—22 “
“.....1894-95—12 “	
Illinois.....1887—1 copies	Ohio.....1889—12 copies
“.....1888—3 “	“.....1890—19 “
“.....1889—2 “	“.....1891— 7 “
“.....1890—3 “	“.....1892— 3 “
“.....1891—7 “	“.....1893— 2 “
“.....1892—8 “	“.....1894—11 “
“.....1893—2 “	“.....1895—12 “
“.....1894—5 “	“.....1896— “
“.....1895—4 “	

Iowa	1887—	7 copies	School of Science—
"	1888—	"	"
"	1889—18	"	" 1885-86— 2 copies
" 2nd meeting	1889—	8	" 1887-88— 3 "
"	1890—	7	" 1889-90— 8 "
"	1891—	4	" 1890-91— 5 "
"	1892—	"	" 1891-92— 5 "
"	1893—	4	" 1892-93— 6 "
"	1894—	9	" 1893-94— 9 "
"	1895—14	"	" 1894-95— 7 "
"	1896—	"	" 1895-96—22 "
O. L. S. Reports—		O. L. S. Reports—	
"	1886—	25 copies	" 1891—81 "
"	1887—	74	" 1892—46 "
"	1888—	78	" 1893—10 "
"	1889—	99	" 1894—73 "
"	1890—	5	" 1895—65 "
		1896—	179 copies

LIST OF CHARTS AND MAPS IN DRAWERS.

Geological Survey of Michigan, containing 13 Plates.
 British Columbia, 10 Sheets and Wall Map.
 Carte Réduite de l'Océan Oriental, 1753.
 Essai d'une Carte Polaire Artique, 1774.
 Charts of St. Lawrence River, 15 Plates (Hydrographic).
 " " " " " " 2nd Set.
 Plan of Northern Polar Regions (Chipman & Stewart), 1896.

Hydrographic Charts of—

Toronto Harbour.
 Lake Huron and Georgian Bay.
 Lakes Erie and Ontario.
 Kingsville Harbour, Lake Erie.
 Lake Superior.
 Polar Regions, Baffin's Bay to Lincoln Sea.
 Lake Michigan.
 N. and E. coasts of Newfoundland.
 Detroit River—Bar Point to Mamajuda Lights.
 Pelee Passage, Lake Erie
 Chicago Harbour and City.
 S. Chicago.
 Erie Harbour.
 Cleveland Harbour and Cuyahoga River.

LIST OF WALL MAPS.

Room (1), Pennsylvania, Quebec, Small Dominion, Arctic Regions, Hydrographic Map, Ry. Map of Canada, Ontario.

Room (2), Nova Scotia, Manitoba, British Columbia, Quebec (maps), Wisconsin, Ohio.

Room (3), N. W. Territories and Manitoba, New Brunswick.

A.

Agriculture, 22nd Annual Report New Jersey Board.
 Almanac, Nautical, for 1872, 1882, 1886.
 Almanac, American Nautical, 1881, 1883, 1884, 1885, 1886, 1887.
 Almanac, Canadian, 1893
 Archives, Canadian, 1883 to 1895.
 Appendices (C. Vol. 3, No. 5, 1854-5, Census and Statistics), (8 to 21, Vol. 15, No. 4, 1857, H. B. Co. Commission), (52 to 58, Vol. 15, No. 9, 1857, Geology around Lake Nipissing), (13 to 20, Vol. 16, No. 5, 1858, Crown Surveys), (22 to 30, Vol. 15, No. 5, 1857, C. L. Report, Montmorency Bridge), (47 to 69, Vol. 14, No. 6, 1856, Boundary, Quebec and N. B.), (J. to T., Vol. 13, No. 8, 1854-5), (35 to 46, Salter's Explorations, Vol. 14, No. 5, 1856—Exposition 1855), (1 to 4, Vol. 15, No. 1, 1857, P. Office and Militia), (9 to 36, Vol. 17, No. 3, 1859, Crown Surveys).
 Arkansas Soc. Eng., etc., 1887 to 1889 (Bound).

B.

British Columbia Reports of Commissioner of C. Lands, 1892 to 1895.
 Baie Verte Canal, 2 copies, Report 1874

C.

Coast Survey from 1873 to 1894 (22 Vols).
 Canada, Report of Commissioner of C. Lands, 1856, 2nd edition, 1857, 1858, 1859, 1860, 1863, 1864, 1865.
 Cape Breton Explorations, 1886.
 Cincinnati Southern Ry. Report, 1880.
 Cornwall Canal, Report by Mr. Page, re break.
 Canada Statistical Record, 1886-1887.
 Canada Abstract and Record, 1888.
 Canada Year Book, 1889, 1890, 1891, 1892.
 Canada Statistical Year Book, 1894.
 Catalogues, etc., 34.

D.

Dawson's Report on line of route between L. Superior and Red River.

Dawson's Report of Red River Expedition, 1871.

Drainage Act, 1894, Ditches and Water-courses Act, 1894, and Tile, Stone and Timber Drainage Act.

E.

Engineering Soc. School of Practical Science, 1885 to 1893, bound.

F.

Flint's Survey.

G.

Geological Survey of New Jersey, Vol. 1.

Geological Survey of Canada, 1877 to 1893. Reports.

Grand Trunk Ry. Report. Report of Committee re 1857—History of, 1864.

Gibson's Surveying—Gummere's Surveying.

H.

Hudson Bay Co., Return re same.

Hudson Bay Co. and N. W. Territories considered in relation to Canada.

Health Officers' Reports, 1889 to 1894 and 1887.

I.

Interior Reports, Surveys in Manitoba and North West, 1884.

Interior Report, 1895.

Interior Depart. Maps re Canadian Irrigation Surveys in 1894.

Intercolonial Railway, Report of Exploratory Surveys, 1864.

Intercolonial Railway General Map, 1864.

Industries, Bureau of, Report 1890, 1891, 1892 (Ontario), 1893 to 1894.

Iowa Society Surveyors and C. Engineers' Reports, 1888 to 1894.

Illinois Society Surveyors and C. Engineers, 1886 to 1890, 1891 to 1894 (Bound).

L.

Lepine's Sentence, Commutation of, 1875.

Logarithmic Tables, Vega.

Letter Books—A, B and C.

Leybourn's Compleat Surveyor, 1653 (loaned by C. Unwin).

M.

- Magdalen Islands, Report on.
 Militia Report, 1871.
 Meteorological Service Report, 1887 and 1888.
 Mines, Bureau of, Ontario, 1892 and 1894; Mines, Report of
 Minister, 1894.
 Minute Book.

N.

- New York, Report of State Surveyor.
 New York and Pennsylvania Survey of Boundary.
 Niagara, State Reservation at, Committee's Report, 1894.
 Norrie on Practical Navigation—Navigation Patouy's.

O.

- Ontario Boundaries.
 Ottawa Ship Canal, Report, 1860
 Ontario Statutes, 59 Vic., 1896; Ontario Forestry, 1896.
 Ontario Land Surveyors' Association Reports, 1886 to 1891
 (Bound).
 Ohio Surveyors and C. Engineers' Reports, 1880 to 1888 and 1889
 to 1893 (Bound).

P.

- Public Works Reports, 1867 to 1882, 1881 and 1882, 1882 and
 1883, 1883 and 1884, 1884 and 1885, 1885 and 1886. Supplement 1886,
 1886 and 1887, 1887 and 1888, 1888 and 1889, 1889 and 1890, 1890
 and 1891. Illustrations and Report on St. Lawrence, between Quebec
 and Montreal, 1892, 1893, 1894, 1895
 Public Works General Report, 1864.
 Photographic Surveying, E. Deville.

Q.

- Quebec, description of, Surveyed Tps. and Explored Territories,
 1889.
 Quebec Report on Public Lands and Forests, 1895.
 Quebec Mines and Minerals and Mining Law, 1892.
 Quebec Report of Commissioner of C. Lands, 1887 to 1895 and
 1895.
 Quebec Fish and Game, Our Rivers and Lakes.

R.

- Railway Machinery, by D. K. Clark, Vols. 1 and 2.
 Railways and Canals Reports, 1880, 1888, 1895.
 Railway, Trunk Line from Nova Scotia to Quebec, 1868.
 Rupert's Land and N. W. Territories, report re acquisition of.

S.

- Surveyor, The, Vol. 3.
 St. Lawrence, Report on Navigation of, by Chief Engineer of Public Works.
 Superior Lake and Red River, Report on Country Between, 1858.
 St. Lawrence Gulf to Bay of Fundy Canal, 1874.
 St. Lawrence Navigation between L. Ontario and Montreal, Report, 1875.
 Sanitary Convention (Woodstock), 1887.
 Surveyors P. L. and O. L. Associations' Papers, in cases, 1 to 7 and 8 to 13.

T.

- Tredgold on Locomotive Engines, Vol. 1; Marine Engines, Vols. 2 and 3; Stationary Engines, Vol. 4.

U.

- Upper Canada Surveys, Remarks on, 1861 and 1863.

W.

- Welland Canal Report, 1872, 2 copies.

 REPORT OF COMMITTEE ON POLAR RESEARCH.

MR. PRESIDENT,—Although the results of the work done by your Committee on Polar Research during the past year may be inappreciable, it has not been altogether inactive. Taking advantage of the fact that an expedition is to be sent to Hudson Straits and vicinity by the Dominion Government during the approaching spring, the Hon. Mr. Davies, Minister of Marine and Fisheries, under whose control the expedition is being despatched, was interviewed with the object of having a small exploring party accompany the expedition to a point on the north shore of Hudson Straits near the west end, and thence work northerly during the summer and return with the ship in the autumn. With regard to such a proposition, however, I was informed that I would have to deal with the Minister of the Interior. This I at once did through a written communication,—a copy of which, together with the Minister's reply, is hereto attached.

I only regret that it does not contain more encouragement.

“ 42 James St. North, Hamilton, Ont.

“ HON. CLIFFORD SIFTON,

“ December 29th, 1896.

“ Minister of the Interior,

“ Ottawa.

“ SIR,—On behalf of the Association of Ontario Land Surveyors, I desire to call your attention to what appears to us a very worthy object, viz., the exploration and examination of some of the hitherto entirely unknown shores of northern Canada. The accompanying North Polar map, recently prepared by two of our members, Messrs. Chipman and Stewart, will show you at a glance the extent of unexplored territory situated within the bounds of our Dominion.

“ Since we believe an expedition is to be sent out to Hudson Strait in the spring by the Department of Marine and Fisheries, it appears to us that a small exploring party could be sent out with the Expedition at a minimum expenditure of money, and from the west end of the Strait might do much excellent work along the coast to the north, as indicated by the red line on map. This northern region is not the worthless waste that some suppose it to be, but is undoubtedly rich in its fisheries, furs and minerals. From personal observation, I have seen enough to convince me of this fact.

“ We therefore beg to urge upon you the advisability of seizing the opportunity for sending out an exploring party with the Marine Expedition next spring to carry on work along the east shore of Fox Channel, and thence if possible during a second season, to the west coast of Grinnell Land. There is no more interesting field in the world for exploratory work than that above outlined.

“ A party could be conveyed to or from the shores of North Devon any year by one of the whalers frequenting the waters of Baffin Bay; but without going further into details, we leave the matter in your most able hands.

“ Together with the North Polar Map, permit me to send you two articles relating to Hudson Bay and Northern Exploration. As our Association meets in February, may I ask the favor of receiving your reply in such time that I may be able to present it to the meeting.

“ I have the honor to be, Sir,

“ Your obedient servant,

“ J. W. TYRRELL,

“(Chairman Com. on Polar Research.)”

“(PERSONAL.)

“Ottawa, January 12th, 1897.

“J. W. TYRRELL, ESQ.,

“42 James Street North,

“Hamilton, Ont.

“DEAR SIR,—I have pleasure in acknowledging receipt of yours of the 29th ult., and have noted what you say in regard to the advisability of exploring Northern Canada. I am afraid the demands upon my Department will not permit of any expenditure in that direction during the coming year, but am pleased to be apprised of your views and may be able to do something in the direction suggested in the future.

“Yours faithfully,

“CLIFFORD SIFTON.”

Notwithstanding the indifferent success of your Committee, the year 1896 has been a notable one in the annals of Polar Research.

Since the last annual meeting of our Association, by far the most successful Polar expedition ever inaugurated has returned from its three years' battle with the ice packs.

The dauntless leader of this expedition, as you all know, is a Norwegian—Dr. Frithjof Nansen—upon whom honor and tribute is now being poured by all nations. Though Nansen failed in the attainment of his highest ambition, he was singularly successful in many respects. He and his solitary companion—Lieut. Johansen—performed a wonderful five months' journey, which has no equal in the history of arctic exploration, over the frozen sea, reaching a point 170 geographical miles nearer the pole than had ever been attained by any human being. He penetrated a hitherto undiscovered area of 50,000 square miles and collected much valuable scientific information.

His expedition has practically demonstrated the truth of the theory with regard to the drift of the polar pack, whether from ocean current or prevailing winds, and it has thus determined the route for future exploration.

Nansen has also with the model of the “Fram” to a great extent solved the problem of dangerous ice navigation, and has proved most conclusively by his three years' experience, which was entirely free from disaster, that it is possible to spend a healthy and cheerful, if not a pleasant existence, even amidst the solitary darkness of a polar night.

His expedition sailed from the coast of Norway during the summer of 1893, and on the 22nd of September of the same year, north of the New Siberian Islands, entered the polar pack, with which

for nearly three years it was to drift in a westerly direction. On the 14th of March, 1895, after spending a year and a half in the pack, Nansen and Johansen stepped over the side of the "Fram," and, accompanied by a number of dogs, and one hundred days' provisions for themselves, set out over the frozen sea for the Pole. They did not reach it, but they reached latitude $86^{\circ} 14'$ north, on April 7th, and after five months' travel over the ice, and experiencing many hardships and escaping many dangers, they returned to the shores of Frans Josef Land, where they arrived on August the 6th, 1895, and where for the ten succeeding months they lived in a hut ten feet long by six feet wide, built of stones and covered with walrus hide.

During their occupation of these winter quarters, they subsisted entirely upon polar bears and other animals which they killed. In the month of June, 1896, whilst attempting to reach Spitzbergen over the drifting pack, they happily fell in with the Jackson-Harmsworth expedition near Cape Flora, and thence by the "Windward" were taken to Vardo on the coast of Norway.

At a reception given to Nansen by the members of the Royal Society and other distinguished men, in the city of London, only a few days ago, the guest of the banquet concluded his reply to the toast tendered to him, by expressing the hope that his friends would appreciate his "politeness" in leaving nearly three degrees between his farthest north and the pole still undiscovered.

The goal of polar expeditions remaining therefore unattained, let man with his inherent desire to fathom the mysteries of the unknown, persist in his noble endeavors, until both Arctic and Antarctic Poles shall be compelled to raise the flag of truce, and submit to their discovery.

In addition to sentimental reasons, there are many substantial objects to be gained through judicious arctic exploration. There is much to be looked for in the development of fisheries, the establishment of fur trade, and the discovery of minerals. It is well known that for many years the northern portions of Hudson Bay and the channels to the north of it have been favorite American and Dundee whaling districts. Several New England vessels have made Marble Island, in the northwest part of the Bay, their regular wintering quarters, for the purpose of getting at the whales with the breaking up of the ice in the spring. An American vessel for years wintered at Spicer's Harbour on the north shore of Hudson Straits, in order to attain the same object, and succeeded in accumulating much wealth.

When it is considered that a single Right Whale, in oil and bone, is valued at from ten to twenty thousand dollars, it is not difficult to conceive the possibilities of a successful whaling voyage.

Exclusive, however, of these more or less scanty prizes, Hudson Bay and the adjacent waters abound in other commercially valuable forms of life. I have observed the surface of the water, as far as the eye could reach from the deck of a vessel, appear an undulating sheet of white,—caused by great schools of white whales. This species of whale in the adult state is about fourteen feet in length, and is

valuable for both hide and oil. Great numbers of them are captured by the traders of the Hudson Bay Company, and their products are shipped to England.

Walruscs are also found in great numbers in various parts of our north seas. I have met with many large herds of them, usually in shallow water and in the vicinity of sandy shores, where they feed upon clams which they dig from the sand.

A walrus hide—the weight of which averages three hundred pounds—is valued at about ten cents per pound, which together with the ivory tusks, places the value of one animal at from thirty to forty dollars. Hence it can be seen that a very few hundred walruscs alone would form a cargo of no mean value.

In addition to the above list might be mentioned narwhales, porpoises, several varieties of seals, and many species of magnificent fish, all of which are of much commercial value. So much for the available products of our northern seas.

I think as much can be said with regard to the wealth of the land, but I shall merely endeavor to indicate in what direction its products may be looked for.

As to *furs*.—The fact that the traders of the Hudson Bay Company have for the past two hundred years been making untold wealth out of the furs obtained from these and adjoining districts to the south and west, seems to be almost sufficient proof of the existence of valuable furs. At one Hudson Bay station alone, I know that it is not an uncommon event for the Eskimos in one season to bring down from the north, three or four hundred skins of musk oxen, besides many others of polar bears, arctic wolves, wolverines, foxes, etc., etc.

I have myself seen the richest of furs, stacked by the Eskimos, like hay cocks upon the shore, to await an opportunity for transportation to the nearest Hudson Bay Coy.'s trading post.

At one locality which I had occasion to visit in 1885, the Eskimos during the one winter had trapped over a thousand white foxes, besides many wolves, wolverines and colored foxes. One black fox skin, which came into my possession from this place, was sold at the wharf in Halifax—where I landed—for sixty dollars; which I believe was considerably less than its full value.

As to *minerals*.—There is no reason why the limitless rocky plains of the north should not be found to contain as many and as rich mineral tracts as have ever been discovered in the temperate or torrid zones. In fact, mineral tracts have been discovered in some parts of our arctic territory, and beyond doubt many more rich ones await the arrival of the explorer and the prospector.

From a scientist's point of view, there is much to be gained through judicious exploration in the arctics. Of the many branches of science which may be pursued with fruitful results in this broad realm of mystery, the following are the most important,—Geology, Geography, Ethnology, Zoology, Botany, Meteorology, Oceanology,

and Terrestrial Magnetism, and the extension of knowledge in any or all of these departments of learning would certainly be most desirable.

As to modern authorities upon questions of Arctic Exploration, few men should be better able to give expression to sound views than Admiral A. H. Markham, who, in 1876, distinguished himself in connection with the Nares Expedition. In a paper read by him before the Sixth International Geographical Congress, held in London in 1895, he expressed himself as strongly in favor of continued Arctic Research; and in speaking of the most promising fields for future exploration, he says: "No more important or interesting work associated with North Polar research, can be conceived than the exploration of that vast unknown region situated between Wrangle Island and Prince Patrick Island, and the connection of Prince Patrick Island with Aldriche's farthest in Grant Land." Now this unknown and most interesting region lies—we are glad to be able to claim—within the Dominion of Canada; but what are we as Canadians doing to establish our claim, or to lift from it the enveloping cloud of mystery?

Let us not be contented to stand still and see other nations win the laurels, but rather let us be inspired by the sentiments of the author who wrote the familiar lines—

"Up! up! Let us a voyage take,
Why sit we here at ease?
Find us a vessel tight and snug,
Bound for the Northern Seas."

All of which is respectfully submitted

J. W. TYRRELL,
Chairman of Committee.

DISCUSSION.

Mr. Niven—I think that is a very interesting document. Since we had Lieutenant Peary here, more interest seems to have been taken in the northern regions than before, and I thought we should have Dr. Nansen this year. It seems to be the proper thing for those men to be brought here by the land surveyors, and I think we should get him here next year.

The President—I hear he is going to be here next year, and we probably could.

Mr. Kirkpatrick—Would not it be possible to bring influence on the Dominion Government through some of the members as to this exploration? I think it would be possible to have a committee wait upon Mr. Sifton. It might be pressed upon him, and some of the

members spoken to, to bring it before him. We might get Mr. Lount, of this city; he ought to be approached in the matter.

Mr. Tyrrell—As to the advisability of trying to send a deputation down to Ottawa to bring this matter before the House, I would like very much personally if it could be accomplished, and if it is at all practicable I should have much pleasure in moving such a deputation be appointed, and I would be much pleased to be a member of it.

The President—How would it be to move that a special committee be appointed, or take your own committee on Polar Research, to draft a petition to the Dominion Government and have it submitted to-morrow or the next day to the Association, and when that is carried we will then be in a position to communicate with the Department. Leave the matter as it is now and bring in this resolution.

REPORT OF COMMITTEE ON STANDARD MEASURES OF LENGTH.

[NO REPORT.]

REPORT OF COMMITTEE ON LEGISLATION.

GENTLEMEN,—On June 15th, 1896, a circular letter was sent to each member of this important Committee by the Chairman, requesting each to take up a particular part of the work in revising the several Statutes affecting Surveyors and the Survey of Lands.

It was found impossible to call a meeting of the committee until Dec. 30th, when the matter of revision was taken up in earnest.

On Dec. 31st, the Draft Bill was presented to the Association at the special meeting, and discussed clause by clause.

The sections of the Act respecting Registered and Compiled Plans were referred to a special committee, with instructions to recast the same and report again to the Committee on Legislation. After receiving the replies from the sub-committee, the Draft Bill was submitted to the solicitors having in hand the revision of the Provincial Statutes. We were then informed that the two Acts, Cap. 152, R. S. O. and Cap. 34, 1892, had been recast into two Acts—one respecting *Land Surveyors*, and the other respecting the *Survey of Lands*.

These two new draft Acts do not, however, contain any of the changes desired by the committee, the chief of which were the following:—

(a)—Act respecting Surveyors.

1. Term of office of members of Board of Examiners changed from three years to two years.
2. Examinations to be held once per year only—February recommended.
3. Preliminary examination to include grammar, history, geography and linear drawing,
4. Final examination to include botany and forestry.
5. Candidates for final examination to present reports on Surveys made during apprenticeship.
6. Shortening term. Clauses to be recast.
7. Additional schedules.

(b)—Act respecting the Survey of Lands.

1. Standard measure to be a steel band, 66 ft. long, duly tested and stamped.
2. Municipal Surveys, when confirmed by the Department of Crown Lands, to be considered final after due notice to all parties interested.
3. Re-survey of city, town and village lots to conform more closely with original survey.
4. Plans for registration to be prepared as now prescribed in the *Land Titles Act*.
5. Completed plans to be two classes. *a.* Plans based on actual surveys and measurements. *b.* Plans based on paper titles only.
6. Rearrangement of sections prescribing methods of survey.

The amendments as recommended by the committee are here-with presented for your consideration.

WILLIS CHIPMAN,
Chairman.

DISCUSSION.

The President—It has been proposed we should take up the proposed Amendments in the Survey Act and the Act respecting Land Surveyors. The main points were pointed out by the Committee on Legislation.

Mr. Sankey—After the special meeting of the Association that was called together over this, the draft that was then prepared was handed to me. On making inquiries I was first told that they did not propose to make any re-arrangement of the Acts this session. On further enquiry I found this matter had already engaged the attention of the Ontario Government, and I was fortunate in making an appointment with Mr. Scott and Mr. Biggar, who are both engaged on the subject of re-arranging Acts—consolidation and re-arrangement. I attended at Mr. Scott's office for a very long time, and through his kindness I got a proof of the first portion of the Act that we are interested in. I may say it is the intention of the Government to pass or consolidate two Acts now with regard to Surveyors. One will be the first Act, whatever its chapter will be, an Act Respecting Land Surveyors. That Act embraces all the parts of the old Act, chapter 152 and chapter 34. It is chapter 152 of the Revised Statutes of Ontario, and chapter 34 of 55 Victoriae which was the Act that incorporated this Association. They had got this Act in the form commencing the various sections. We had got the whole thing in one with our proposed draft, and it seemed to me it made not a great deal of difference if we accepted their sectional numbers instead of our own. I went over the whole of the Act respecting Land Surveyors with him, and found that many of the proposals that we had suggested were put in the Act as they occurred to him. I do not know that it is necessary to go over all the points where we agreed. I should think at present it would be necessary merely to show that there are certain things we desire, which cannot go in under the head of consolidation; but the people I have spoken to about it do not see any reason why the amending Act should not be got through this session to amend the various clauses.

Mr. Gibson—Did the Government take that up?

Mr. Sankey—The question whether the Government would take it up or somebody take it up for us is one that is open to question. I do not think that the amendments we are asking are such that the Government would object to take up. It is merely making things either clearer or adding a little to some of the existing legislation. I suppose we would be at the expense of some extra printing. I might say whatever is put in this year in the way of amending will go into the consolidated statutes. After the Act of Land Surveyors is gone through there will be the Act respecting the Survey of Lands, that will be the title of some other chapter, and anything that is already in the Surveyors' Act as part of the Registry Act is going to be taken out of the Surveyors' Act and put into the Registry Act, or whatever amendments we desire; first of all in the Act respecting the Survey of Lands, will have to be amendments to the clauses of the existing Act. Now whatever amendments we propose with regard to registered plans or the compiled plans, will be amendments to the Registry Act, that being the way Mr. Scott outlined it to me. I have already com-

pleted the whole of the Act respecting Land Surveyors, and I suppose that will be the best thing for us to take up now and go through with.

What they are going to put into the Act respecting Land Surveyors will include our incorporation, also all the preliminary steps that are necessary to a man becoming a land surveyor and getting a certificate. The Board of Examiners and their appointment and the subjects they are entitled to examine upon, and everything up to the time a man gets a certificate.

The other Act will contain what it is a land surveyor shall be, after he becomes a land surveyor. This draft of ours, which we supposed was going to be all one Act, includes the whole thing, the Registry Act and all.

The President—The Act was printed exactly as the Acts are now, I understand, and there is very little change.

Mr. Sankey—A slight change in a clause here and there. Chapters 54 and 55 Victoria and a portion of R. S. O. Chapter 152 will be amalgamated in one. Clause No. 3, to give you an example, in chapter 152, says: "No person shall act as a land surveyor within this Province unless he has been duly authorized to practise as a land surveyor according to the provisions of this Act," [reads]. [Reads from Chapter 34.] That is the principle that is carried on all through.

Mr. Gibson—Prepare it the same as the old Act of Incorporation instead of what you have suggested there.

Mr. Sankey—"All persons prior to [reads] of the said Association." I was going to say what Mr. Scott drew my attention to was this, there were several proposals made here with regard to what information a candidate for examination shall supply the Board of Examiners with, as to the nature of his service and certificates and things of that kind, and Mr. Scott drew my attention to the fact that under the existing Act the Association has the power to pass By-laws for the proper management and for the good of the profession. He said if it goes in under that head it is far better for you to pass such by-laws as you desire yourselves. They have the authority of an Act of Parliament and do not bring them in under a special Act. As long as you do not overstep what is for the good of the Association, of the profession at large, no court in Canada would upset your action. And I thought that was good advice, and I think it worth our while following.

We will take up the other questions.

Sec. 19. It was found advisable by the Board of Examiners that the Secretary-Treasurer should be *ex officio* a member of the Board of Examiners. One reason was he is there all the time and he has the handling of the papers and giving of the papers to the candidates and

he is not sworn in as a member and it was considered advisable he should be sworn in. The simplest way to do it was to make him *ex officio* a member of the Board of Examiners. So Clause 19 is to read this way [reads]. Then the one oath covers everything, because he is a member of the Board of Examiners, and you do not have to administer a special oath to him.

The next change is in Clause 20, where it was desired that we should have only one meeting of the Board of Examiners annually, and that it be held on the second Monday in February; so the words "First Monday in each of the months of April and November" are struck out and the words "Second Monday in February" inserted in lieu thereof.

In regard to the apprentices, we propose to strike out the existing Clause 22, and insert this clause in lieu thereof: "No person shall be admitted" [reads]. Mr. Biggar, Mr. Scott and some other gentleman in the room came to the conclusion "Orthography" was the proper word and the Board of Examiners had the power to divide that into whatever subjects they considered necessary. [Reads.]

Sec. 23 of this printed draft goes out and becomes one of the sections later on.

Sec. 24 [Reads.]

And this will be a new clause added in: "Any persons serving . . . Ontario Land Surveyor."

Mr. Gibson—That means the time he puts in at the School might be put into the 4th year.

Mr. Sankey—He must notify the Board he is going to do this before he starts, and he must get the permission of the Board if it is anywhere other than the School of Practical Science. It is the course they recognize.

As to the next amendment, Sec. 26. I will read the existing law and what was proposed to be changed. [Reads.] The difficulty was this: first of all the Board of Examiners had a considerable difficulty in knowing what the term "Land Surveyor duly admitted to practise in any of Her Majesty's Dominions other than this Province" meant. In England we have been led to understand there is no actual admission to practise as a land surveyor. Nor is there in Australia or any other of Her Majesty's dominions. This was what was proposed and as far as I know was finally decided on [reads].

The principal point is no one will be allowed to go through unless he serves the twelve months. The Board of Examiners have power to put on as many more as they think necessary.

Mr. Gibson—Quebec would not reciprocate in the matter before.

Mr. Jones—They could come in under six months' service before, and still if we want to practise in Quebec we have to serve a year.

Mr. Sankey—With regard to subsection 2 of section 27, which is the clause referring to those applicants for examination who may have to serve one, two or three years at the School of Practical Science, I may say I had a long discussion with Prof. Galbraith on this point, and my personal idea was it was a great mistake to have that in our Act at all. He said, “I wish you to strike the clause out altogether, I think it is unnecessary.” I think most surveyors think the same way, so we propose to strike that clause out, unless someone wants it kept in. The result will be those attending the School of Science that do not graduate and get their diploma will have no more right to become land surveyors than any other person. They have got to pass their preliminary examination, serve their three years, and then pass their final.

The next amendments are simply clerical additions, so to speak. There is one in section 30. [Reads.]

In section 37 the addition is, “Each applicant.” [Reads.]

In subsection 4 of section 38, “If the Council think fit” [Reads.]

Then the next clause of importance is Clause 30, which is the clause in which we have amalgamated all the fees, and Mr. Van-
Nostrand has furnished me with a list here. It is simply picking them out from the Act from one section and another and putting them all in one. There is no addition to them and there is no change at all. They are as they are by law to-day.

Section 40 is the same. [Reads.]

Section 25, chapter 152, referred to.

I understand with regard to professional evidence in court, \$4 a day is a standard fee paid to all professional men. I may say in this the Board of Revision have not thought fit to change that from \$5 to \$4, and I do not think we had better draw their attention to it.

That includes the whole of the Act in regard to the Land Surveyors; and there is one point I suppose the Revisors have omitted, that is about the standard of measure, as to whether the clause referring to that is to be in this or in the other. Personally, I think it ought to be in this, for it is one of the requirements that the surveyor has to do, to pay a \$2 fee for his standard.

Mr. Sankey—There is one clause in particular we ought to discuss I think, and that is the proposed amendment to section 59 of chapter 152, that is with regard to the running of side lines. After a great deal of discussion, this is the form of the amended statement now: “For land surveyors employed to run,” etc. [Reads section.]

I may say that it does not insist on taking an absolute astronomic observation if you do not want to, and it avoids the necessity of laying out the governing line. If you have your point to start from already fixed, either by original monument or by the elements, you can run a line from that point and tie across to the front and rear ends of the governing line and then make your proper allowance for convergence in meridian and direct your line back again.

Mr. Niven—That is all right for that clause of the Act, but what I want is the sectional system.

Mr. John Davis—I was called in a suit in which I had made a survey, and Mr. Aylesworth, Q.C., was cross-examining me, and he took the ground very strongly because I had not taken this astronomic observation that the whole survey was irregular.

Mr. Sankey—I think that is possibly so, for the old Act says if it is not done before, and the course cannot be ascertained, it must be determined by astronomic observation. That is what the Act lays down, you must ascertain by astronomic observation.

Mr. J. Davis—Why not stike that “astronomic observation,” out altogether ?

Mr. Sankey—That is what we have done, we have struck it out. We say he shall run the line on the same astronomic course. It remains with the surveyor to decide which is the best. Were there not some monuments on the ground to determine your governing line ?

Mr. J. Davis—Yes.

Mr. Sankey—It does not make any difference to the surveyor or the person for whom the survey is made what that particular bearing may be as long as the line to be run is run on the same astronomic course, and the fact of its being north 20° or 30° east by actual observation, as long as it is on the astronomic course of the governing line, there is the end of it, as the governing line is on the ground.

Those words, “astronomic course,” were suggested after a lot of discussion. The words were originally “astronomically parallel.” The words “astronomic course” seem to cover the whole question.

Mr. Niven—That is right.

Mr. Sankey—He shall run the line on the same astronomic course as the straight line joining the front and rear angles of the governing boundary line of said concession or section.

Mr. J. Davis—Why not leave the section just as it is, and add that these lines can be run by means of alternate angles after making due allowance for these meridians.

Mr. Sankey—You cannot do that. If it is not already done or cannot be ascertained, “He shall ascertain . . . front and rear angles of the governing boundary line.” The objection was, before you could do that, you have to cut out that boundary line, get a straight line between the front and rear ends, and then take your astronomic observations on that line; and that seemed to some sur-

veyors, who had more experience in that line of work than I had, an unnecessary expense to put their client to.

Mr. Niven—You can take the course of, the trial line.

Mr. Sankey—Is it not better to leave out the “astronomic observation” altogether?

Mr. J. Davis.—If you can.

Mr. Sankey.—You can if you leave that out of the Act.

Mr. Gibson—As to the “astronomic course”?

Mr. Sankey—If the words “astronomic course” are not in the section, what is going to suggest to them the asking of the question you speak of in law suits?

Mr. Gibson—As you have it now?

Mr. Sankey—We have struck it out, the same astronomic course.

Mr. Gibson—If you are asked what is the astronomic course?

Mr. Sankey—If you do not put that in you will be faced with the magnetic course.

Mr. J. Davis—What was the original intention? What did they mean by that? If you wanted to run a line between lots 30 and 31 in one of those old townships. The idea was that you were to take that astronomic observation on the boundary line; then go up and take another at the division line. That is what the old section of the Act was supposed to cover.

Mr. Sankey—I quite agree with you, but this section does not compel you to do that. It allows you to do it.

Mr. J. Davis—It is simply all a quibble, and judges do not like it.

Mr. Gibson—Suppose it was only a mile, and you were going to take a very important case, and very heavy costs in taking astronomic observations in both cases?

Mr. J. Davis—The trouble is you may go twenty miles from the survey and stay for a week.

Mr. Sankey—Then you can angle up. Does this not allow that?

Mr. Foster—You can insert the words either by a series of angles or one or more astronomic observations.

Mr. Sankey—The way it is now it covers every way the surveyor knows, and in the interests of his client he uses the method he thinks most satisfactory. [Reads section again.]

Mr. Niven—That covers it all right provided that you know this astronomic course, but how are you going to take the course where you do not get it ?

Mr. Sankey—If you do not know it you have got to find it. You have got to find the front and rear ends of the governing boundary line. Then you imagine the line joining this without running it.

Mr. J. Davis—I have had some worry in court about this very thing, and that is the reason I am very particular about it.

Mr. Sankey—The question all turns on this word “astronomic.”

Mr. J. Davis—Yes, that is it.

Mr. Sankey—If you say “on the same course” there is the difficulty. That is what occurred to me when the words were first written here, it was on the same course as it is in the Act before. Now that may be the magnetic or astronomic. That is a quibble lawyers could easily raise or surveyors. It would be the same course.

Mr. H. H. Gibson—“By astronomical observation or otherwise.”

Mr. J. Davis—If you say I have run that line by alternate angles, which is the more accurate way of dealing with it.

Mr. Sankey—I will tell you why Mr. Aylesworth raised the point with you, and he was perfectly right. It says he shall determine it by astronomic observation. If you do not fulfil the law as laid down in those words, he would be justified in taking the objection he did; you did not fulfil the requirements of the law.

Mr. J. Davis—The fact is there is not one in a hundred lines drawn legally in the country.

Mr. Gibson—You run it by astronomic observation or otherwise to secure that result. That is what we actually do. There is not one line in fifty run astronomically.

Mr. J. Davis—If you leave that astronomic course in, it will conflict with section 53.

Mr. Sankey—“Shall run such division line as aforesaid on the same astronomic course.”

Mr. Gibson—“By astronomic observation or otherwise.”

Mr. Jones—I do not see the object of defining the method of doing the work where there are three methods left open.

Mr. J. Davis—You have it perfectly there, as to what the surveyor shall do ; he is the best judge.

Mr. Sankey—“ Shall run such division lines . . . by astronomic observation or otherwise as he may see fit.”

Mr. Gibson—That is what we do anyway. That will be it.

Mr. Jones—If it is left the way Mr. Sankey had it the lawyers are not entitled to ask that. The Act, they will say, has left perhaps two or three courses open. You are working for one side, you have taken a certain course in which to do it. You have measured over, angled up. I have a surveyor here who has made surveys in accordance with the Survey Act, and he may say I have a surveyor on my side who has taken it the best way, that is by astronomic course, the first way mentioned in the Act. I think we are emphasizng something to the lawyers that would be better left out altogether.

Mr. Sankey—Here is a point in which we will create difficulty. A surveyor is employed to run a line, and we will say he has a client in the district he lives in, and he does not want to put his client to any unnecessary expense, and he goes to work and angles up and measures across, does not even angle up to the governing line to the two points, and some five or seven years afterwards a dispute on the land comes up, and the surveyor does not hear anything about it, and a third surveyor makes an astronomic observation, and the next thing he hears it is overthrown. He says my method is correct ; but he may not have been as careful in his chaining as he should have been. If he thought there would have been a law suit he would have taken the astronomic observation.

I have put in “ shall run such division line or such line on the same astronomic course, determined by astronomic observation or otherwise.”

Now we go on to the next part of the same section, “ or, if the line ” [reads]. The old Act does not say very clearly the two ends shall be joined. In does not make it very clear.

Mr. Davis—You say it is absolutely necessary to join them.

Mr. Sankey—Yes.

Mr. A. R. Davis—What do you infer from that ; we must actually run that line out ?

Mr. Sankey—I am taking the front of the concession where we have to run a line at an angle to the front of any concession or other line which is not straight. Then the ends of such line shall be drawn

as provided above. That is the two extreme ends of the line shall be joined, and you run your line in the requisite angle to that straight line, not to whatever variations of the line may exist within its course.

Mr. Niven—What did you do as to the proposed running the sectional system on the astronomic course? Take the sectional system altogether?

Mr. Sankey—That matter was left for further consideration. We have got some diagrams here.

With regard to the registered plans, the proposed amendment to the Registry Act: "Whenever any land is surveyed and subdivided," [reads]. In discussing the matter with Mr. Scott, he said: "It is very little more expense and very little more trouble to write the front width on each lot." He added that himself: "The width of each lot" [reads]. He has also suggested that we add a clause to insert on the plan what the governing line used for each block is or for the whole plan, if only one governing line is used. For instance, we say Yonge Street taken as north ten degrees west is the governing line of this plan, or block so-and-so.

Mr. Gibson—And between such points as defined by such monuments?

Mr. Sankey—That is the clause we want to add in.

Mr. Gibson—As defined by monuments. Then it is fixed.

Mr. Sankey—It says such information as shall show the course. Regarding the compiled plans we have the next two important things. This would be an amendment to the Registry Act [reads]: "Unless the Inspector of Registry Offices orders a plan by the Registrar."

Mr. Scott said that would entail great expense. If he shows the deeds to the surveyor, he can make such extracts from them as he deems necessary. If he requires copies he should make them at his own expense, but the Registrar is to exhibit the deeds; it is not to rest with the surveyor to make a selection of such deeds as he deems necessary. It is the Registrar's duty to do that. The point is he is not responsible for what is put on, other than what is found on registered plans. If the surveyor is to be responsible he has got to hunt through hundreds of deeds to find the right one, whereas this has defined, the Registrar shall show him the deed he requires to put in the plan, and then the surveyor shall take from it such information as he may deem requisite. [Reads down to "from actual survey."]

Mr. Gibson—Do we understand from that we have to go down and survey it?

Mr. Sankey—Certainly.

Mr. Gibson—You would have double lots all over the town.

Mr. Sankey—You have got to go around the boundary of each registered plan.

Mr. Gibson—And the railway lots are all covered by deeds.

Mr. Sankey—This clause was provided to comply with the desires of a large number of surveyors that plans of this kind should be very accurate.

Mr. Jones—If you are making a plan of Toronto ordered by the inspector you will have to show on that plan not only every lot, but if 10 feet had been sold off a lot.

Mr. Sankey—Not unless the Registrar hands you the deed and says he wants you to show that covered by that deed. Where a plan is registered according to this section, first of all you show the outside boundaries under such registered plan as they appear on the ground by lines and measurements in black, then in case they differ from the boundary shown in the plans and deeds of record [reads down to “in some other color”]. It may be fixed by the walls of houses or streams or original boundaries.

Mr. Ross—It may be the fence is not right and the posts were put in roughly and not supposed to be the correct boundary.

Mr. Sankey—The surveyor has to use his own judgment as to that. But he goes on the ground and finds certain streets and certain blocks are bounded by fences and houses and occupied in that way; those are clearly the boundaries of that property as they appear on the ground. He is only bound to say he found them there.

Mr. Ross—I do not think that would work very well. As to the Registrar he is supposed to show all these deeds without any fee.

Mr. Sankey—Yes, but not to give copies of them.

Mr. Ross—At present it is undefined, the Registrar can charge what he likes.

Mr. Sankey—The surveyor has to search now and select the deed himself.

Mr. Jones—It rests with the Registrar as to the amount of details that shall be put in.

Mr. Sankey—Except as to registered plans.

Mr. Ross—That would work all right with some Registrars; some are particular, but with others it would be another thing. I think the surveyor ought to make a good plan whether the Registrar wants it or not.

Mr. Sankey—The compiling of those plans is compulsory, it is not in his option.

Mr. Gibson—Yes, but it is a little ambiguous as to the work you have to do. The question is whether you have only to put on the plans already registered.

Mr. Sankey—Then one other clause, “When the Registrar” [reads].

Mr. Jones—It may be a combination of the two plans. I suppose the title would simply have to be changed to a certain part of the plan.

Mr. Sankey—I do not think it would be a combination of the two ; it is one or the other.

Mr. Jones—What I mean is, supposing that the inspector considered it necessary that for a certain section of a city or town that the simple compiled plan in accordance with that section would do, and for the other part of the town that the other section would apply.

The President—The sections respecting municipal surveys are not important, and I think the best thing we can do is to hand them to Mr. Kirkpatrick who is busy drafting some new clauses respecting municipal surveys.

There is one other section that has not been touched on, Mr. Sankey told me, respecting sectional surveys. The one under the present Act, clause 52, refers to sub-division into sections of townships surveyed according to the Order-in-Council of March, 1829. There are some few townships that have been surveyed or laid out in a different manner from the ordinary typical Algoma township. They are laid out in the same way as the townships in Manitoba and the North-West and numbered in the same way. Some surveyors have been in the habit when called upon to run sectional lines of running those lines as they are run in Manitoba and that is prescribed by the Dominion Lands Act, but that is not the method according to the present Act as it stands. It is now a question whether we would amend our Act to conform with the Dominion in that respect or leave it as it is.

Mr. Niven—What part of our Act speaks of this ?

The President—Section 52. I do not know whether it applies to that kind of township or not.

Mr. Niven—We do not understand that to mean 36 sections in a township.

Mr. Jones—We could have a clause defining how they should be run then. It should be the same as in the Dominion Surveys.

Mr. Niven—Do you find anything there with reference to this Order-in-Council, section 52, in that Act? I drafted a clause, section 52, according to the Order-in-Council of 1829. I just happened to see the diagram there at the door. Take those upper two concessions. That refers to the sectional system that is referred to in this section 52. Now I am called upon to run a line between 9 and 10 in the second concession up there near the west corner. As the law stands now I have to go down to five and six side road and run that line through, across those two concessions, to get the bearing, and then angle up or take an observation at 9 and 10 and run the line. In a new country as it is in Muskoka and Parry Sound and Nipissing District and in Haliburton and also in Hastings, those back townships, the country is nearly all bush and there is more work connected with getting the bearing than there is in running the line. I have found it so in practice there for the last 25 years; and what I proposed here years ago, I have never been able to get everybody to see as I see it, but the longer I have looked at the matter the more convinced I am, what I want is the correct way of doing it, that is to go to 9 and 10 and take an observation and run the line on the astronomic course given on the plan of that township; and not to bother with 5 and 6 at all.

Mr. Gibson—You have to do that now.

Mr. Niven—I propose to run all the lines in the block on the astronomic course given on the plan. It is necessary to take an observation first, and it is not necessary to have an observation at every lot. You can take an observation at one point and carry your line from one point to another; it would be far less labor, less expensive and better, I contend, in every way. At the present time a poor man cannot afford to have his line run, and if it were my way it could be done for half the expense.

Mr. Gibson—And more correctly too.

Mr. Niven—Yes. Another matter, suppose you go to five and six and you have a difficulty in finding the bearing. Go down across that block and perhaps there is nothing there. Perhaps there is a section of country that has all been burned over and you cannot find blazed trees, posts or anything else. What are you going to do then? Then you have to go farther south and you have more work there, perhaps have a week's work before you can do anything. By this time you get discouraged and say, "I cannot do it at all." I will give you a practical instance. In the County of Hastings, five or six years ago, in the Township of Farraday, I commenced to get the bearing across a block; the lots are about $1\frac{1}{2}$ miles across. The snow was very deep and we worked the whole day, and did not get the depth of one concession. The men said "This is intolerable, we cannot stand this." I said I know it, but the law compels me to do

this, or otherwise I cannot run your line properly. Well, they said, whether it is run properly or improperly we are not going back any more, and so everybody went off that night. The man was in a great state to have his line run, and I said, "Well, I will give you a line, I do not know whether it will be exactly on the same course as that or not, but if it is not it should be," and I set my instrument up that night and took an observation, and next morning ran his line, and I believe it will be a better line than the other one. There is not a surveyor in the room who does not know what I am saying occurs in his practice, and I think it would be much better to take an observation in those cases. I do not propose to go into the old settled parts of the country, up in the County of Perth and Huron where that system prevails, or some other place, but to go into the new districts, take Parry Sound and Muskoka, all that part of the District of Nipissing south of French river and the Mattawa river, the County of Haliburton and the north part of Hastings, Peterboro', Renfrew and Frontenac and down there, all those townships in which there have not been very many lines run, and I think it would be a great boon to the people there to have a survey performed in that way. In talking over this matter with Mr. C. F. Aylsworth, who is a land surveyor and road inspector, a short time ago, he approved of the system strongly, and suggested that it should be brought into force, say on the 1st of July next, so many months after the passing of the Act, when the lines should be run in that way; and he suggested that every surveyor should return to the township clerk the lines he had run during that year so as to know whether a certain line was run under the new system or under the old. But the principle is what I am contending for.

Mr. A. R. Davis—I think Mr. Niven is quite correct in his statement that it is impossible for poor farmers in those rear townships to have a survey made according to the present regulations. They simply do not make the survey, do not call upon the surveyor. A farmer will come into my office and say, "How would you run that line between Lots 9 and 10," in such a concession? Well, I explain to him what the law calls for, as Mr. Niven has explained, and he says, "That will take you a week, and while I am quite willing to bear the expense of a day or two I cannot afford to have this survey made," and he drops out. And we all know that it takes more time to get the bearing, and get started at the actual survey than it does to make the survey. If we could change our law, modify it so as to make it possible to take the observation then, and perform the work, it would simplify matters materially, and be in the interests both of the surveyor and the public.

Mr. Foster—That would not interfere with the former section of the Act we have been discussing as to the astronomic course?

Mr. Niven—No, no; in certain townships you would run them on the astronomic course given on the plan of that township.

Mr. Gibson—Add to that, “ It shall be applied in case of certain districts.”

The President—The difficulty is in specifying or limiting or pointing out the districts where this is to apply.

Mr. Niven of course is acquainted with Haliburton and east and west of that, but how far shall that extend east or west? I think that is the difficulty and it would take some little time to settle.

Mr. Niven—I can tell you exactly. The idea is not to go into the old townships. Take for instance the counties of Perth and Huron, they were laid out on that system.

The President—Take the township of Oldham.

Mr. A. R. Davis—It would come under the system Mr. Niven recommends. There are no fences, fire has gone through and the monuments gone.

The President—What would you call Sherbrooke?

Mr. A. R. Davis—You cannot draw the line at a certain part of Sherbrooke. Take the township of Burgess, an old township, and it is as broken as these are.

Mr. Niven—Follow me for a minute. In the Muskoka and Parry Sound Districts, all that part of the District of Nipissing south of the Mattawa river and the County of Haliburton, three townships in the north part of Victoria, and three or four in the north part of Peterboro', and a number in the north part of Hastings and Addington and Renfrew, keeping away from the Ottawa river where there has been a great deal of surveying done, which would likely conflict with others, take all the new territory.

The President—I think I would keep within the county limits. I would not like one part of a county to be laid out in one way and another part in another.

Mr. Niven—There are counties where there are two systems of surveying. Take the County of Addington with double front concessions on the front and sectional system in the rear.

I propose to add a sub section to section 52: “ Provided that in the following townships,” then enumerated, “ the lines between all lots shall be run on the astronomic course given on the original plans and field notes thereof, of said townships, of record in the Department of Crown Lands.”

There will be the townships I have mentioned. As I said before, we do not propose to go into old districts, take Perth and Huron for instance where the old lines have been run, but restricted to the new country where there have only been a few lines run. You can take the whole district of Parry Sound and Muskoka, and the greater part

of the district of Nipissing south of the Mattawa river. It would not apply to the 640 acre system, leave that alone. It would take a part of the Provisional County of Haliburton and parts of Victoria, Peterboro', Renfrew, Hastings and Addington, and part of Frontenac, and keep away from the Ottawa river.

Mr. A. R. Davis—I consider Mr. Niven's proposition a good one, the clause he intends to add to 52. I think it is good in certain cases, but is it wise to make the thing obligatory? Suppose you take that side road between 5 and 6, there may be cases where the country is not all wilderness—sometimes it is open and the lines well defined on the ground—and you are called upon and go 40 or 50 miles in back, and run that line between 6 and 7, and it may be cloudy weather and it may not be convenient for a surveyor to wait to make an observation, would not it be well to let him run it in the method we have adopted in the other cases? Why make it obligatory to take this observation?

Mr. Niven—I have thought of that, but if you do that you will have the surveys conflicting, because it will not be perhaps in one case in ten where you find the side road exactly according to plan, and if you adopt that you will have to take one system. It is a little hard perhaps in such cases as Mr. Davis mentions, and I have known such cases, too, but they are not many, and you will observe that a surveyor as soon as he gets a start in a neighborhood, it is not necessary to take an observation for every line, because he can keep his points and carry his bearings from line to line from one part of the country to the other. There is little difficulty there. That was an objection that Mr. Kirkpatrick urged eight years ago, but Mr. Kirkpatrick has come down to the time and he thinks it will work all right in the new country. [Reads draft amendment.]

Mr. Jones—There is nothing there about the astronomic observation. He can run the line, as we discussed in the other section, as long as he gets the astronomic bearing. It is not necessary always to take an astronomic observation.

Mr. A. R. Davis—I second the motion. I see Mr. Niven's explanation of the fact, having once taken an observation in one of those concessions, that the observation would apply for perhaps all the lines for a long distance throughout that concession and the adjoining concessions. It is necessary to have one observation; and then the difficulty pointed out here disappears largely; while it may be a serious grievance at one time, when it was cloudy for a few days just at the period he wanted his first observation, still afterwards having that first observation he carries it forward.

Mr. J. Davis—It seems to be open to avoid the matter by means of quibbles. If it says we are to do it this way, we are to run it by a

certain bearing, and it comes into court, and the question asked is, "What was the astronomic bearing, did you obtain it?" and we say we did not, we do not fulfill the conditions and requirements of the Act, and by leaving the thing open, by leaving it so we can run it by alternate angles or by this astronomic course it would do away with the difficulty. It is contended here there would be discrepancies between surveys. There would be that anyway. You would be making gore lots in every one of those side roads because they would not conform with the original bearing.

Mr. Niven—If you leave that optional you will never know how you are to run a certain line. It must be either one way or the other, it must be either parallel to the other line between 5 and 6 or on the astronomic course given on the line. You cannot have it both ways. You may as well understand that first as last, and you must have an observation to run your line on the astronomic course. If you go into the neighborhood and four or five lines run all around you, one observation will do them all. It is not necessary to take an observation every quarter of a mile. And you have to take your chances, you can take a star or the sun. It is the most scientific way of surveying, but there can be no option in the matter.

Mr. J. Davis—If this passes we can have no option in the clause we discussed here half an hour or so ago.

Mr. Niven—It is a different matter altogether.

Mr. J. Davis—I cannot see any difference. If you are called upon to do work in a certain way, you must do it in that way. In the clause we were discussing a while ago, the line runs on the same course, making allowance for divergence of meridians, and you add the astronomic observation and put in the word "otherwise." There is no difference here, it seems to me.

Mr. Gibson—There is a great difference. A governing line was used there, but here this is not the case, no governing line at all. That is the difference.

Mr. J. Davis—Will you please tell me how there is no governing line. Say on that side road between 5 and 6, suppose you are called upon to find a stake between 5 and 6 that the meridian was taken from, and find one between 5 and 6 on the other concession and the country is cleared out, some man has patched it up, do you mean to say there is no governing line?

Mr. Gibson—The real fact is this, you do away with the governing line in the last case; you do away with it entirely, do not require it at all, do not care whether it is there or not. In fact it is better if there is not one there.

Mr. J. Davis—Why not admit this system all over?

Mr. Gibson—It is only intended for the new townships.

Mr. Jones—It would have been a good thing if it had been admitted originally, but we have to face the conditions as they are.

The President—It would be well to pass a resolution authorizing the incoming Council to press this legislation or appoint a small sub-committee, for it must be attended to at once. If the Association would authorize the committee that is already appointed to bring it before the Legislature at once, it would be a good thing.

The Secretary—The responsibility of it should be left with two or three, since we have the whole affair boiled down. A special committee of the whole Association could bring about no result, and what we have to do is, not to decide what is to be done, but how it is to be done. I think a motion would be in order to form a small committee, who would make it a personal matter and use the best ways and means in their power to bring about the desired legislation.

REPORT OF COMMITTEE ON EXPLORATORY SURVEYS.

MR. PRESIDENT,—Your Committee beg to report that they have had under consideration the important matter referred to them, viz., the desirability of a thorough system of exploration of our unoccupied domain. We deem this work desirable for several reasons referred to later on. In the first place let us inquire what has been done. Many years ago certain exploration lines were run north of Lake Superior, and at the same time a line was started from the Upper Ottawa to meet one started east from Michipicoton. We believe for some reason these never connected. The late A. P. Salter, O.L.S., also ran a number of base and meridian lines north of Lake Huron on which the subsequent surveys in that region were based. During the past five years an outline survey has been made along the line of the Canadian Pacific Railway from the townships of what might be called Eastern Ontario, starting near Spanish River Station and extending to the east boundary of the township of Haycock, near the Lake-of-the-Woods, a distance of near eight hundred miles. This survey serves all the purposes of a base line through this district, from which future subdivision or other outline surveys can be started. In addition to this, by means of it, all the previous surveys of townships, mining locations, town sites, etc., along its course have been located and tied on so that their exact positions can be seen by reference to the maps and field notes; also all railway stations, sidings, bridges and culverts and all mile boards are noted, so that in future any tie

line run to the railway and connected with any of these points will form a satisfactory connection.

For several years Alex. Niven, O.L.S., has been engaged on exploratory and outline surveys, first in the country adjacent to Lake Temiscamingue and later in running base and meridian lines in the Rainy River District, and during the past season on a line running due north between the Districts of Algoma and Nipissing, his objective point being the south shore of James' Bay. This line crosses the Canadian Pacific Railway about four miles west of Sudbury, and has been run to a point 132 miles north of said railway on to about latitude $48^{\circ} 30'$ North. The termination of this line is some distance beyond the height of land between the St. Lawrence and Hudson Bay waters, in a level tract of excellent land, and it will probably be extended during the present year.

Numerous other exploratory or outline surveys have been made at various times and in different parts of the country, such as Herrick's exploration of the north shore of Lake Superior, but your committee desire more to give expression to their opinion of what is demanded in the future than to give a history of what has been done in the past. In the first place it is their opinion that in advance of surveys proper, and especially of sub-division work, there should be a thorough exploration made with a view of ascertaining and classifying the various sections. For instance, certain sections, where it would be more profitable for the Province to allow them to remain for their timber, should not be sub-divided or settlers allowed to locate, but be preserved for the produce of timber. Again a mineral section might be profitably surveyed on a different system from that of agricultural land. There is no question that our unexplored country to the north and west is rich in minerals.

The forests also may, if a proper system of cutting and preservation is adopted, continue for all time a great source of wealth to the Province. There is no more reason why the soil adapted to the growth of timber should not continue to bear its successive crops if good forestry methods prevail, than that the soil adapted to the growth of the cereals should be confined to one crop.

But in order that the work which we as surveyors are called upon to perform in this new region may be in the public interest, it is necessary that the Government be possessed of sufficient knowledge regarding the various sections of that vast region to enable them to know what sections should be opened up for agriculture; what parts should be sub-divided for mining purposes; and also what districts should be preserved for the growth of timber.

Again, with such knowledge they would be in a better position to know where it would be wise to project highways and assist in the construction of railroads, and this information can only be obtained by a thorough exploration of the whole country.

It is but a comparatively short time since this Province became the undisputed owner of the vast territory between Lake Superior and Manitoba, and extending as far north as, probably, it would be

profitable for her to go ; and our legislators are only now beginning to realize that this heritage may be worth looking after. Of course if it were of no value they would be justified in their past inactivity, but now in order that they may start right in opening it up, in order that the development may be undertaken in a systematic manner, and in a way where every dollar spent may produce the best results, it is as necessary that they should be acquainted with the character of all sections as it is that a farmer commencing on a new lot should know the character of all parts of that lot in order to proceed intelligently and profitably from the beginning. Heretofore we have been working in the dark, and in a manner resembling a farmer who, owning a two-hundred acre lot, had never considered it worth his while to examine the character of his possessions beyond the limits of his small clearing on the front of the lot. At the present time we hear of three or four projected railways to James' Bay, but with our present limited knowledge regarding the character of the country, is it possible for our rulers to say which, if any, of these will pass through a country which it would be profitable for the Province to expend money to open up.

For these and other reasons that might be given, your committee feel that they are more than justified in asking the Association to use its influence in the manner that we have indicated.

E. STEWART,
Chairman.

DISCUSSION.

Mr. Stewart—Although those recommendations may not bear fruit immediately, I think from our experience in the past there are several suggestions that have in time been adopted by the Government, and I remember several years ago making a motion in this Association regarding exploratory surveys, and a committee was appointed and waited on the Commissioner of Crown Lands, and I think Mr. Niven's instructions this year were just on the lines we proposed. We proposed that in making these exploratory surveys the surveyor be accompanied by men capable of judging what was good mineral land and recording timber and also agricultural land, and though it is several years since, I think that our labors then have borne fruit.

Mr. Kirkpatrick—A geologist accompanied Mr. Niven this year, and I believe he brought back a number of specimens, quite a large variety, and they have been handed over to the School of Practical Science to Professor Coleman, and probably his report will be published in the next Report of the Bureau of Mines. I have not myself seen the report, but it will no doubt be published and will bear fruit in that way. The object was to see what was the extent

of the Huronian formation in that northern region, because I believe it is a well known fact it is in the Huronian formation the principal gold-bearing rocks are found.

Mr. Niven—I think some of the suggestions I heard in the last part of the report are all right. Some exploration has been done in times past that has not been productive of much good. For instance, a line was run from the Montreal River, away west towards Lake Superior, and also one from Lake Superior easterly to meet that one, and they never met. They ran simply a line and it is pretty hard to find now, but I found it this year where I crossed it. I found several places where there is an angle of 30 degrees from the line. I think with the lines they should run proper base lines, meridian lines, and also east and west, and plant posts at every mile and iron posts at every three miles, that is the proper method of doing it, for then we have something definite to go upon, either for timber locations, or townships if necessary, or mining locations. No doubt there is a certain amount of exploration necessary; at the same time, if a country is blocked out in that way, by base lines at stated distances apart, we will soon get a better knowledge of the country than we have at present. Our knowledge of that part of the country is very limited. Last year there was a geologist attached to the party and he went about as far as he could from the line, brought down a certain number of specimens of rock, but I have not heard yet as to what they contain. There was no mineral visible at any time, at least we saw no gold. If the geologist found any gold we did not know of it.

The President—Did you cross the height of land before you got out of the Huronian rocks?

Mr. Niven—We were in Huronian rocks after we crossed the height of land.

The President—How far past the height of land before you get into the level country?

Mr. Niven—I think it was about the 65th mile of my 100 that we crossed. That would be about 95 miles north of the Canadian Pacific Railway.

The President—How much farther did you go?

Mr. Niven—We went 100 miles; 132 miles altogether from the railway.

The President—How much of it was in level country?

Mr. Niven—The last ten miles was in very level country, and as far as we could see from a little elevation, from men climbing a tree, was level as far as the eye could carry. An Indian told me it extended far. Timber was spruce, tamarack, white birch, poplar, balsam of

gilead, and so on, very large timber, clay land, and covered with a black mould, beautiful farming country. How far that extends I cannot tell, but it appeared to extend a long way, and I was told by the Indian and a white trader I met a short distance down, that it extended a long way north.

The President—On what waters were you then ?

Mr. Niven—We were on the waters that flow into the Mattagami chiefly. This line extended north to Lake Abbitibi, and this would run parallel to it, although some distance east, as far as James Bay. That is as far as we know from the plans we had.

The President—Is it the intention to go on with that this year ?

Mr. Niven—I cannot tell you. Probably somebody else could tell you better than I can.

Mr. Kirkpatrick—The Province would have been in a bad situation if they had not had those meridian lines running through the Rainy River District.

REPORT OF COMMITTEE ON CIVIL ENGINEERS'
BILL.

GENTLEMEN,—This Committee has nothing to report, as the Canadian Society of Civil Engineers has not as yet applied to the Provincial House for an Act of incorporation. The Bill introduced into the Quebec Legislature to incorporate the Civil Engineering Society was withdrawn at its second reading. A copy of the Manitoba Act of Incorporation is in the hands of the Secretary.

WILLIS CHIPMAN,
Chairman.

DISCUSSION.

The President—Last year, as you will see from the Proceedings, page 180, in the Notes of Council Meetings, a deputation from the Canadian Society of Civil Engineers, composed of Sir Casimir Gzowski, Messrs. Allan Macdougall and M. J. Butler, was received by the Council. A copy of draft of proposed bill to incorporate that Society was presented, Sir Casimir Gzowski and Mr. Macdougall explaining at length the objects sought. The Council afterwards

appointed a special committee to discuss the bill and to report. (See page 6.)

I do not know whether that committee has ever reported or not, but we drafted a report in which we stated that we did not consider it advisable to take any action whatever at present, as the Canadian Society did not intend to bring in any bill at this Session of the Legislature. A similar bill was presented in the Quebec Legislature, a copy of which we have, which bill was withdrawn at the second reading, owing to some opposition from the land surveyors of that Province. That is all we have to report.

Mr. Stewart—What did they ask? What were the provisions?

The President—It is a close corporation.

Mr. Stewart—Did they wish to amalgamate with our Association?

The President—No.

Mr. Stewart—Why did they come to you?

The President—They came to us to allay any opposition. That was the main thing, and they desired to have the bill drafted in such a way as not to interfere with our Association if they can.

Mr. Stewart—What do they propose practising? Land surveying?

The President—No. We have copies of both bills here.

REPORT OF COMMITTEE ON DRAINAGE.

Parliament Buildings, Toronto, Canada, 5th November, 1895.

To Willis Chipman, Esq., O.L.S., Chairman Special Committee on Legislation, O.L.S. Association, Toronto :

DEAR SIR,—We, the members of the Special Committee on Legislation, O.L.S. Association, to whom was assigned on August 1st, 1896, the duty of reporting upon the question of proposed amendments to the two Drainage Acts of 1894, beg leave to report as follows:—

Each and every member of the present Drainage Committee as well as a number of the members of former Drainage Committees of this Association have been requested to offer suggestions as to pro-

posed amendments of the Drainage Acts, and replies having been received from several of them, we find that the prevailing opinion of those who have replied is that no radical changes should be made to either of the Acts at the present time, they having been in force for only a comparatively short time.

A meeting of the Drainage Committee having been summoned for to-day for the purpose of considering suggested amendments and to submit a report to your Committee on Legislation, and none of the members excepting the Chairman having been able to attend, we think it advisable that nothing further be done in the matter until the next annual meeting of our Association, when any proposed amendments can be submitted by the Drainage Committee to the Association in time for action to be taken thereon by the Legislature at its next session.

T. HARRY JONES,

B. J. SAUNDERS.

DISCUSSION.

Mr. Jones—There is no report. Mr. Saunders presented a report at the meeting held here in December, a short report, the substance of which report was I think after a great deal of correspondence with different members of the Drainage Committee and others interested in drainage, that it would not be advisable to recommend at the present time any changes in the law.

The President—Shall we consider this the report or shall we draft a new report ?

Mr. Jones—I understand no members of the Drainage Committee are present at this meeting.

REPORT OF COMMITTEE ON TOPOGRAPHICAL SURVEY.

MR. PRESIDENT,—Your Committee on Topographical Survey begs to report as follows:—

Confidence, we are told, is a plant of slow growth. So it is, and so it should be if progress is to be made on a solid, sound and lasting basis.

Of all the aspirations and endeavors of the Association, none is more important for the use, benefit and convenience of mankind, and at the same time more difficult to attain than a topographic survey.

The usefulness—permeating all classes of the community—has in former years been fully set forth. It would appear that the course now to pursue is to bring it annually before the Provincial Govern-

ment, supported by work of that nature being done in all other civilized countries. The primary triangulation, as stated in former reports, should be undertaken by the Federal Government.

Right here it may be stated that during the past year was issued the "Report of the Geodetic Survey of South Africa during 1883-92," under the direction of David Gill, Her Majesty's astronomer at the Cape. This triangulation survey extends from north of Natal, in latitude 27°.30' S., through the colony of Natal, Griqualand East and Cape Colony, besides a chain of triangles to Kimberley, and one through Bechuanaland. Surely this is an object lesson for Canada, that claims the pre-eminent place in Greater Britain.

I cannot refrain from quoting the Directors: "Indeed, the influence of the Geodetic Survey has made itself felt by raising the whole tone of survey operations in South Africa. Strongly as it was at first opposed, and grudgingly as it was maintained, its advantages are now fully acknowledged, and by none more warmly than the Surveyors-General of the Cape Colony, Natal and Bechuanaland." It is hoped that this further evidence will be another step towards the desired goal.

It is expected to extend the South African triangulation northward to the mouth of the Nile, thereby covering 65° of meridional arc, say 4,500 miles!!

Quoting again Dr. Gill: "Such a continuous chain of triangulation would afford to every traveller, explorer and surveyor points of departure which would give to his labors a precision and value that could be reached in no other way."

To the frame-work of the primary triangulation will be attached the topographic survey, the benefits of which are more readily discernible by the people than its necessarily preceding triangulation.

During the past year, in connection with the survey of the north shore of Lake Erie, a temporary observatory, with permanent pier, was erected at Port Stanley, and observations for latitude and longitude made. This point or its vicinity is suitable as a triangulation station.

Preliminary information and data with reference to the location of primary triangulation stations in Western Ontario have been obtained.

Recently, as stated in *Science*, the Ohio Academy of Science has taken steps to secure favorable action by the next Legislature for establishing a topographic survey of the State. It may be mentioned that Ohio has already primary geodetic stations.

Now, your Committee would suggest that a committee, armed with recent geodetic and topographic work, again wait upon the Commissioner of Crown Lands, and urge the inauguration of a topographical survey.

Perseverance is the price of success.

All of which is respectfully submitted.

February 20th, 1897.

OTTO J. KLOTZ,
Chairman.

DISCUSSION.

The President—I am sorry the Topographical Committee did not get some actual work done. While I was chairman last year we interviewed the Government and they promised to take the matter into consideration, at least Mr. Hardy did, but the matter was dropped by us through press of business. I had no time to attend to it and it appears no one else had any time. The question was dropped entirely, and soon after Mr. Hardy was promoted to the Premiership, and the matter, I suppose, is dead until it is resurrected again by us. Mr. Klotz is undoubtedly well fitted for the chairmanship, and I think perhaps during the coming year he may have time on his hands so he can bring the matter permanently before the Government. I have no doubt the matter will be taken up in earnest by the Government at an early date, probably not until the next general provincial elections.

Mr. Gibson—No work of this kind has ever been done in Canada ?

The President—No. The Government has not undertaken even to look into the matter. Mr. Hardy was presented with enough reading matter to keep him busy for a month.

Mr. Niven—Perhaps he has not had the month to spare yet.

REPORT OF COMMITTEE ON LAND SURVEYING.

Your Committee beg to report as follows :—

That considering the fact that a Special Committee on amendments to the Survey Act will report at this meeting, the Committee remained in “*statu quo*.”

We would draw the attention of the Special Committee on Legislation to the following :—That the Registry Act be so amended as to establish a fixed fee to surveyors for the use of registered plans when making copies.

2. That where side lines between lots have never been formerly run by any surveyor, that the surveyor making the survey may determine the proportion of cost to each owner interested (having first given notice of survey to all parties interested). The cost of survey to be paid by the parties interested, or if not, then by the municipality similar to collections made under the Ditches and Watercourses Act.

We feel grateful to Mr. P. S. Gibson, O.L.S., and Mr. H. L. Esten, O.L.S., and Mr. A. P. Walker, O.L.S., for their papers on

“Sectional Surveys,” and “Head Notes of Reported Land Cases,” and “Natural Boundaries,” respectively—as furnishing the class of paper fully in keeping with the aims of the Association.

We are sorry to say that very few questions have been forwarded to the “Question Drawer.”

All of which is respectfully submitted,

J. L. MORRIS,
Chairman.

QUESTIONS.

R.S.O., Cap. 152, Sec. 50. If any division or side line between lots, or *proof line* intended to be on the same course as the division or side lines between lots, was drawn *in any such concession*, bounded as aforesaid, in the original survey thereof, the division or side lines between the lots therein shall be on the same course as such division or side line or proof line.

Question 1.—The wording of above section would indicate that only in some concessions having proof lines, can these lines be taken as governing lines. Will the Committee kindly define *such concessions*?

Answer.—Such a concession is described in section 49.

Question 2.—Some townships surveyed shortly after the Order in Council, 27th March, 1829, were not surveyed exactly in accordance therewith. That is, instead of having all the section lines run only a few of the side-roads were run and called “proof lines.” In these concessions would you take these proof lines as governing lines after the method set out in Sec. 51 of the Act, or would you disregard them altogether?

Answer.—If survey made in accordance with instructions, the side-roads run would govern. If not run in accordance with instructions, would not use them to govern other lines.

Question 3.—In 1834 there was a village surveyed and laid out in town lots along the lake shore. The company that had this work done would never sell the lots, but leased them for a term of years. At one time this was a flourishing village, but there is now no trace on the ground that there had ever been such a place. But the lots have been on the township treasurer's books and on those of the local registrar and have been a source of annoyance ever since.

The portion of the village not included in the beach and roadway has been incorporated into the surrounding farms. Is it possible to have this survey retraced and ascertain what farms contain certain lots and thus get the taxes thereon.

The plan is neatly made to scale and measurements given, but

there are no bearings given, nor any starting point, no township lots mentioned, nor such lot lines shown. But there is a ravine and creek in the centre of it (the village), which is there still, there is also a given road back to Talbot Street, which road is still there and is supposed to be where it always was. Would it be possible with this data to re-stake it in accordance with the plan and get the required information ?

Answer.—No data for a re-survey.

Yours respectfully,

ANGUS SMITH.

DISCUSSION.

Mr. Niven—The first question has been settled. The second one is this : “ Where side lines between lots,” etc. [Reads.]

Mr. Foster—I do not see how they could make a municipality pay for a private survey of any party. As to dividing up the cost of lines this is an old matter, done every day. I have done it in a great many cases, done it by consent merely, and I have no legal authority for it either, and as to putting any cost on a municipality for a private line, I think it is simply an impossibility.

Mr. Davis—I think that is true as far as the municipality is concerned, but I do wish we had some clause in our Act that would compel parties to pay their proportion of the survey. There are people who sponge, they are willing to have the survey made, and encourage it in every possible way, but you make the survey and they will get out of paying a cent, and it is as much an advantage to them as to the neighbor, and I think that that should be covered, whether just in the words of the recommendation in the report or not, is a question, but there is a difficulty there that should be met.

Mr. Gibson—I think the present system is the best. I go and make a survey for parties, I wish to stick to the man who employs me ; but if it is divided up amongst the crowd they may not pay. If I, by law, had to take it proportionately I would not do the surveying.

Mr. Davis—Do you not find a farmer very often does not have a survey made, because he has to pay the whole expense of it ?

Mr. Gibson—Yes, but if you had to get your pay out of four or five farmers you would not get it at all. Of course if the public insists we are similar to the case of Ditches and Water Courses Act we could understand it. But in the case of a line between parties it is a different thing altogether.

The President—I think it is too late now, it will have to go to the Legislative Committee. It may come up on the next revision or next year.

REPORT OF THE ENGINEERING COMMITTEE.

MR. PRESIDENT,—Engineering work has for several years been quite inactive, and while your Committee cannot find that the prospects indicate any revolutionary change, the outlook promises a healthy development in lines which will require the services of the engineering profession. This is especially the case in municipal branches. The present tendency is for the towns and cities to increase in population more rapidly than the country districts. This together with an awakening knowledge on the part of the public of the value of waterworks and sewers, is gradually producing a condition in which all towns of any pretensions will demand these public works. The installation of municipal electric systems is a feature which promises to develop. A better class of pavements and improved streets is a branch which will add to the opportunity of the municipal engineer. While the tendency in the past has been to employ the services of the engineer for the first construction of these works, it is further beginning to be felt that a salaried and permanent town-official is necessary to look after their proper maintenance.

Mining engineering, in view of the gold discoveries in Rossland, B. C., and in the Rainy River District of Ontario, will create a demand for expert services; while if mining operations become profitable, of which there is every probability, it is likely that a number of railway extensions and spurs will be required.

Various electric railways have been completed during the past year, while others are projected. The Hamilton and Dundas street railway will soon be operated by electricity. The track is now laid with 65 lb. steel rails, and will be trollied early in the spring. From Hamilton to Dundas is the first stage of a line which, in the near future, is to be pushed out to Galt, only fourteen miles, and here the existing Galt, Preston and Hespeler road will be utilized to make the missing link to Berlin from Preston, a distance of eight miles; so that twenty-two miles of electric road will complete this chain, uniting Hamilton with a large number of villages. It is quite possible that this will be accomplished, and perhaps even Guelph be reached before the end of 1897.

What is believed to be the largest ditch in America has recently been completed. This drain serves the townships of Raleigh, Harwich and Pilbury, and was constructed at a cost of \$40,000, the work occupying two years. It is over ten miles in length, is 90 feet wide at the outlet, and tapers to 45 feet, and 9 feet deep. This class of work, which was commenced under the Drainage Act in 1883, is a field which will afford constant and increasing employment.

During the past year an exceedingly important link in the trans-continental system was completed—the Ottawa, Arnprior and Parry Sound Railway. This connects at Parry Sound with the lake grain route from the west. The road is practically an extension of the

Canada Atlantic Railway. At present freight is carried through to Boston, but by the building of 90 miles additional, chiefly in the Province of Quebec, Quebec city will be made the port of shipment. When completed the route from Duluth to Liverpool will be 800 miles shorter than by the lakes, Buffalo and New York.

A road is projected from Irondale Junction to Brockville, known as the Irondale, Bancroft and Ottawa Railway. This by an International Bridge across the St. Lawrence will connect with the New York Central Railway. When completed it will open up an important mineral and timber district in the northern portion of Hastings and Addington. Thirty-five miles of this road easterly from Irondale Junction have been completed, and about \$20,000 has been spent on pier work at Brockville.

Two important roads are advocated, known as the Nipissing and James' Bay, and the Toronto and James' Bay Railroads, each with a view to opening up mining and timber districts in the northern part of the Province; and creating a port on Hudson Bay, for grain transportation.

A feature of the past year was the successful issue of the effort to harness the power of the Niagara River, whereby power is now furnished the city of Buffalo from that source. The question of long distance transmission of electric power in an economical manner remains still to be solved; but should this be accomplished, the possibility of utilizing the water power at Niagara has been demonstrated.

Your Committee of 1896 recommended the consideration of enlarging the scope of the Association. A special committee on legislation was appointed to deal with this matter, thereby relieving your Committee of such work. Your present Committee desire, however, to place themselves on record as in favor of extending the scope of the Association on lines laid down by your Committee of 1896.

J. W. CAMPBELL,

Chairman (*pro tem*).

REPORT OF THE COMMITTEE ON ENTERTAINMENT.

MR. PRESIDENT,—Your Committee beg to report as follows: The annual meeting of the Association was held in the Association's Repository at the Parliament Buildings, Toronto, on February 23rd, 24th and 25th. This was the first annual meeting held entirely in our own rooms, which your Committee consider are quite suitable and convenient for the purpose.

Taking into consideration the number of members now engaged in staking out mining and other claims on the outskirts of the Prov-

ince, the attendance was extremely satisfactory. About 25 members were in attendance, and an interesting and instructive programme was duly carried out under the supervision of our worthy President, Mr. Willis Chipman

The annual dinner, held at McConkey's restaurant on the evening of the second day, was as usual one of the events of the meeting, and your Committee believe it was heartily enjoyed by all present. Owing to reasons given above and others, the attendance was not quite so large as on previous occasions, but your Committee are of the opinion that this was more than counterbalanced by the excellency of the speeches, and the good fellowship shown by the members present and their guests. While all the speeches were excellent, particular mention might perhaps be made of those of Messrs. E. Stewart, Aubrey White, A. W. Campbell and L. B. Stewart, and of the address given in pure Choctaw by Prof. Galbraith. Your Committee regret that the phonograph provided for the occasion slipped a cog at the moment when most required and failed to record this address for the benefit of the Association, and also regret that the two able translations furnished by Messrs. King and Aubrey White differ in some important particulars.

The chair was taken by the President, Mr. Willis Chipman, supported by the guests of the evening, Messrs. Aubrey White, Assistant Commissioner of Crown Lands, and Kivas Tully of the Department of Public Works. The vice-chair was occupied by Mr. T. Harry Jones, and Mr. C. E. King represented the Engineering Society of the School of Practical Science. Letters were received from Hon. J. M. Gibson, Commissioner of Crown Lands, and A. Blue, Esq., Director of Mines, regretting their inability to be present. The other members and their guests arranged themselves around the table as shown on next page.

After due justice had been done to the repast prepared by Mine Host McConkey, the chairman proposed the health of "The Queen," which was right royally received; and was followed by

Toast, "Canada," responded to by Mr. E. Stewart;

Song, "Bacon and Greens," Mr. Niven;

Toast, "Crown Lands Department," responded to by Mr. Aubrey White;

Recitation, Mr. T. Harry Jones;

Toast, "Public Works Department," responded to by Mr. Kivas Tully and Mr. R. P. Fairbairn;

Song, by Mr. Sewell, "Working on the Railway";

Toast, "Our Northern Heritage," responded to by Messrs. Tyrrell and L. B. Stewart;

Toast, "Board of Examiners," responded to by Messrs. Gibson and Sankey;

Toast, "Good Roads," responded to by Mr. Campbell;

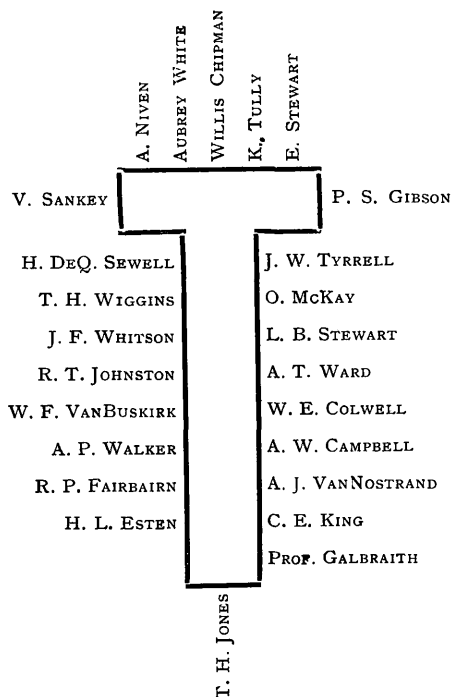
Toast, "City Engineers," responded to by Messrs. VanBuskirk and Wiggins;

Toast, "School of Practical Science and Sister Societies," responded to by Prof. Galbraith and Mr. King;

Volunteer toast, proposed by Mr. A. White, "The Association of Ontario Land Surveyors," responded to by the President;

Volunteer toast, "The Entertainment Committee," responded to by Messrs. Walker and Van Nostrand;

Toast, "The Ladies," responded to by Mr. Esten.



The toast list was agreeably interspersed with numerous selections on the phonograph, under the able supervision of Messrs. Colwell and Ward, to whom the especial thanks of your Committee are due.

Your Committee are glad to be able to report that with some little financiering the receipts from the sale of the dinner tickets has been found to just cover the expenditure. A statement of the receipts and disbursements has been filed in the office of the Secretary-Treas.

All of which is respectfully submitted.

A. P. WALKER, *Acting Chairman.*

PRESIDENT'S ADDRESS.

GENTLEMEN,—From 1886 to 1894 it was the privilege of the President to deliver two annual addresses, but this is the first time that the duty has devolved on the President of delivering two addresses within two months.

Since our last annual meeting death has removed William Haskins, of Hamilton; Alfred Howitt, of Gourock; James Robert Peddle, of Doon; and Augustus Clifford Thomson (withdrawn), of Chicago.

Obituaries of Mr. Haskins and Mr. Howitt will be found on p. 182 of the Proceedings.

Owing to the enforced absence of many of our members in North-Western Ontario, who are doing their part in developing the natural resources of the country, the attendance at this, our twelfth annual meeting, may not be equal that of former years, and some of the Standing Committees may not be able to present reports. Those present should, therefore, make additional exertions to make this meeting equal in interest to that of any preceding meeting.

The work of the Committee on Legislation has been the most important of the year. Your further attention will be called to this matter. Prompt energetic action is necessary at the present juncture.

The reports of the Special Committees will be found of more than ordinary interest. The problems being grappled with by the Committees on Polar Research and Exploration in Ontario are gigantic, and too much should not be expected in immediate results.

I will conclude by welcoming you to this the twelfth annual meeting.

WILLIS CHIPMAN, *President*.

P A P E R S .

[This Association is not responsible as a body for any opinions expressed in its Papers by Members.]

REMINISCENCES OF AN OLD SURVEYOR.

By CHARLES UNWIN, O.L.S.,

Toronto.

1847.

I commenced to learn surveying in June, 1847, with the late John Stoughton Dennis, of Weston, but was not under articles until the following November. Mr. Dennis had a good country practice, as well as his city one in Toronto. He was principally instrumental in getting up the Institute of Surveyors, Engineers and Architects, from which has been evolved the Canadian Institute. Of this first named Institute he was acting as Secretary, and it was when posting a huge pile of circulars for him at the Weston post office that I first became acquainted with Mr. Thornhill A. Agar, the father of my nephew (the reader of this paper). Mr. Agar was clerk in the store of John Andrew Donaldson, late Immigration Agent, in whose store the post office was kept. We had many rambles in the country round Weston when business was over for the day, and quiet little suppers afterwards. Mr. Agar had but recently arrived from the Emerald Isle, so dear to its children as the "First flower of the earth, first gem of the sea," and he thought it necessary to go armed with a pitchfork when on our evening expeditions, for fear of wild bulls or bears attacking us. There are more "bulls" and "bears" on King and Toronto Streets in our fair city to-day than were within many lots of Weston then.

The first survey of any consequence which Mr. Dennis undertook after I went to him was one to make a map of the city of Toronto, then extending from the Don to Dufferin Street and from the Bay to Bloor Street. I believe that I personally measured all the houses and most of the sheds within these boundaries, with the exception of the New Garrison. Mr. Sandford Fleming plotted the notes and lithographed the plan, and a more beautiful piece of lithography would be hard to find; but, unfortunately, the plan was on too small a scale to be of much practical use—12 chains, or nearly 800 feet to the inch, or, including the border which showed the principal buildings, only the size of a pocket handkerchief of moderate dimensions.

I may say that Messrs. Scobie & Balfour, the principal publishers in Toronto at that time, had purchased the notes and undertaken to publish the map, and thinking that a small one would sell best, fell into the error of having it much *too* small, as above noted. I have a mutilated copy of the map and were it not so shabby should have much pleasure in presenting it to the Association, but it is in so bad a condition that it would be no great acquisition.

1848.

My first bush survey was assisting in laying out lots on the Indian Reserve on the north shore of Balsam Lake in the Township of Bexley. T. C. Prosser was the surveyor in charge. The survey was made under instructions from the Indian Department to John S. Dennis. I was desired to bring a row boat from Atherley to Point Mara. Now, a Roman Catholic missionary (a fine specimen of a Frenchman, fully six feet high and stout in proportion) also wanted to go to the same place, but there being no room for him in my boat I told him that if he could get another I would let him have a couple of my men to row him down. After a good deal of trouble he succeeded in getting a boat, but it was a very leaky one, and his Reverence had to abandon the book he was reading and bail for all he was worth to keep afloat till he got to the nearest island, where they upset the boat and then pulled back to the mainland as quickly as possible. In spite of this, the missionary, being a capital walker, got to Point Mara shortly after my party. We arrived at Point Mara about sundown and seeing an empty shanty near our landing-place took possession of it for the night, and a very lively night of it we had, as I well remember. Being much fatigued after a hard day's work we turned in shortly after supper and lay down upon some straw lying upon the floor of the shanty, in our innocence supposing it to be clean. We had not been lying down long before we found we were not the first animals which had made a bed of it. Our first intimation of its having been previously used was the sight of our cook, a young fellow of about fifteen, who had turned in first, sitting up in his sleep and picking over the straw as if looking for something. When I and the rest of the party lay down we could not sleep a wink; we felt something biting us and making us perfectly miserable, but had to grin and bear it until daylight came, when we found our shirts literally covered with fleas—and we had a most difficult task in getting rid of them.

We took our stuff from Point Mara to Balsam Lake with an ox team, a distance of about 14 miles, and had to brush out the road in many places to get the team through. On our arrival at the lake I was invited to take tea at Mr. Stevenson's. Mr. S was father-in-law to Admiral VanSittart, whose widow, I believe, owned the farm. It was quite a swell place with a squared log fence in front of it. I accepted the invitation, and although I was most cordially welcomed I was soon sorry that I had, for those horrible fleas had not been entirely got rid of, and all teatime I felt perhaps something like Job

of old when he took a potsherd to scrape himself withal, for the pesky things were very annoying.

We left the Stevenson's the following morning for the old Indian village, then deserted, and took up our quarters in one of the vacant log houses which the government had built for the Indians.

While on this survey I had my first experience of being lost in the bush. Mr. Prosser had given me a half holiday to go with dog and gun to try my luck at shooting partridges, which were plentiful in the neighborhood. I had not been long out before a covey was put up and I tried to get a shot at them, but they flew away before I had an opportunity. I followed them and tried again, and again they were off, and so on for a good many times until finally they had led me so far into the bush away from our line that I was completely lost, and a more miserable boy (for I was but a boy then) you could not imagine. I climbed a tree to try and find the houses in the village, but could see none—nor even the lake.

I thought my dog could help me out of my difficulty so tore a leaf out of my field book and wrote a note on it to the party intimating that I was lost and begging them to hunt me up, tied the note around the dog's neck and tried to drive him away thinking he would go to the rest of the party, but the little brute stuck to me closer than a brother. Finally Mr. Prosser came in search of me and took me to the line the men were opening—but of course they were cutting in the wrong direction! At any rate I thought so.

After the completion of this survey, we made one in the Township of Mara which was then nearly all solid bush. We boarded with a man named Parsons. There was only one room in the house, and what with Parsons, his wife, three children and our surveying party, to say nothing of a woman visiting there, it was pretty full. There were only two beds in the room; one of which, of course, was for Mr. and Mrs. Parsons and as many of the little Parsonses as could be crowded into it. Mr. Prosser and I were given the other. The rest had to sleep upon the floor. Our men, who of course slept in their clothes, were aroused in the morning by the woman visitor pulling the bedclothes off them. Our board was not the most recherché imaginable. It consisted of hard tack, salted cucumbers and boiled turnips. Whilst on this survey, fortunately for us, a poor old woman died and Mr. Prosser and I were invited to the wake and the funeral. We went to the latter which took place at Beaverton, then a small place but having at least one tavern; it was probably some 13 miles from the funeral's place of starting. The body was put upon a sleigh, although it was summer time, or fall, and no snow upon the ground, but there being no wheel carriages to be had in those days in Mara it was the best that they could do. One would imagine that the poor old lady would have been jolted out of her coffin going over the numerous pieces of corduroy road. We walked behind the sleigh to Beaverton and were frequently refreshed on the way by whiskey dealt out to us by the daughter of the deceased, a woman of about forty, who carried the crathur in a black bottle and gave it to us out of a tin pepper-box.

When the procession arrived at Beaverton Mr. Prosser and I dropped out and had a good square meal at the tavern—a thing we had not enjoyed for about six weeks.

1850-51.

In 1850 Mr. Dennis was employed in laying out parts of the Townships of Bentinck and Glenelg. We walked behind an ox-team which carried our possessions and camp equipage from Owen Sound, then a small village, to near where the Saugeen River crosses the Owen Sound road. I well remember remarking to Mr. Dennis as we walked behind some of the provisions that there was a horrible smell and that it was like a sewer. He replied: "You smell the pork you will have to eat the next six months, my boy."

On this survey I was given charge of a party for the first time. Two parties were run part of the time, Mr. Dennis taking one and I the other—one taking the concession roads and the other the side roads—each trying to be first at the intersection. At one time the snow was very deep and I urged my party to hurry up and beat the boss by being at the intersection first. They did their best and got to where the lines should cross late in the afternoon and we were surprised neither to see nor to hear anything of the other party. Having several miles to walk to camp we did not remain long waiting for them, and getting no answer to our repeated shouts started for camp. We had to walk the last mile or two by torch-light. When we arrived in camp we found the other party busy making snow-shoes from pieces of dry cedar. Mr. Dennis' men, most of whom were middleaged, found the snow so deep that they refused to go out, and decided to get some dry cedar and make snow-shoes for both parties. My men tried the home made snow-shoes, but said they would not wear them, preferring to break track in turns, which they did, but found it to be hard work. On our way to camp by torch-light one of my chainmen, an old and a very credulous fellow lately from the Old Country, had a nasty knock across the eyes with a branch, and one of the men told him that he saw fire fly out of his eye and the foolish fellow fully believed it, and frequently told people that it was a fact for so and so saw it.

Mr. C. L. Davies, my chief chainman, and I had a very unpleasant experience one night. A settler wished to show us some hospitality and invited us to sleep in his bed. We accepted the offer, but were horrified to find after we had got very comfortably asleep that he had crept in at the foot of the bed, and that his feet were sharing our pillows.

1851-52.

Part of the last year of my apprenticeship and the summer and autumn of the year in which I obtained my diploma I was employed under Mr. Dennis in laying out the Indian Reserves on the north side of Lake Huron. We commenced at Parry Island and ended at the Soo. We had a very nice sail-boat called the "Upper Canada," and had an enjoyable time generally. The scenery amongst the islands resembles in many places that of the islands in the Saint Lawrence.

I remember that we were encamped on an island not far from "Grumbling" Point, which is very difficult to get around with a sail-boat unless the wind is fair. Our guide came to me one morning about four o'clock and told me that we had better make sail as fast as we could for the wind was fair for us. I called all hands up, and, although pretty tired after a hard day's work, all but one got up and loaded the boat. There was one man however, my first chainman, who had strong objections to getting up before the day was aired, and he refused. I told the men to take down the tent and leave him on the island, when finding I was serious my gentleman aroused himself. Unfortunately for his comfort we had to make a still earlier start next day, for we had not succeeded in getting around Grumbling Point, but on this occasion my friend did not require calling twice.

There were many rattlesnakes upon some of these reserves; we killed eight one Sunday—"better day, better deed." Mr. Dennis had one of his party bitten on the finger. Mr. Dennis promptly took his razor (surveyors shaved in those days, fortunately for the bitten man) and cut the bitten piece out, put some gunpowder on the wound and applied a match. By this treatment without loss of time, he probably saved the poor fellow's life.

The last reserve I laid out was near the Soo. My instructions were to "begin at a pine tree at Maskinonge Bay (this tree had probably been squared and marked); thence north 43° E. (true if possible, if not magnetic and ascertain true) twelve and one-half miles. Then due north 12 miles; when near river (on which look out for Vidals' posts for mineral location) send party back to take batteau around up the river at head of Echo Lake; from here take a supply of provisions at line at end of twelve miles on north and south line. Start due west and run fifteen and three-quarter miles; during this time you may perhaps get supplies up Garden River, to which point batteau had better be sent. At end of east and west lines turn due south and run to crest of mountains north of River St. Mary's; from here run trial line down to boundary which Indians will show you at Partridge Point. Measure offset and calculate direction of true line to close, which run, taking angle between it and the first line where difference begins. When concluded make way to Penetang and so home.

The distances above were taken from Bayfields' chart, and agreed to by the Indians and Mr. Keating, their interpreter, and Mr. Dennis.

When I got to the crest of the mountains I could see St. Mary's River. I thought that if I had a smoke made at the post I could come pretty close to it, and determined to send a couple of men down to it and make a smoke, which when made we saw from the mountain's crest. I took the bearing and ran the line some three miles from top of mountain and came within two feet of the post, which I moved into my blazed line. The season was well advanced and the steamer was soon to make her last trip, so that I was afraid to adhere literally to my instructions, for in those days there was no C.P.R. to take me home.

I had a rather pleasant experience at the end of this survey.

I had no money to bring my party to Penetanguishene, and only an order from Mr. Dennis on the Captain or Purser, I forget which, of the regular boat, and as it had met with an accident and been replaced by another I was doubtful as to whether my order would prove to be of any service to me. Meeting one Archie Dunlop, a well-known cattle dealer, trading from Penetang to the Bruce Mines and other places on Lake Huron, I told him my story. He kindly offered to lend me all the money I required to pay the passage of myself and party, and also advised me to take all my party down cabin passage, as the boat was so slow that it would cost more to pay deck fare with meals charged extra, than cabin fare with meals included. I took his advice and took cabin passage for all. I may say here that the order was accepted, and Archie's kindness was not trespassed upon, but I felt the generous offer very much, the more so as I had met him only once before.

1857.

On Saturday, the 17th January, 1857, I put in a miserably cold night, whilst surveying the road line from Lake Couchiching to Muskoka River. We had a ridge tent, but no stove, nor any means of having a fire inside and we had not too many blankets. The fire outside roasted one side of us, whilst the other side was freezing; the thermometer registered 38° below zero. On the survey of this road I had with me a gentleman who is one of our city ex-aldermen, and he used to sleep in all the clothes he could pile on—over-coat, boots and mitts.

In making road line surveys I thought it would be well to show some of the features of the country on my map on each side of my line. Having with me an Indian who knew the country well, I got him to sketch the lakes and streams near the line, and showed them on my plan. Of course this made a more symmetrical map and also made more square inches than the bare road line—and we were paid by the square inch!

The late David Gibson was much amused at the remark made by Mr. Cauchon (the then Commissioner of Crown Lands) upon seeing my plan. He said: "Meester Geebson, there ees no getting over you surveyors. Eef you pay them by the day they fool away their time, and eef you pay them by the eench—Mon Dieu: look at thees plan!!"

1858-59.

During parts of the years 1858 and 1859 I was engaged surveying the township of Lutterworth. There are numerous small lakes in this township and one large one—Gull Lake. At the time the survey was made it abounded in beavers. We were fortunate in having an old hunter in our party who killed a good many, and we were glad to have them served up for our suppers. They were in camp thought to be excellent eating, but on sending one home I was informed that it was not relished much, but then you see they had not the hunger-sauce that a bush life gives a man.

1860-61.

In surveying the townships of Esten, Spragge and Salter in 1860-61, I had occasion to cross a lake about $1\frac{1}{4}$ miles wide. We made a raft and my cousin (F. L. Foster), an axeman and I went across on it all right enough, but when we had completed our work the raft had soaked so much water that it would bring only two back again. There was a small island about a quarter of a mile from the southerly shore, and Foster, who was an excellent swimmer, said that he would swim the mile from the north shore to the island if I would swim the quarter mile. He did his part like a duck, but I lost heart altogether when I attempted my part, and had to lay hold of the raft. So long as I could just touch it I felt safe. However, we all arrived safely in due time.

There were several rather interesting circumstances connected with this survey. One of the men, a Mohawk half-breed, was very fond of whiskey, as was also the cook—a great friend of his. The Mohawk frequently pleaded illness and unfitness for work. I noticed at the same time that my supply of liquor was diminishing very fast, and suspected the cook and Mohawk of helping themselves in some way or other. My first chainman thought he would try an experiment, so put some tartar emetic in a bottle of whiskey one morning when the Mohawk pleaded sickness, and placed it so that there would be little difficulty in these worthies finding it. When we returned at night we found that Mr. Mohawk had been really very sick, and was not at all well pleased with the trick that had been played upon him.

Knowing that Indians do not like to work long at one job, I had made those hired by me on this survey sign an agreement that they would remain and work faithfully until the end of the survey or forfeit whatever money was due them. One man, an elderly one, named Esquemeaux, a man I frequently sent to La Cloche for letters and provisions, did not return when sent on his last trip, and when paying off the party at Little Current I requested the interpreter to give him a good fright and tell him that there was no money coming to him as he had left without leave before the end of the survey. The poor fellow was well frightened and promised never to serve any other surveyor such a shabby trick. He was highly delighted when he got his money. I have heard since that Mr. Niven, one of our ex-Presidents, had Esquemeaux afterwards and found him an excellent man.

During the time of this survey H.R.H. the Prince of Wales visited Canada, and my provisions getting short and money for obtaining more being exhausted, I determined to visit Toronto, raise the wind and get a fresh supply. I killed two birds with one stone, for I saw the Prince and also got my fresh stock of provisions, amongst them being a barrel of home-made mixed pickles, which were much appreciated by the party.

On returning to my survey I met three of my party at La Cloche and with them started off for camp, calling at store camp for supplies. One man reached the camp that night, but I was too much played out and remained out all night a mile or more from camp. It was a beautifully moonlit night, but too decidedly cold to sleep without

blankets and we had none with us, so were very glad when it was light enough for us to proceed on our journey.

After finishing the townships of Esten and Spragge we started from Serpent Bay, on the ice, about three p.m., walked about three miles and camped for the night, which was an awfully rough one. On getting up in the morning we found about four inches of snow on our blankets. After breakfast we started and walked to the mouth of Spanish River, a distance of about eighteen miles, with snow and sleet in our faces nearly all the way—and oh! how cold! We had to drag our provisions and camp equipage on roughly made hand-sleighs. Several of us were pretty well played out and were more than pleased when we saw the mast of a schooner that was frozen in at the mouth of the river. It put new life into us.

There was only one man, if I remember rightly, on the schooner when we got there, but he was afterwards joined by two others who were bringing a barrel of whiskey from the Bruce mines to trade with the Indians. I think I may safely say that we all sampled that same barrel. In the morning we started off for La Cloche and made arrangements with the Hudson Bay factor there for such supplies as we might need for the survey of the Township of Salter. In walking up Spanish River I was bringing up the rear and was carrying my tripod, the men who preceded me all carrying loads. They had all got safely over a bad place in the ice where there was quite a current. When I came along I broke through. One of the men called out, "Save the tripod." Another more considerate one sang out, "Damn the tripod; save the man!" However, both were saved, and the man was not sorry to reach the store shanty he had made on the bank of the river and in which he had something to keep out the cold.

1880-81. MANITOBA.

I left Toronto on 29th July, 1880, to re-survey two townships on the Riding Mountains. Taking the steamer "Frances Smith" at Collingwood we had an exceedingly pleasant trip all the way from Toronto to Duluth. Our jolly travelling party consisted chiefly of relatives of one of my surveying party, Mr. Edward Gooderham, who when writing home afterwards said: "I can get through all my work and manage the food, but at washing I am a failure." The steamer called at Owen Sound and took on board a Miss Webb, a school teacher, and a brother—a young boy of about twelve years—who were on their way to Rapid City. Miss Webb informed me that she was going to keep house for her brothers who were out there. "Take my word for it," said I, "you will be married before a year is out." "Oh, no," she said, "I am going to keep house for my brothers." Nevertheless she *was* married inside of six months.

I left Miss Webb and her young brother at Winnipeg to wait for an elder brother who was to take her to Rapid City. They overtook me, however, two days after I left, just as we were having breakfast. I persuaded them to join us in our matutinal meal for they had not had theirs, and I advised Miss Webb to leave her ox-cart and take my buck-board, being more comfortable to ride in. Thus we travelled

together for several days to the ever-to-be-remembered music of the Red River carts.

The first township which I re-surveyed was a fearfully rough one, and if the surveyor who took the original contract took it at anything less than a good round figure I don't wonder at his scamping his work. It was while moving camp in this township that I learned of the marriage of my late travelling companion, and strange to say, my informant was my new father-in-law, and he drove the team with my camp equipage.

One of the longest tramps of my life was on the 14th of January, 1881, travelling from my first township to the second. We had a double team and a single horse; the team consisted of a horse and an ox yoked together; the single "horse" was an Indian pony, which gave out before we got half way to our destination. Although the distance was only about 30 miles it took us from 5 a.m. till 10 p.m. to accomplish it. When we started it was beautifully bright and clear, the moon was about at the full, but it was bitterly cold. We had to keep moving for there was no place to stop at until we reached a settler's shanty, our objective point. Certainly we stopped once or twice on the road to boil the kettle and have a meal, but were mightily glad to get to the shanty, have a good supper and go to bed—although the bed was on the floor of the said shanty. A tramp of 17 hours with the thermometer at 20° below zero gave me all I cared about having.

After completing my survey we made for Minnedosa, where I hired a horse and buggy, on May 2nd, and drove to Grand Valley to see a friend who lives opposite where Brandon now stands. After spending the night at my friend's, I returned to Minnedosa in the morning. In August, 1880, when I first saw the site of Brandon there were no houses; only the tents of the C. P. R. were standing there. To-day it is a populous city. It was supposed by many that Grand Valley would be chosen for the town plot. It was then a stirring little place containing 10 tents and 15 wooden buildings. While at Grand Valley I visited the grave of my old friend, Archie McNabb, who had died shortly before whilst on a Government survey in the neighborhood. He lies buried in a school section near the village. We left Grand Valley on the 16th of May by the steamer "City of Winnipeg," at 3 a.m., arriving at Winnipeg at 5 p.m. on the following day, and in Toronto at 6:30 a.m. on the 22nd, in good time for the Queen's Birthday.

Dear Queen!—she who has for nearly 60 years reigned over so vast an empire and in whose crown our own dear country, "Fair Canada, Land of the Maple Leaf," shines so bright a jewel—may she be long spared to occupy in health and strength her glorious throne, and when she is called home by the King of kings may her natal day, known to us all so well as "the 24th," our most charming and best enjoyed outing day, coming, as it does, in a month which in this Dominion is so fresh and fair and sweet, continue to be celebrated as a public holiday in perpetual remembrance of so noble and so good a woman and so greatly beloved a sovereign as is our Supreme Lady Victoria the Good, whom God preserve!

DISCUSSION.

Mr. Gibson—I was very much pleased with the reminiscences of my friend. Everything was as sweet as it possibly could be. That incident with reference to my father was repeated to me one day. I think it is a pleasant thing to have these reminiscences, and if they could have been extended a little further with a little fatherly advice I think it would have been very nicely rounded off. A man of his age and experience could give excellent advice to, I was going to say, us young men, though I think he is a few years younger than me, but no one would suppose it—a man of his age and experience could give excellent advice to us all. I think we should encourage the members of this Association, especially our young people, to make a start that way and hand them in every five or six years.

Mr. Niven—I must say I was very much pleased with the paper of Mr. Unwin. I remember perfectly well the interesting character he alludes to. He did prove a very good man—thanks to his early training. I may say that I met Mr. Unwin at Sutton on the first survey I was ever on, when I had just become an apprentice. He mentioned the township of Lutterworth, and I may say that as that township is in the neighborhood of Haliburton I have occasionally had to make some surveys there, and I am very happy to say that when I am hunting up the base line there if I get between two blazed trees I can find the line.

Mr. Gibson—I too have gone over some of Mr. Unwin's work, and I must say he is very thorough in his surveys.

Mr. Stewart—I think I have had the pleasure of seeing the pine tree Mr. Unwin refers to. I think since then that portion has been surrendered and is now a township. I knew the Eskimo, and I remember his son, but whether his son developed like his father since I am not aware. I remember the other was not the best of servants that I had by any means. If I am not mistaken this is the first paper we have had of this kind, but I hope it will not be the last. I am sure that a great many of the older members of the profession would be able to prepare papers that would be of very great interest, and perhaps of historical value as well.

Mr. Chipman—I regret that Mr. Abrey is not here to make some remarks upon the paper of Mr. Unwin. While I was serving my time with him we covered part of the territory referred to. I remember very well travelling on Spanish River and making about the same trip he did, going across on the ice and climbing the La Cloche mountains. I was also at Brandon the year before he mentioned, 1880. At that time there was no house there at all, and I had during the illness of Mr. Abrey the pleasure of running both the north and south lines where the city of Brandon now is, Rosser Avenue, I think, is along one of my old lines. There are several people he mentions whose names are familiar to me. I remember the Eskimo family.

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IRRIGATION IN THE NORTH-WEST TERRITORIES.

By WM. PEARCE,
Calgary.

THE object sought to be attained by sending your society an article on Irrigation in the North-West Territories, is not so much that the climate of Ontario is such that the subject is one of considerable interest to many in that Province, though one who has observed the beneficial efforts of irrigation will unhesitatingly assert that in very many localities, and in the majority of seasons, irrigation to a certain extent would be beneficial and highly profitable, nor does he require the gift of prophecy to foretell that within the life of the present generation it will be practised to a very much greater extent in the humid districts than even the enthusiasts on the subject anticipate. Before leaving this branch of the subject it may not be out of place to observe that few, if any, that were reared in a humid climate, and afterwards lived in an arid or semi-arid one, where irrigation was necessary, but were impressed with the neglected opportunities in irrigation in the humid portions. Particularly is this applicable to gardening and the growth of trees. Further, you in Ontario, irrigate to a much greater extent than you imagine; every gardener, in watering his plants, shrubs and trees, sprinkling his lawn, etc., is engaged in irrigation.

Writers of good repute have asserted that the Garden of Eden was irrigated, and that assertion may be true, if not actually proven, and slight reflection will convince anyone that all the ancient civilizations existed wholly in irrigated territory.

To the Association of Ontario Land Surveyors the subject is not new, but older than the earliest records, so that no apology is necessary because of its newness.

There is any amount of scope for the inventive genius, intelligently applied, by the members of this Association on lines for which your training has to a very considerable extent fitted you, and in which your tastes will no doubt find the most congenial employments, viz., in the solution of devices for accurate measurements of water and the division thereof. Although inventive genius of a high order has been brought to bear on these contrivances for centuries, we are far from arriving at anything like the accuracy desirable. This, to those who have not given the subject any attention, will no doubt seem surprising, but an investigation thereof will demonstrate its truth and the attempt at its solution will be found most interesting even should the result not prove successful.

Another branch of the subject equally interesting and valuable,

viz., designs for diversions of water from the beds of the streams or for creating reservoirs for storage thereof; head gates, and other gates required along the systems; falls or drops for water, which are necessary to a greater or less extent on all systems of any size; spillways or checks necessary to prevent the breaking of banks, etc., arising from local storms or cloud bursts; flumes of various designs for carrying water over or around obstacles of various kinds; tunnels, bridges, culverts, etc.; the best manner of making the topographical surveys necessary, not only to obtain the information requisite to design the minor ditches or canals of any system, so that economy and thoroughness in their construction may be attained, but also the same information over a lesser area required for the purpose of the distribution and application of the water when delivered at some point on or near the land on which it is to be applied; implements for levelling the land, so that the water can be more cheaply and thoroughly applied thereon. It may seem strange that after water has been applied on land for centuries that there should be room for ingenuity or a material improvement in this line, but such is the case; the conditions vary, so that what may be suitable in one case may not be applicable in another; and with us, where the products from irrigation must be sold at best at moderate prices, there is necessity for the greatest economy on the lines mentioned.

Anyone who may think this subject an uninteresting one will find himself agreeably astonished. Running water has a fascination for all.

In 1894 the Dominion Government instituted surveys, gauging of streams, and collection of data necessary to ascertain the amount of water available, and those portions of the territories on which it could be best applied; also for the location of sites for the storage of water. This last has a very important bearing, as has also the conservation of forest areas.

The experience of other countries, particularly that of our neighbors to the south, has demonstrated that no time is to be lost in making the reservations for the purpose indicated; as settlement and the construction of roads and railways, have naturally occupied the points which are most vital in storage of water, if such is to be stored at the minimum of cost and at the best points. At one point in the Rio Grande, the United States geological survey report that the creation of a reservoir at the best point, in fact the only one, will necessitate the reconstruction of a railway which would involve the outlay of hundreds of thousands of dollars. This might have been obviated without material cost to said railway, had the reservation been made before the construction thereof.

Up to the close of the season of 1896, the Canadian irrigation surveys had been extended over a considerable area. The complete work comprises 1,296 miles of line level, 3,811 square miles of contour topographical surveys, and 44 detailed surveys of reservoir sites. In addition to this some 223 miles of location have been completed for proposed irrigation canals, some of which are of considerable magnitude. The question of the water supply available for irrigation in the

portion of the territories requiring irrigation has been examined into, 319 gaugings of streams have been completed, and the discharge of a large number of springs and the volume of numerous lakes measured. The information needed in attacking the many complex problems connected with the flow of or storage of water, has necessarily to be of an exact character, and the field work in connection with the irrigation surveys has to be carefully performed, so that in some instances great rapidity is not attainable ; however, it will be seen from the above statement that good progress in this important work has been made.

There are now in operation in the Territories 157 irrigation canals and ditches, supplying water to areas varying from 10 acres to 10,000 acres. The total area under ditch, and capable of being irrigated, therefore comprises some 140,000 acres, of which only a portion is as yet being supplied with water ; but this portion is being rapidly extended as fast as the land can be prepared to receive the water, and from present indications and with fair encouragement the growth of irrigation will undoubtedly be rapid.

Very full reports of what has been accomplished, illustrated with maps, plates and diagrams, have been issued by the Department of the Interior, for the years 1894 and 1895, and the one for the past season will shortly be forthcoming ; and any member of the Association whose interest in this subject is aroused, would probably obtain copies thereof by application to the Secretary of the Department of the Interior.

The cost of irrigation in the United States has been \$815 per acre for preparing the land, and \$12.12 additional. With us the cost would be considerably less.

The district of country which requires irrigation may be described as follows : Bounded on the south by the International Boundary ; on the west by the Rocky Mountains ; the other boundary being described as follows : commencing at the intersection of the International Boundary, by longitude 102° west ; thence north-west to latitude 51° 30' north ; thence west to the Rocky Mountains ; containing about 80,000 square miles, or upwards of 50,000,000 acres.

Its elevation on the east averages about 1,000 feet above the sea, and the western boundary of the arable district about 4,000 feet.

The duty of water will be high, as there is always considerable rainfall and the subsoil being a heavy clay. It is estimated that with storage facilities, which can be economically constructed, there will be water enough for seven or eight millions of acres.

The problems in connection with the application of water will require the greatest ingenuity, so that it may be so distributed that the irrigated portions may be as proportionately as possible distributed around the non-irrigated portions, so as to make the latter contribute to the maximum extent as pasturage in connection with the irrigated portion.

The best mode of settlement to be adopted in the arid or semi-arid areas has also to be solved. To utilize this vast area and

obtain the best results is a goal of the highest importance. This area must be devoted largely, if not wholly, to pastoral pursuits; and it is probable that the greatest volume of dairy products attainable on any portion of this continent—possibly, within the same area, in the world—may be raised in the tract under discussion.

It required considerable persistency on the part of a few who took up and agitated this question to prevail upon our legislatures to provide the legislation necessary for this subject, but in 1894 the country was fortunate enough to have an Irrigation Act placed in our statutes. It is probable in working out this question many defects will be found in the same; it is hoped, however, that it will not be so productive of litigation as the Drainage Act has proved in at least one Province in Canada. As the defects are discovered, they can, it is anticipated, be remedied by amendments to the said Act. With us in the Territories, fortunately the control of both the water and the land is vested in the same authority; thus we will avoid the great weakness that has been met with and has proved so fatal to such a large number of enterprises in the western United States. It has also been attempted, and it would seem successfully, to have the administration thereof under strong central control, thereby avoiding the rock which has frequently proved so fatal—viz., disputes and litigation. On no subject, even in connection with rich and valuable mines of the precious metals, has there been so much heart burning litigation, and in some cases many lives have been sacrificed in disputes arising out of water for irrigation purposes. It would prove much too lengthy to attempt in this to explain fully the provisions of the Irrigation Act, whereby such disputes are thought to be avoided; the making the title to water as secure as to land or any other property; doing justice to the consumer as well as the one who supplies the water; providing a speedy, equitable and non-appealable decision, regarding any and all controversies which may arise out of the construction and carrying on of irrigation. None of the very many technical points or problems arising out of this subject have been attempted. It would make it much too lengthy, they had best be taken up one by one by any members of this or kindred associations. There are dozens of problems which each in itself would justify the production of a paper sufficiently lengthy, interesting and valuable, to claim your attention at any one session.

He who makes a hobby of any subject cannot understand why his theme has not the interest to others that it has to himself, and it may be that to many of you this effusion may appear dry and uninteresting. It is at all events not a dry subject. But this promise can be safely given you, that at least 999 out of every thousand who take the trouble to enquire into this subject will be interested, and a goodly percentage will be as great enthusiasts as the writer. This is not a reckless assertion, but one fully borne out by experience. If even in a very small percentage of you interest in this is aroused, the writer will be highly gratified and a thousand-fold repaid for the slight trouble he has taken.

DISCUSSION.

Mr. Gibson—I am very much pleased with this paper. It opens up a very wide field for a surveyor and engineer. We are quite well aware that an engineer alone is not capable of carrying on works of that kind so well as a person who is a land surveyor as well as an engineer, and in view of the work, which apparently the Government is blocking out in the arid districts of the Northwest, I think this paper is suggestive to us all, and lays the foundations for a large amount of work which we surveyors will take deep interest in. I understand already there is a new machine that will be used among the farmers, run by storage batteries, by which the ground can be turned up and pulverized and seed sown at the rate of 25 to 40 acres a day. In view of that it is quite evident that our Western country will be developed very rapidly if you get a system of agriculture based on that manner of cultivation, and with this system of drainage supplying water in the manner spoken of, they will develop a large amount of land up there. I think in Ontario we make the water disappear too rapidly by our system of drainage. I remember when I was a lad we generally, about the middle of February, had all the fields flooded. Now we have our ditches and our tile drains so fixed that the water can hardly touch the land before it is hurried off into some ditch.

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A FEW WORDS ON ELECTRIC STREET RAILWAYS.

BY T. O. BOLGER, C.E., O L. S.

Kingston.

DURING the last five years Electric Railways have become a familiar object in every city in Ontario and in many of the larger towns, and, as the construction of such roads has been going on under the immediate observation of the general public, it is hard to find anything to say on the subject that will be of interest, still the writer hopes that he may have made some observations in his small experience in such work that may be worth setting forth.

In the first place, an Electric Railway is a very easy thing to locate, as you can run it up and down almost any grade and turn it round corners with curves of almost any radius ; in fact, any road on which a horse and carriage can be driven in comparative safety, thereon can you locate and operate an Electric Railway.

For instance, in Kingston there are several grades of five per cent, and the cars go up them with apparently as much ease as if they were running on the level, and this too when they are filled to overflowing with passengers. Of course, it takes more amperes of current and makes a bigger call on the power-house, but, apparently, they go up as easily as they come down. The coming down part requires the most care, as a loaded car going down a five per cent. grade gets up a big speed, and if anything went wrong with the brake chains it might be awkward.

But five per cent. grades are not considered at all excessive, and roads are now successfully operated with grades as high as ten and even twelve per cent.

The sharpest curve that is allowable is one of forty feet radius for the inside rail, and curves should be made as much more than that as possible, as the wheels will grind and crack on a curve of that radius, while, with fifty and sixty feet radius they will go round quite easily ; 100 feet radius is better still, when it can be placed, but it is not often that such a curve will suit the surroundings. Of course, getting round a right-angled corner in a business street, forty to forty-five feet radius curves have to be put in, but, in suburban localities, easier curves can nearly always be managed, and every additional foot of radius is a benefit to the road.

In the old horse car lines they always used that abomination a cast iron curved rail, which was a terror to the drivers of vehicles, but, with a nicely curved 60 pounds steel T rail the vehicles find no difficulty at all.

The writer has only had experience with T rails, although, of course, he has seen the girder rail used in Toronto, Montreal and other large cities where the streets are paved and where, owing to their depth, they are no doubt best adapted. But, for ordinary macadam streets, a good sixty or sixty-five pounds steel T rail makes a first-class road, and if properly tamped, lined and levelled, leaves little to be desired.

Railway Companies sometimes buy discarded steam railway rails, and think them good enough for their electric road; but this is a great mistake, as there will surely be little kinks and bends in the best of such rails, and nothing in the world will get these out of them; and no matter what care is taken laying them, the result will be a rough road for ever. I have seen the poor track-layers in despair over such rails, as they are expected to make a good road out of impossible material. It will pay a company far better to buy new, clean, straight rails, and then they can have a track laid, over which their cars will run smoothly and not get shaken and jarred, as they surely will if the rails are kinked and bent.

The usual thing in laying a railway track in a macadam road is to cut trenches crosswise of the road, about two feet apart, in which to place the ties, and then other shallower trenches lengthwise of the road to receive the rails, and then, when the rails are spiked, tamp up the ties, with what broken stone and mud is most convenient, until the top of the rail is flush with the surface of the street, and then pack back as much of the macadam and mud as will make the street surface level, and the job is supposed to be finished. But this makes a poor job, because you cannot tamp ties properly with such stuff as is dug out of a roadbed, as the stony part is all too coarse and the mud will give way under the ties the first time it gets wet; besides, the refilling of the trenches will absorb water the first wet season, and the ties will churn and get displaced, or will heave in frosty weather and disturb the alignment and level of the track.

To do the thing right, a trench the width of the length of the ties ought to be taken out continuously along the street to a depth of three to four inches below the bottom of the ties, and a cushion of good railway ballast put in for the ties to rest on. On such a bottom as this the ties can be tamped in a good and sufficient manner, which cannot be done if they are lying on the coarse stones which usually form the bottom course of an ordinary macadam street.

If the roadbed itself is not properly drained, some provision should be made for drainage under the ties; in fact, there ought to be a large-sized field tile laid between the rails, deep enough down to be below frost line, and the filling over this should be of a porous enough nature to allow all water to percolate down to the tile.

When the rails are all in place, duly lined and ready, the practice here has been to fill up the spaces round the ties and rails to about one inch higher than the street level, and then put on the eighteen ton steam road roller and roll till everything is solid. If the surface is made up in this way, with good, clean, broken stone and sufficient

good bedding, the rails are left just nicely flush with the street and are but very little impediment to vehicles, and the surface thus compacted keeps in good order for a long time. It was feared that the surface would wear away rapidly near the rails, causing them to stick up in a dangerous manner, but this does not appear to be the case to any great extent. Of course, a first-class electric road should be laid on concrete foundation and the surface finished with asphalt, brick, or granite block, such as has been done in the first-class streets of Toronto, or other large cities where they do things about right. But in smaller places the parties who put in an electric road have a good deal of pluck to risk their money in the venture, and if the municipality would insist on too expensive a roadbed, they would have to go without the road.

The engineer or surveyor who does the laying out of the work for a street railway generally has his work pretty well cut out for him, as the city or town engineer, on behalf of the municipality, always tells him where to lay out the tangents, either in the centre or at the side of the street, as the case may be, and also gives him the radius for the curves for every corner, and, in case of the grades, will also give him instructions; in some places making him keep flush with the street surface, and in others, where the municipality intend to alter or improve the street grade, will make the grade of the rails conform to the intended improvement. Still, the surveyor laying out the work will have enough to do to keep him interested, especially as the men digging the trenches are continually destroying his marks, and it is a most trying thing on his patience after carefully and laboriously laying out, say a forty-five foot curve round a right-angled corner by driving railway spikes ten feet apart, all exactly right, to find on coming back from dinner that they are all rooted up and some sixty or seventy men digging with picks and shovels within a distance of as many feet exactly on the sight of his curve, and that he is expected forthwith to lay it out all over again. Then, when laying the track round a curve, the rails have all to be bent with a rail bender, and the engineer in charge has to stand by and see that the proper curvature is attained, which he ascertains by measuring the middle ordinate. A handy little formula for finding the middle ordinate is as follows: One eighth of the square of the length of the rail divided by the radius gives the length of the middle ordinate in feet; that is to say, in bending a 30 foot rail to fit a curve of 40 feet radius you can find the ordinate as follows: the square of 30 is 900, which divided by 8 gives 112.5, which divided again by 40 gives 2.81 feet. It may be stated that a good bender will turn the circle true enough for practical purposes, and when you get the ordinate right your rail will be all right. The rail has to be put through the bender several times before you get it right, and as, including guard rail, it requires nearly 200 feet of rail to go round a right-angled corner, it is no small job to get a curve properly put in.

The men generally employed by the railway people to boss the track laying, are section foremen off some steam road, and are mostly

men of good intelligence ; but they always want to elevate the outer rail on a curve unduly, and much of an elevation makes an awkward appearance on the street.

The laying out of the switches, turn-outs, etc., has to be done very exactly ; the points, frogs, etc., are all castings and are made to fit exactly the kind of turn-out required, but then they must be placed exactly right distances apart and the rails curved and cut to fit exactly between, as a badly regulated switch is a constant source of annoyance on the road.

Generally speaking, the engineer or surveyor who lays out the road has nothing to do with the electric part of it. This is done by the electrician, and his functions are by far the most important, and even while laying the rails he takes a hand in.

All the electricity that is sent out of the power-house along the trolley wire comes back again to the power-house, either along the rails, if properly connected, or gets into the ground and finds its way back underneath, taking advantage of such convenient paths as may exist down there, such as water mains and gas pipes, etc. Now, it is not at all a good thing for such pipes to have such a use made of them, and it is very much to the interest of the municipality that the electricity should be confined as much as possible to the rails. If the rails formed a continuous bar they would make an excellent channel, but as they do not always touch, and as their contact is often broken by rust, etc., even when they appear to touch, something has to be done to connect them, and this is called bonding the rails and is accomplished by joining each rail to its neighbor by short pieces of copper wire 000 wire gauge or about $\frac{3}{8}$ inches in diameter, and this is what the electrician does to the rails before they are covered up.

The railway people do not care particularly how the electricity gets back, so long as it does get back, and it is not for the welfare of the water pipes that they are solicitous when they take such care in bonding the rails, but in very dry weather, or in very hard frosty weather, the ground does not conduct freely, and when the current cannot get away freely, either along the rail or through the ground, the difference of potential between the trolley wire and the rail is lessened and the efficiency of the current impaired. Up till some ten or eleven years ago, when electric lighting commenced to become general, the writer of this paper never heard of the terms volt, ampere, or ohm, and knew no more about electricity than to be aware that lightning was a display of that commodity and that you could exhibit electric sparks by rubbing a cat's back in frosty weather. He knew, however, a good deal about magnetism, as developed in an old-fashioned surveyor's compass, and was up to all its tricks and capers and was prepared to find a way to counteract its most malignant efforts, such as it constantly puts forth, to entrap an unwary surveyor and try and induce him to head his lines in a direction at right angles to the course he ought to go, and many are the conflicts he and magnetism have had on the non-impregnated mountains of North Hastings and Peterboro and, in fact, all over the Huron and Ontario and

Algoma districts, and he fears that localities might be found where erratic actions of magnetism may have prevailed to such an extent as to cause divergencies in lines of his that ought to be straight.

But this familiarity with practical magnetism helped him not at all with electro magnetism and electricity, as it is utilized in lighting our cities and propelling our street cars, and it became necessary in his capacity as City Engineer in a small city to have sufficient knowledge of electricity to understand thoroughly the technical terms used, and be able to follow, intelligently, descriptions of electrical appliances for lighting, heating and power purposes.

Most of the works on electricity are so extremely technical that it is most difficult for a beginner in the subject to follow them; they always assume that you know just that something that you don't know; and, in order to find out that something, you read and read and puzzle your brains, wading through heaps of scientific facts that you do not want at all, and by the time you master the something you are after, you have forgotten a whole lot of things you had laboriously got up before.

Now, the writer wanted to know what an ampere is and he wanted to know it just as clearly as he knows what a gallon of water is, and the same for a volt, an ohm and a watt. And, as it gave him much trouble to get a clear understanding of these terms, he feels it would not be amiss to explain, in simple language, his conception of them, for the benefit of some few old-fashioned members of the Association who like him have no knowledge of electricity and who like him never expect to have the time or opportunity to acquire such knowledge.

Electricity, they now say, is not a fluid, but, for the purpose of this explanation, it will do no harm to assume that it is a fluid, also to assume that it will flow along a wire in the same way that water flows in a pipe, only the electricity flows along outside the wire, while the water flows inside the pipe. If the air were a conductor the electricity would leak off the wire in the same way that water would leak out of a pipe if there were holes in it.

Electricity will not have any inclination to flow along a wire unless it is pushed along, the same as water will not flow in a pipe unless it is pushed along by a difference of level in the water. If you put two equally high tanks of water side by side, connected at the bottoms by a pipe, the water in one will not try to flow into the other, as they are both on the same level, but if you take half the water out of one, the water in the other will flow through the pipe with a force, due to the difference of level or the head. Now, this difference of level or head in water is just the same as difference of potential in electricity; in water you designate the difference of level as so many feet head, in electricity you designate the difference of potential as so many volts.

Difference of level in water can be expressed in another way. That is as pressure, or so many pounds to the square inch, thus 1 foot head gives .43 pressure, and 100 feet head 43.4 pounds, but head

and pressure indicate the same thing. In electricity difference of potential is also called electro-motive force, but both terms mean the same as pressure or head in water, and a volt is the unit by which this electric pressure is measured. The quantity or current strength going along a wire is measured by a unit called an ampere, and this amount can be best exemplified by the analogy of the miner's inch of water, which is a method they have of measuring the quantity of water sold by those owning water rights in California. A miner's inch is the quantity of water that will flow through a hole of one inch sectional area bored through a two-inch plank with a head above the hole of six inches. Now, one ampere of current along a wire is just the same sort of a thing as a miner's inch of water flowing in a trough, and two or more amperes of current in a wire are the same as the current caused by two or more such holes leading into the same trough.

A watt is the unit of work, and to find the number of watts in a circuit you multiply the number of volts by the number of amperes; thus a circuit that has a current strength of 10 amperes and a pressure of 500 volts would give 5,000 watts, and as 746 watts equal a horse power, that circuit would be good for 6.6 horse power, which can be used for lighting lamps, running cars, etc.

Conductivity is a word peculiar to electricity, and expresses the capability of different kinds of wire to convey a current; thus a copper wire has six times the conductivity of an iron wire, and will conduct a current with as much ease as an iron wire of six times its sectional area, that is to say, it offers that much less resistance to the flow of the current.

Resistance to the flow of current in a wire is the same as friction in a water pipe, and in electricity they have a unit of resistance called an ohm; and thus we speak of a wire or a coil having so many ohms of resistance. There is no analogous term in hydraulics; and in speaking of frictional resistance in pipes, hose, etc., they put a value on it as the loss of head per 100 feet.

In speaking of water, in a former paragraph, it was stated that water would not flow in a pipe unless there was a difference of level to make pressure, but, of course, a pressure can be caused by a pump and applied at the lower end of a pipe and the water forced up hill. And this state of affairs is more like the condition of things in electricity where the dynamo takes the place of the pump.

If you visit a power-house in the evening, when all the lamps are on and the cars still running, you will encounter a busy scene and you can make some interesting observations. For instance, in our power-house here, if you observe the volt meter on the trolley circuit you will see that the hand indicates 550 volts and remains nearly steady at that, while the ampere meter twings from 75 up to 350, according as current is called for by the cars, but you will notice that the hand is more regularly about 110 and only swings up to the higher figures for a second or two as a sudden call is made for power. Now, an average of 110 amperes multiplied by 550 volts gives 60,500 watts, or something over 80 horse power. There are seven cars out on

the line, which is about 11 horse-power per car. This is only an average, as probably some of the cars are running down hill and using no power, while others going up hill are using, perhaps, double the average.

There are three circuits in the city supplying arc lamps with 40, 34 and 31 lamps respectively. Now, the ampere meters on these circuits show, or ought to show, a steady current of 9 amperes, and the voltage should be 2,000, 1,700 and 1,500 volts for the three circuits respectively, but there are no meters indicating such high voltage; but if you apply a volt meter to any of the lamps, you will find a drop of potential of 50 volts.

On the incandescent circuit, which also supplies power for small motors, you will notice that the three-wire system is used; and two dynamos, each dynamo sending out some 400 amperes of current at a uniform pressure of 115 volts.

It will be seen, from these observations at the power-house, that the different uses to which the current is applied require different combinations of the two properties, current-strength and pressure.

DISCUSSION.

Mr. Tyrrell—I would like some information given with reference to the rail. Mr. Bolger spoke of the use of the "T" rail and the Girder rail. I have heard a great deal of discussion as to the merits of the two, some engineers thinking the Girder rail alone should be used in cities, whilst other engineers think that the "T" rail is equally as good, if not preferable. I have had no experience myself in the matter. I would like to know if anyone here has had, and what is the general opinion. My own personal idea would be that for paved streets, such as asphalt or brick pavements, the Girder rail would be preferable, so that they could lay close up to the flange of the rail, whereas on the macadam streets probably the "T" rail will answer equally well. That is merely my own idea in the matter.

Mr. Jones—It is the Girder rail they have in Hamilton.

Mr. Tyrrell—On the paved streets.

Mr. Jones—They use the "T" rail at Brantford, and the reason they gave there that it was advocated was, that it would be more suitable than the other rail in case they wished to carry freight. They thought they might wish to do so to some of the outlying factories.

Mr. Abrey—In Toronto Junction they used the Girder rail on Dundas Street and on one of the other streets, on the others they laid the "T" rail. At the time it was put down I insisted strongly for the Girder rail on all the streets, but a good deal of pressure was brought to bear by the Company on the Council and they were permitted to put the "T" rail on the other streets. We have no paved streets. I think the "T" rail would be as good, certainly a good deal better for the street cars. The Girder rail is easily filled up with mud and stones and there is lots of expense, and it does not work so

well with them. On paved streets I think the Girder rail would be much better.

In reference to grades, we use grades there of 6 per cent. on the western hills, and the cars seem to work very well on that grade. They are a good distance from the power house there. We have a good grade on the Lambton hills, and when they get on the hills they work slower. They try to arrange to get some of the cars going up hill and some down, but that is impossible in such circuits as we have there. The 6 per cent. grade seems to work very well.

[This Association is not responsible as a body for any opinions expressed in its Papers by Members.]

GOLD MINES IN RAINY RIVER DISTRICT.

By J. F. WHITSON, O.L.S.,

Toronto.

I HAVE been asked by our Secretary to prepare a short paper on Gold Mining in the new district of Rainy River. I will endeavor to give some of the information I gathered during the two years I was an active explorer in the district, 1890-91, and from what I have gathered during the last few years, when I have been somewhat closely connected with the mining interests of that district, so that you may have some idea of the great mineral wealth of Ontario's most westerly possession. I am fully alive to the responsibility resting on anyone writing about a new mining country, and shall hew closely to the line, so that no one going to the new field will be disappointed in not finding things fully as good as stated in this paper, but rather be able to say, "the half had not been told."

UNTOLD WEALTH.

Indeed it would be very difficult to over estimate the possibilities regarding the mineral wealth of new Ontario. Up to the year 1856, when Napier made his first exploration trip through the district, but little was known of the new region, and in fact that statement would almost hold good at the present time with reference to a great portion of the country lying even south of the C. P. R., between it and the northern boundary of Minnesota, while the country to the north of the railway is as yet a closed book. The building of the great railway, the C. P. R., has done much to open up the western country; and no portion of Ontario has been more benefited than this new district. It occupies that great stretch of country lying between Thunder Bay District and the Province of Manitoba, 192 miles in width, and extending from the northern boundary of Minnesota, north to Lake Seul, 175 miles in length on its eastern boundary, and averaging not less than 125 miles, and comprising an area of nearly 20,000 square miles, or about 12,000,000 acres; including within its limits the Lake of the Woods with its 1,400 or more islands, Rainy Lake with its 600 miles of coast line, or more than that of Lake Ontario; Lakes Manitou, Wabigoon, Eagle, Lonely and more than a thousand other lakes, in fact one might call it "the land of a thousand lakes."

GENERAL CHARACTERISTICS.

The general physical characteristics of the country are very similar to those found in other glacier swept Archean tracts, such as

the north shore of Lake Huron, Muskoka, or Parry Sound. In few places is the country as mountainous as the north shore of Lake Superior, nor as difficult to explore as the region north of Lake Huron. Within the district are to be found many large and magnificent streams. Rainy River is 80 miles in length, with an average width of not less than 500 feet. Winnipeg, English, Seine, Manitou, Eagle and many more streams are quite navigable for large boats in places. The geological formation of the district is either Laurentian, Huronian or (Keewatin), and post glacier, the Laurentian rocks predominating. The most recent, the clays and sands, form the agricultural section of the region along the Rainy River and around Wabigoon.

THE GOLD-BEARING ROCKS.

Of the total area of the district nearly 5,000 square miles is covered with the Huronian or gold-bearing rocks. It will, therefore, be seen what a vast field there is for prospectors in this new district. I believe that this new Ontario will be one of the richest gold districts in the Dominion within the next ten years; yes, on the continent.

The success which has attended mining in that thinly populated and undeveloped condition of the country in the past two years is but an evidence of the great success which awaits the future exploration not only for gold but for other minerals.

The history of the district since attention was first drawn to it by the discovery of gold about fourteen years ago, shows that nearly all the exploration to which the country had been subjected up to within the last eighteen months has been confined to the shores of the Lake of the Woods, Rainy Lake, and a few of the larger streams tributary thereto. Few prospectors have ever penetrated into the interior; in fact this will apply even up to the present time; they having contented themselves in prospecting the main waterways which are easy of access, going back but a short distance inland, so that at the present time but a very small portion of the country, even convenient to the C. P. R. or the larger lakes, has as yet been even partially explored.

GOOD RESULTS AHEAD.

Long after the first discovery of gold on the Lake of the Woods, very little development work was done except on the Pine Portage and Sultana Mines; this was partly owing to the want of capital, but more particularly to the belief that there was little gold to be found in the district. The good results attending the development of the Sultana Mine has done much to encourage others to prospect and develop discoveries, and in nearly every instance where development work has been done, the results have been highly satisfactory, so much so that during the last two years prospecting has been very active, and has resulted in the discovery of a great many veins of gold-bearing quartz, many of them are undoubtedly rich, and will yield large profits when mined.

HALF DOZEN STAMP MILLS.

Mining, properly speaking, can scarcely be said to have been more than begun, except in a few cases ; prospecting, however, has been very active, and many of the leads are well stripped and opened into, so no less than 100 different mines are being developed or partially so ; with the increased shipping facilities, the building of new roads by the Government, the investment of English and foreign capital in the district of late, it is confidently anticipated that this year will see extensive mining operations and good returns therefrom ; in fact there are no less than half a dozen stamp mills either being shipped into the district or being erected at the present time.

The good results of the last six months' mining has given to those interested in the future of the Lake of the Woods unqualified satisfaction. Everything, with few exceptions, has gone to show that their confidence has been well grounded.

SCEPTICISM REMOVED.

Those who were at first sceptical as to the permanency in depth and richness of the deposits have candidly yielded in the face of the unquestionable evidence offered them in the splendid showing of such mines as the Sultana, at a depth of 400 feet, with an enormous body of rich ore at that depth, and every appearance of an unlimited quantity, which can be mined and stamped, with even a 10-stamp mill, at less than \$4.00 per ton.

The Regina Mine, at a depth of 286 feet, with a similar mill, is producing gold at nearly the same cost per ton. Other mines in the district, such as the Mikado Yum Yum, Cornucopia, Gold Coin on Shoal Lake, Gold Hill, Black Jack, Princess, Scramble, Trojan, Triumph, Bath Island and many others on the Lake of the Woods are producing large quantities of rich ore, and there is scarcely the shadow of a doubt but that most of them will do so. The Mikado yielded well at first clean up ; so also did the Saw Bill, Lake Harold, Hawk Bay. Folger and Hammond are producing large quantities of ore, and are undoubtedly splendid mines.

SUCCESSFUL RESULTS.

On Seine River the Foley Mine has a 20-stamp mill at work and can work the ore at \$3.00 per ton. They are down several hundred feet in the shaft, and there is every appearance of it being a permanent mine.

The Porcupine, the Weigand, Proudfoot and many other mines on the Seine River, are turning out successfully.

Rainy River as a gold district can be conveniently divided into five sections. First, and probably the most important, is the Lake of the Woods section, including all the country north west of Rainy Lake and around Shoal Lake ; west of the Lake of the Woods, com-

prising an area of not less than 2,000 square miles in which there has been over 1,500 claims surveyed. The Rainy Lake section, comprising the Seine River, has over 1,100 claims surveyed. Gold was first discovered on a small island in Rainy Lake on the Minnesota side of the line, in the fall of 1893. In the spring of 1891 was found a small nugget of pure gold on Hunters' Island. Since that time the prospecting has been very active and several good mines located, on which stamp mills are now working.

GOOD VEINS WELL DEVELOPED.

The Manitou section, comprising the country round Manitou and Wabigoon and Eagle Lakes, in which there are over 300 locations surveyed and several good veins well developed, and from all appearance this has every likelihood of being a very good gold district. One of my Indians in 1890 found a sample showing free gold at the head of this lake, and I arranged with him to take me to the place, but a few hours before starting the Indian got drunk and I was never able to get him sober enough to go.

The Saw Bill Lake section, including the country around Saw Bill and Harold Lakes, in which about 125 claims have been surveyed; this is one of the most promising sections in the district, and contains the great Folger and Hammoud dyke from 10 to 300 feet in width, and nearly a mile in length, and which appears to assay from a few dollars per ton up to \$100 or more; this is probably one of the largest quartz ledges ever discovered in the Province, and is probably one of the most enticing properties on the market.

FOUR THOUSAND CLAIMS SURVEYED.

The year 1883 marks the beginning of surveys of mining locations on the Lake of the Woods. No less than 4,000 claims have since been surveyed, during the last two years 2,500, and over 1,500 during the last twelve months, within the district 1,500 patents and mining leases have been issued, covering over 2,000 claims. From fifteen to twenty Ontario land surveyors and their assistants are in the field at the present time hard at work. Of the 4,000 claims already staked out, there are, of course, as in all gold fields, a very large number of worthless, or comparatively worthless properties, but at the same time there appears to be an unusually large number of promising veins.

BEST IN THE DOMINION.

If one claim in every 100 proves a paying mine, 40 gold mines in the district mean a great deal; if 2% prove a successful property, it will make one of the best gold regions in the Dominion; if 5%, it will surpass that of California.

A purchase carefully and judiciously made may be safely calculated upon as likely to yield, under proper and economical management,

profits that will compare very favorably with some of the best known gold districts. It is not improbable that even a few very rich claims will be found, but the legitimate claims of the region are based upon the free-milling character of the ore, the large quantities of ore in sight, the true fissure veins, the economy with which the ore can be worked owing to the abundance of fuel, the splendid shipping facilities afforded by the navigable streams and lakes and the abundance of good waterpower.

CAPITAL WANTED.

One great drawback, however, to the mining development of Western Ontario is the fact that so many of Ontario's investors are land speculators rather than mining developers. They are willing to lease or purchase large tracts of mining land at \$1 or \$2 per acre with the hope of selling it at a fabulous price without spending one single dollar in development work, and thus the barter and sale of mining lands go on. Many of the small investors in the poorer claims will never reap a dollar in return and there are hundreds of worthless claims in this district. I fear that in the course of only a few years, at the mouth of the shaft of many of these partly developed claims could be erected a slab and on it the inscription written "Died for want of sufficient capital to develop."

A PROVINCE OF ITSELF.

This new district is a province within itself, with a future, possessed as it is with great natural advantages as a mining country, and peopled with an industrious race, her progress cannot be checked, as her resources are becoming better known, her towns and villages are becoming more populous, while sturdy farmers from the east are filling her agricultural areas, and on every hand can be seen abundant evidences of prosperity and advancement.

DISCUSSION.

Mr. Niven—I was very much interested in Mr. Whitson's paper, and although I have been through a good part of that district, unfortunately I never discovered anything. The fact of the matter is, surveyors never have time to look for gold. When you are out there with fifteen men around you, and expenses of \$25 a day, you do not feel much like stopping. I hope some of the many surveyors who are up there now may be more fortunate than those that have preceded them. Mr. Whitson has been through the country a good deal and is pretty well posted with reference to those matters, and I have no doubt that what we have heard from him is reliable.

Mr. Tyrrell—Is gold found in the Mispickle ores of the Lake-of-the-Woods? I know Mispickle ores are very common in that district.

Mr. Whitson—They have made no development work in the Mispickle ores yet. It is in the free milling with very few exceptions.

Mr. Sewell—I believe the rule is there, when you get sulphuret you very seldom get gold. In the Foley Mines on one occasion I got a lot of sulphuret and found some four or five pounds, and I tested it very carefully, and I could not get any gold out of it, but out of the rock you can get any amount. That is one of the peculiarities of the Lake-of-the-Woods and the whole of the Rainy River District, that in that sulphuret you get very little gold. It is generally saved as concentrates, but the amount of gold in it is very small, so that it is practically free milling

Mr. Kirkpatrick—There is one feature that is encouraging to Canadians, and that is the more recent developments have been principally among Canadians. In the Seine River and Vermilion Lake, Wild Pigeon Lake and Manitou, it was almost invariably Americans who were dealing, and Canadians did not seem to be in the country at all; but I think now people are waking up and realizing that they should not let everything go past out of their hands; and it is a feature of the last, if we may call it, "boom," it has been principally amongst Canadians, and I hope we will have the benefits of their courage, and not, as Mr. Whitson says, sit down and expect somebody else to come in and buy it at fabulous prices, because that is the thing we do not want to do. English capital is coming into the country. The Portage Mine was sold, I think, for \$18,000 to a firm in England who represent a South African Company, who turned it into the Mikado Mine. Before very many weeks passed over the gentlemen who sold it for \$18,000 were ready to kick themselves for having done so, for nearly half the purchase money had been taken out in those few weeks, as I understand, to pay for the mine. I am very glad English capital is coming in, because if they get a few good paying mines I do not know any country in the world that is better able to furnish capital than England, and I believe it will be put on a sure basis.

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HINTS TO PROSPECTORS.

BY HENRY DEQ. SEWELL, M.E., O.L.S., D.L.S., A.M.I.C.E.

Port Arthur.

THE object of this paper is to furnish a few practical suggestions or hints for the guidance of prospectors when in the field, which the author trusts may prove useful to many who have little or no knowledge of chemistry, and in the absence of being able to take an extended course of scientific study on this subject that they may be benefited by the few simple rules here given. Especially as when they are far from their homes, and out in the bush, they cannot conveniently carry much additional weight beyond possibly a few ounces. Thus by making a few practical tests of their discoveries on the ground, they may be enabled on their return to give others a fairly definite idea of their discoveries.

First of all it is self evident that any serious addition to their kit, amounting to say even ten pounds, would be entirely out of the question, as the prospector has generally to carry everything he takes with him on his back, and therefore the length of time he can spend on a trip is closely governed by the available weight for provisions that he can conveniently take with him after deducting the weight of his blankets, tent, etc.

Such being the case, the Ontario explorer, when he has found a good looking vein, simply wishes to determine whether it contains gold or not (other minerals being practically outlawed, owing to the Royalty clause imposed by our would-be wise M.P.'s), and he will also naturally wish to find out whether the gold is present in a free state, or whether it is mixed with any mineral that will materially affect the cost of extracting the gold.

The method he commonly adopts is to load himself well with specimens of the ore (more or less picked). On his return home, where he usually keeps or borrows from a neighbor, a large, heavy mortar, sieve, and pan, with which he goes through the usual method of panning, and if properly carried out it should afford him a fair idea of the value of the ore.

By such means, however, his tests are usually confined to the veins he may consider most likely, and thus he easily passes over many fairly good veins, that may possibly contain gold in paying quantities (particularly if they should happen to be at some distance from the travelled watercourses, which he generally follows with his

canoe), simply because he does not consider it worth while to carry the samples of ore to his camp.

Thus by taking with him a small box containing a few reagents, and a blowpipe kit, which will hardly weigh more than a pound and can be purchased for \$2.50, to which may be added a small text-book, he can readily determine with absolute certainty any mineral he may come across.

Since, however, the law practically restricts his search to gold, with its associated minerals, a much smaller kit will do equally as well, and thus be the means of preventing him from passing over too lightly and without proper examination many desirable veins that he otherwise might have been hardly disposed to have given even a thought.

If then he takes with him in addition to his ordinary kit a blowpipe with a spirit or grease lamp, a small hammer, anvil, forceps, magnet and a clay pipe for cupelling, with a little soda carb, bone ash, litharge and charcoal (the latter he can generally make in the woods if required), he is in a position to make a satisfactory test for gold with its associated minerals.

By heating with the blowpipe on charcoal, commonly called roasting, a small quantity of the powdered ore, the presence of sulphur, arsenic, antimony and tellurium can be readily detected, the first two by their smell, sulphur, being that of a match, whilst arsenic smells like garlic or onions, besides giving off white fumes. Antimony also gives off white fumes, which form a white coating on the charcoal, but they have no smell.

Tellurium also gives off white fumes, which form a dense white ring deposit, slightly yellowish when hot and tinging the flame point light green.

As, however, there may be some difficulty experienced in distinguishing sulphur from arsenic without practice, where both are associated together in the same mineral, it may be desirable to give another simple test for sulphur. It is well known that sulphur will tarnish silver; so we mix a little of the powdered ore with a little soda carb. and powdered charcoal, place the mixture on a silver coin, then gently heat it with the blowpipe, and should there be any sulphur present, it will betray itself by the usual stain or tarnish on the silver.

Iron is another associated mineral. It can always be detected by the magnet, magnetite being magnetic, whilst hematite becomes so when heated.

Having thus made all the usual tests for associated minerals, it only remains to determine the presence of gold and silver by cupellation. This can either be done from a small portion of the ore direct, if sufficiently rich, or the process can be simplified by concentrating from a somewhat larger quantity of the ore. In the absence of a mortar and pan, it is surprising what a handy man can do with an axe or pick, whilst a fairly serviceable pan can be extemporized by burning the grease off a frying-pan. Then taking a small quantity of the powdered ore, or concentrates, after roasting it carefully on char-

coal, mix it with a little litharge, fuse it into a button on charcoal, and afterwards proceed to cupell it, on a cupell which can be easily made by pressing a small quantity of bone ash into the clay pipe. This will take rather more time and trouble than the foregoing tests, but it can be accomplished with a little practice.

After having determined the presence of gold in the vein to his satisfaction, the next thing to be done is to make a careful examination of the vein, noting its size and direction, whether it goes with or across the formation, and what the formation consists of. He should also note whether the hill (if any) extends above the vein, and if so, to what extent. If there is any water in the neighborhood, that should also be noted.

The next point to be determined is the topography surrounding the vein. Should he be an adept at free hand sketching, he can show the vein with the principal features surrounding it; otherwise, and perhaps still better, he can provide himself with a small photographic camera, with which he can rapidly take all the views he may require. A camera using film cartridges (each cartridge providing for 12 exposures), making pictures $1\frac{1}{2}'' \times 2''$ will measure $2\frac{1}{4}'' \times 2\frac{7}{8}'' \times 3\frac{7}{8}''$, weighs five ounces, and can be purchased for \$5.00.

The principal advantages of this kind of camera is that anyone entirely ignorant of photography can use it successfully, as the cartridges are so made that they can be placed in and removed from the camera at will, in broad daylight, the film only being exposed to light when taking the picture; and the views so taken, can, on his return, be developed, printed from, or enlarged by any photographer, should the explorer either not have the desire or the ability to do the work himself. Thus with very little trouble or expense he can place himself in a position to convey to others a fair idea of his discovery, that, generally speaking, would considerably facilitate his prospects of making a sale, and possibly of getting a higher price.

In conclusion, I would particularly warn prospectors against the use of high flown names for common rocks, such as "protogine" for "granite," which are apt to be exceedingly misleading, and may possibly terminate, as the writer once heard from a would-be English expert, who wanted a location with good veins on it, but it must be in the "Antipyrine."

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THE SAULT STE. MARIE AND HUDSON BAY RAILWAY.

By JOSEPH COZENS, O.L.S.,

Sault Ste. Marie.

As THE original promoter of this line, I am asked for a short paper on the proposed route. I shall not present this from an engineering standpoint—that is for the near future—but as showing the *possibilities* in regard to the country and the advantages to be derived by Ontario from its construction.

“From ocean to ocean”—from Canada's great chain of lakes to her greater inland sea. What the construction of the Canadian Pacific Railway has been to the Dominion of Canada, the building of the S.S.M. & H.B. Railway will be to Ontario. As Sault Ste. Marie is the key to Lake Superior so is it also the key to Hudson Bay.

Nearly 17,000,000 tons of freight passed through the Sault Ste. Marie canals last season. A few miles north of the town of Sault Ste. Marie and of the line of this great traffic highway, is what? An unbroken wilderness! Not in the sense of a barren waste, as all the elements of successful settlement are there—but there are no roads, and hence no settlers. For the past twenty years Ontario has been depopulated for the benefit of Manitoba and the North-West, leaving her magnificent northern territory—which, according to Dr. Ball, of the Geological Survey, “Contains in the valley of the Moose River, alone more good land than the whole of the present cultivated portion of Ontario”—to lie fallow, uninhabited, save by a few miserable Indians. It is generally conceded that an enormous amount of benefit has accrued to Ontario from the settlement of Manitoba and the North-West territories—how much greater the benefit had this settlement been *at home*, within her own territory.

What would this railway do for Ontario? It would open up a grand farming country—easily accessible—close to good markets, close to lake navigation, with no “*magnificent distances*” of which every mile means so much less in profit to the settler. It would develop the mineral country lying north of Sault Ste. Marie, as the Canadian Pacific Railway has developed the Sudbury District, and more than all, it would bring Hudson Bay close to our doors, and enable us to utilize the enormous fishing resources of that great inland sea.

How few people realize that Sault Ste. Marie is only 400 miles distant from the sea coast of the second greatest inland sea in the world!—a sea which is practically land-locked, and *entirely within*

the Dominion of Canada. How few again have any idea of the immensity of this sea! If an island of the combined area of all the great lakes were in the centre of Hudson Bay it could not be seen from the shore. This sea is closed from the ocean for about nine months in the year, while the season of navigation *upon* it is longer than on Lake



Superior—hence the necessity for a *portage* to the south by which its enormous resources can be developed and its products marketed.

Of all the proposed routes to Hudson Bay, that from Sault Ste. Marie is without comparison the best one. It is the most direct and shortest between the great lakes and the seaboard, the connections at Sault Ste Marie with lake navigation and with existing lines of railway are unequalled, and the route between the crossing of the

main line of the Canadian Pacific Railway and the ocean the shortest possible (250 miles).

Concerning the railway itself. I trust it will be the first electric through line on the continent. The waters on the route will furnish more than sufficient power. And that electricity will be used for the railway of the future is beyond question.

Again concerning easy access to the northern part of the North-West Territories. A glance at the accompanying map will show that a line of steamships to Chesterfield Inlet, and a short portage railway to the connecting waters of the Mackenzie River will bring the northern gold fields of the Rocky Mountain chain in closer connection with Ontario than even with British Columbia. The enormous oil fields of the section lying between Mackenzie River and Hudson Bay will also be tributary to this route.

In 1889 I took the first steps towards obtaining a charter for the line. Since then I have travelled many a weary mile, and spent some of the best years of my life in gaining knowledge of the country to be traversed. I had more or less previous knowledge of this section, and my various trips have more than confirmed my idea that this route of all others is the one most eminently suited by nature for the opening up by Ontario of its northern seaboard.

NOTES ON FISHERIES.

“Whales abound in Hudson Bay as nowhere else in the world, also walrus and porpoises in vast numbers.”

Lieutenant Gordon, in his reports to the Dominion Government of 1884-5-6, of his exploration in Hudson Bay, mentions the countless number of porpoises he saw along the coast, estimating there must have been 10,000 in one “school” near the mouth of the Nelson River.

The salmon fisheries are so extensive that the Hudson Bay Co. at one time fitted up a steamer to take cargoes to England, but the long voyage to Liverpool and the detention at the Straits involved too much expense to afford a profit.

From the report of one of the officers of the Gordon expedition: “We anchored and commenced to jig. The water was very clear and I could see down some ten or twelve feet. At a depth of ten feet the cod were so thick that the only way I can describe their numbers would be to say that there were millions and millions of them to the acre.”

NOTES AS TO MINERAL INDICATIONS.

Ontario Bureau of Mines Report, 1894, page 124, contains the following remarks:—

Lignite: “Lignite outcrops for 60 miles along the Moose River. Mr. Borron reports the thickness to be from 6 to 9 feet where examined. A sample brought by Professor Bell, in 1875, proved to contain 46% of fixed carbon. Under the new process now adopted in Sweden

this can be made into merchantable condition for shipment, and provides a satisfactory substitute for a large proportion of the coal now brought into Ontario from the United States."

Iron Ores : A very large body of iron ore exists in the Matagami branch of the Moose River. This is reported by Professor Bell as in one place exposed for 1,000 feet, and rising 15 feet above the level of the river (analysis shows 52.42% of metallic iron). Mr. Borron found the same 20 miles above Mamatawa. He says this is the same sort of ore that is worked so largely in England, and forms the basis of her enormous iron industry.

Gypsum : Banks of pure gypsum, from 10 to 20 feet high, occur on both sides of the Moose River, twenty-one miles above Moose Factory. The only place where this mineral has been discovered upon the chain of great lakes is near Tawas Bay, Michigan, where the material for the covering of the Centennial Buildings in Chicago was mined. This industry attracted around one mine alone a population of several thousand people.

Kaolin : On the banks of the Missanaba branch is found an immense deposit of Kaolin in its purest state. Mr. Borron, who has had experience in glass making, reports it as superior to anything in England or Scotland.

The Geological report on these minerals concludes by saying : "When the extension of population and transportation facilities to this region confer a value upon its minerals they will be found in quantity and richness sufficient to form the basis of a large and important industry."

In the limits of this paper I have only been able to notice some of the salient features of this route. That I shall have the hearty co-operation of the Association in the enterprise, I am confident, it "goes without saying." The interest of the surveyor is in the development of the country.

May we see during the next decade many a prosperous settlement and many a flourishing mining camp on the line of the Sault Ste Marie and Hudson Bay Railway.

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WATER WORKS.

By T. H. WIGGINS, C.E., O.L.S.

Cornwall.

OUR genial Secretary has chosen this subject for my paper in rather a novel way. I presume he imagines other people are as good natured as he, and I have submitted to his choice; although two days are hardly sufficient to prepare a paper to be read before a Society many of whose members have devoted much more time to the subject than the writer.

In the published Proceedings of the Society I have noticed that papers have been read upon "The Brantford Water Works," "The Georgetown Water Works," "The Kincardine Water Works," and "The Protection of the Source of Supply of the Owen Sound Water Works." In the list of papers read before the Engineering Society of the School of Science are "The Beeton Water Works," by the late J. R. Peddar, O.L.S., and the "North Bay Water Works," by T. R. Deacon, O.L.S.

Water works is a wide term and may embrace much. In this paper I will deal with the subject in a general way, firstly speaking of what I have considered interesting in the construction of systems old and new, and then giving a short description of the Cornwall water works system.

It would be interesting to study the earlier developments of the utilization of water power. The Egyptian tympanium was a water wheel in a current or fall of water which, as it revolved raised up on its concaved blades to the height of its diameter small quantities of water which was emptied into wooden troughs and conveyed by gravity to its place for use. In our daily papers a short time ago a sketch and story were given of how a clever and probably lazy boy watered his father's stock from a pond near the barn by arranging a hose around a wheel so as to work on the same principle as the tympanium. His scheme required the motive force to revolve the wheel, and the construction of troughs from the wheel to the barn.

The wind mills, which are so plentiful to-day in rural districts, save an immense amount of labor.

I remember seeing illustrated a rude water works system in a recent engineering paper. It represented a yoke of oxen, driven by a Chinaman, turning an old-fashioned crank power which revolved a bucket chain and thus brought water from a well and discharged it into a ditch which probably led to a neighboring town.

The following statements were taken from the *Engineering News* of July, 1892, relating to the water works of Constantinople. Part of the system dates back to the Byzantium period, and has preserved its peculiar characteristics up to the present time. Recent additions to the system are similar to those in other countries.

"The wooded foot hills of the Balkan Mountains, eleven miles north of the city, were selected for collection ponds from which water was conducted by gravity to the city. The dams have vertical walls reinforced by buttresses, which walls of masonry are from 30 to 40 feet thick and are sometimes lined with marble. From the ponds water is conducted to the city in arched conduits, 24 to 28 inches in width, with slab channels 12 to 16 inches wide at the bottom, and the water flows 8 to 12 inches deep. A two-story aqueduct 14 feet high was at one time at least 4,000 feet long, and 2,000 feet yet remains. It spans a valley in the city and was finished 368 A.D. Another aqueduct, built by Justinian, is 115 feet high. The largest existing aqueduct is of Turkish origin and consists of two stories with pointed arches. Its length is 2,289 feet and height 83 feet."

To-day some of the most picturesque spots about our towns and cities are at the storage basins or reservoirs for supplying water. Many of the basins are artificial and the water is impounded by dams of great or small dimensions as the case requires.

The valleys adjacent to many of the towns in Ontario seem naturally fitted for artificial storage basins. Of course cases arise even in our inland towns where it is not advisable to adopt the gravity system, but to adopt the more expensive methods of pumping water from lower levels by steam or water power into a water tower, storage basin, or by direct and constant pressure.

Many of the towers or tanks are built without thought of beauty of design, and the word tank expresses them better than towers. I can scarcely conceive of any structure of design that mars the natural beauty of a hill top more than a plain iron stand pipe. A writer has said: "They mark the hill tops of Eastern Massachusetts in every direction, but with few exceptions they are not as beautiful as they are conspicuous. They are usually plain cylinders of iron thrust into the air like enormous steam boilers much elongated and set on end, or like very thick unsharpened lead pencils, and they disfigure the landscape as a heavy black perpendicular mark defaces a fine painting." All our designs should bear marks of art and symmetry, and we are apt to lose sight of these matters in iron structures.

In early days of water works the purity of water was but superficially considered. If it had a good color, taste, was free from odor and solids the eye could detect, it was pronounced good. The following is from the *Engineering Record* of August 8th, 1896:—

"Jersey City Water. Bids for filtered supply from the Passaic River. The water shall at all times maintain a standard of purity to be stated in the bids, and which shall give the following particulars in parts per 1,000,000:—

- "Total organic matter,
- "Total free ammonia,

“ Total albuminoid ammonia,

“ Total nitric acid.

“ The number of bacteriæ in one cubic centimeter must be stated.”

London, Eng., takes its water from the Thames and Lea Rivers, whose banks are thickly populated, and filters it through large beds of sand.

Hamburg, Germany, filters and uses water from the polluted Elbe.

Chicago, Ill., although taking its water from the voluminous Lake Michigan, from cribs three and four miles out from the shore, has had considerable trouble in pacifying the citizens as to its purity. This was especially the case in 1892. When freshets occur the canal discharges its filthy waters into the lake and refuse of all kinds is seen floating toward the intake.

About one half of the 2,000 water works systems in the United States, on which have been expended over \$600,000,000, are owned by the municipalities. New Orleans, Louisiana, bought its water works plant in 1868 and sold it again in 1878, and is the only instance, I believe, of a city selling its water works plant after once assuming control.

In the earlier systems wooden pipes were used of small bore. In 1652 Boston, Mass., had a reservoir 12 feet square fed from neighboring springs. Providence, Rhode Island, laid two miles of wooden pipes in 1772 and built a reservoir 13½ feet by 30 feet and 10 feet deep for domestic use.

Some time ago I read a most interesting article on the Vancouver, B.C., water works. The pipes are of steel, rivitted. In the crossing of Burrard Inlet cast iron flexible joints are used where bottom is uneven. The size of the pipe is 22 inches, 16 inches and 12 inches, and it is coated with asphaltum. The 22 inch and 16 inch pipes are eleven-hundredths inches thick.

In Denver, Colorado, the water is partly supplied through large wooden stave pipes. The staves are 1½ inches thick. The pipes are 48 inches in diameter, banded with steel rods. The top staves are California red wood and the lower ones are Colorado pine. These pipes lead the water from the Platte River (in the mountains) to the city. The hauling of large iron pipes would have been very expensive. The staves have a thin tongue of metal at the end, which is driven into a corresponding groove in the stave abutting it, thus making a firm joint. The writer of the article on Denver wooden stave pipes stated that old pine log pipes 5 inches bore laid in 1797 were found sound in 1870. Denver's water supply is taken from cribs underneath the bed of the stream. The gravelly bed forms a natural filter. These cribs have open joints and the water from them is clear. The pipes from the cribs terminate in a 12,000,000 gallon reservoir from which the water is pumped into the mains.

The Citizens' Co., of Denver, put in a line of stave pipes 30 inches in diameter and 16 miles long. The maximum pressure is 185 feet static head and the average pressure is 70 feet static head. The

bands of steel rods are spaced 3.86 inches apart. The total cost of the pipe was \$1.36½ per foot.

On the Maxwell land grant in New Mexico a red wood stave pipe 72 inches in diameter and staves 2½ inches thick was constructed.

Paris, France, with 2½ millions inhabitants, is supplied with water from springs 60 to 100 miles distant.

Vienna, Austria, is supplied from springs fed from the neighboring snow-capped mountains.

Munich, Bavaria, is also supplied from springs. Liverpool and Manchester, England, have expended millions in buying watersheds for water supply. Birmingham, England, is developing a scheme of bringing water a distance of 80 miles.

Much has been written upon the advisability of municipalities buying or constructing their water works plant. Those who contemplate owning their system need not be deterred by the following interesting and expensive experience of Omaha, Nebraska.

The Omaha case is stated thus in the *Engineering Record* of Jan. 9th, 1897:—

“A reorganization committee has taken a water works plant, worth at a conservative estimate about \$3,000,000, and watered the stock and bonded the plant until somebody is expected to pay interest on \$11,750,000, with the result that either the people (consumers) or innocent investors, and probably both, must be swindled. The rates are high. The net receipts are \$239,000.” These statements are partly denied in a later issue by one who is interested in the Omaha water works.

CORNWALL WATER WORKS.

The system was constructed in 1886 and 1887 by Messrs. Moffitt, Hodgkins & Clark, the well-known firm who put in several systems about that time.

The franchise from the town reserved the privilege of purchasing at the end of ten years. This option is now being taken, and in June the arbitrators' award will be given, when the ratepayers will have an opportunity of declaring whether they wish to acquire the plant at the sum fixed by the arbitrators. The source of supply, as all other sources for towns and cities on the banks of the St. Lawrence, is from the river, at a point about five miles below the Long Sault Rapids and about three-quarters of a mile above the town. It is thus above all danger of pollution, and where the current flows swiftly over a pebbled bed, pure and clear.

The pumping station is on the north bank of the river, between the river and the canal. It contains the pumping plant and residence for the engineer. Although not a beautiful structure it is finely located and answers its purpose admirably.

The engine-room floor is 22 feet above the intake pipes which only run out in the river a short distance. The pumping plant consists of two Worthington compound duplex engines, condenser, feed water pump, etc. Each engine is guaranteed to pump 1,000,000

gallons of water in 24 hours with 90 pounds steam on high pressure cylinder against 140 pounds steam fire pressure.

The comparative elevations of the main points in the system are as follows:—

Elevation of St. Lawrence River at pumping station (low water), 36; extreme high water, 60; water surface of canal, 65; bottom of engine pit, 52; base of water tower, 95.25; main parts of tower, 40 to 70.

From the pumping station two 12 inch force mains convey the water across the canal, where they join in one 12 inch main, which continues northerly up Hazel Avenue to the main on Montreal Road. At this point one 12 inch main leads to the distribution system of the town, and another 12 inch pipe to the water tower. The tower is about 2,000 feet from the pumping station in a northerly direction. It is 120 feet high and 20 feet in diameter, and holds 280,000 gallons. It is constructed of wrought iron and weighs about 80 tons, with plates ranging from eleven-sixteenths of an inch to three-sixteenths of an inch in thickness. The tower is not of beautiful design, simply a number of plates rivetted together.

The water pressure, gauged at engines, shows 72 pounds where the tower is filled and the gauges in the main parts of the town 50 to 60 pounds. The difference between the elevation of the water pressure gauge and the top of the tower is 154 feet.

The system comprises

5,200 feet	approximately	12 inch	pipe;
5,900	"	"	8 "
18,850	"	"	6 "
8,500	"	"	4 "

and 63 fire hydrants.

The town of Cornwall pays \$2,500 a year for hydrant service, water for flushing sewers, etc.

A number of the hydrants are fed from 4 inch mains, the company having followed the system, too often followed, of putting in mains of less diameter than 6 inches. The grade of the pipes was not considered important in the original construction, or laying of mains, neither have blow-offs been placed at the low points of the pipe system. Valves are placed at most of the branches, so that almost any section of the town may be cut off for repairs.

The stand pipe when first constructed leaked considerably, but with recaulking and gradual rusting of joints it was made perfectly water tight and to-day is in good condition.

A few years ago rumors were current that the water in the tower contained decaying fish, birds, etc., but upon examination it was found free from impurities.

At each filling of the tower the engineer causes it to overflow and thus gets rid of all floating material.

With a few extensions and improvements Cornwall will have one of the best systems of any town in Ontario.

DISCUSSION.

Mr. Ross—There is one point that is brought out in this paper, that four-inch pipes should never be used in a water works system, that six-inch is small enough for supplying hydrants. There is a great deal of information of different parts of the world that would be of use to members that Mr. Wiggins has collected, and I think his paper is a very valuable and timely one.

The President—I think I should say something in defence of the practice of using four-inch pipes. The size, you must remember, depends on the pressure. Where the pressure is light I would use six-inch, but in places where the pressure is high I see no objection to using four-inch pipe. This year, on a large work, I use six-inch branches altogether, the reason being the pressure would be light; but in the town of Galt, for instance, that is another large work, they used four-inch altogether, and I have heard no complaint whatever with a four-inch main and four-inch branch.

Mr. Wiggins—You mean the main on the street would be four inches?

The President—Yes, and the hydrant.

Mr. Wiggins—What do you think of Mr. Peary's idea of four-inch pipe? Will it fill with rust after a time?

The President—I have seen four-inch pipes, not filled with rust, but the diameter decreased very materially and the flow decreased very materially by rust inside, but those pipes were uncoated. There is no question about it, a six-inch pipe is to be preferred to a four; and for the same reason, an eight inch is preferred to a six, and so on; but to say you should never use a four-inch pipe for fire purposes is putting it too strong altogether.

Mr. A. R. Davis—Do you use less than a four-inch?

The President—No. The size of the pipe, in my mind, depends on the pressure altogether, the pressure available.

Mr. Gibson—Does this rust cling to the pipes very tenaciously, or would not the force of the water wash it out?

The President—No. The tubercles form on the inside of the pipe, some of them are very soft, you could rub them off—in getting the pipe out they generally drop off; but the others you can hardly get off with a cold chisel, that is on pipes that are not coated.

Mr. Wiggins—I would like to ask if it is usual to place the blow-offs at the lower portions of the pipes on the hydrants on systems that you know of—on the systems, that is, separate from the hydrants?

The President—The majority of the works in this country have no blow offs; they should have. Perhaps Mr. Davis could answer a question I would like to have answered. A gentleman stated to me

within the last two months that in Belleville the water tower there was examined and it was found that the bottom was paved for two feet in thickness with dead sparrows. Do you know anything about it ?

Mr. A. R. Davis—No.

Mr. Wiggins—I think after that was rumored about the people of Cornwall had the same idea, and as I stated in my paper, sent a man up to the top of the tower to examine the floating material, and he said there were lots of floating things about the top of the tower. I said in my paper an engineer always overflows the tower once a day as a rule, and takes off all floating material.

The President—But there might be two feet of birds at the bottom ?

Mr. A. R. Davis—Your remark recalls a conversation I had with some party, I cannot remember who he was, but it occurs to me it was in Kingston, where they climbed to the top of the tower and to their consternation they found about a foot of sparrows floating around on the top of the water, and he argued that those towers should never be left open, but should always be covered. Is there any reason why that tower should not be covered ?

The President—No, except the cost. But I never heard of any reason for covering them before.

Mr. Wiggins—I think this overflowing would do away with the floating material.

Mr. Gibson—A fine wire netting over it would stop that I should think.

Mr. Wiggins—In Cornwall it would not do, for I have seen snow and ice up above the tower some ten feet in thickness.

[This Association is not responsible as a body for any opinions expressed in its Papers by Members.]

A FEW HINTS RELATING TO THE SURVEYING OF LINES, AND ABOUT INSTRUMENTS NECESSARY TO PERFORM THE SAME WITH.

BY SHERMAN MALCOLM, O.L.S.,

Blenheim.

My experience at surveying, extending over a period of some forty years, teaches me that a good transit-theodolite (a combination of the transit and the theodolite) is a safer instrument for starting and running lines with than a transit is without the combination.

A proper transit-theodolite should or must have two distinct sets of standards or Y's in which to use or handle the telescope, either set being easily removed and the other set substituted in their places by the surveyor using it. The higher set being standards to revolve the telescope with in taking astronomical observations, which, after observations taken, may be removed and the lower Y's substituted for them to hold the telescope while finishing the survey. While the transit alone has but one set of standards or Y's, with a crossbar attached to plunge or revolve the telescope with, and from frequent wear at the top of the standards by the revolving of the telescope (as required in running lines) may cause the telescope (or combination of the same) to tip sideways, and not follow accurately a plumb line extending from the earth to Polaris, or the sun's upper or lower limb; should this be the case on starting a survey in a wilderness country, no instrument maker could have a chance to adjust the same, and few surveyors could make the necessary change needed to start the line correctly, which might be required at that time.

In the use of the compass and magnetic needle, first of all a true north and south line must be obtained in the field of survey. Then a good compass with a five-inch needle and proper verniers attached, one of which should be a floating *nonius*, attached to the south end of the needle, to sub-divide the degrees on the circle of the compass into small portions. The compass should then be tried on the governing line and the bearing noted before proceeding to correct for annual variation (in case of an old survey). Also, the needle should be tested at the starting point to ascertain if there be any local attraction, which is best proven by sighting at different points of a small circle surrounding the starting point, thence reversing the bearings back from the points in the circle to the starting point, which should read the same if there were no local attraction.

Diurnal variation (in parts of Ontario in the summer time, seems to be caused by the greater heat of the sun, apparently generating electricity so as to swing the needle westerly) should be corrected as much as possible while using the compass, by frequently showering the compass cover with cold water. Another way will help to reduce it, viz., to sight on the governing line, getting the bearing at a certain hour of one day, and starting the line to be run at the same hour on the following day.

DISCUSSION.

Mr. Foster—I have run a good many compass lines in the same region of country Mr. Malcolm has. I noticed that variation, but I never thought for a moment it came from electricity, or the difference between heat and cold, for there is really very little difference in the heat and cold of some days; and as to sprinkling the compass glass with cold water it may check electricity, but it certainly would not make any difference in diurnal variation; but I do not think he is right about the cause of it.

Mr. Sewell—I think it would check the needle working freely; that would be the effect on a rainy day, but at no other time.

The President—I do not think that should go into our Proceedings without the opposition being stated. [Reads from paper down to 'by frequently showering the compass cover with water.']

Mr. Gibson—This diurnal variation begins in the morning. In a cloudy day the needle is not affected as much as on a warm, sunshiny day, there is no question. But the diurnal variation in the winter time is not as great as in the summer. Now by the action of the sun, the heat upon the glass of course is produced in this way, as my friend suggests; if you are carrying your instrument under your arm, and you put your damp finger on it, you will take the electricity off. The effect of using anything that is wet would carry the electricity off the glass. It holds the electricity. If you rub the glass with the hand it may play the mischief with the needle, and the application of moisture in that way will carry off the electricity.

The President—Is this diurnal variation merely a local affair? Is it in the instrument itself or outside of the instrument?

Mr. Gibson—It is the effect of the sun. The glass is nonconductive. The electricity will stay there unless you put a damp finger on it.

The President—That is not the diurnal variation.

Mr. Gibson—The diurnal variation is the effect of the sun.

The President—He states a diurnal variation of 15 minutes per day should be corrected as much as possible by frequently showering the compass with cold water.

Mr. Gibson—That surely is not what he means.

The President—He should have an opportunity of correcting that.

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ISLAND SURVEYS—GEORGIAN BAY, LAKE HURON.

By CHARLES E. FITTON, O.L.S., D.L.S.,

Orillia.

BEFORE going into details of the survey, it might interest some of our members and others who read the reports of our Association to know that the Georgian Bay, with its numerous islands, has for years been a favorite resort, not only for Canadians, but also for our American cousins, large numbers of whom may be seen there every summer, and any one not having visited that part of Lake Huron would be surprised at the number and size of some of the summer residences. Another favorite way of spending a few weeks in this beautiful locality is a sojourn in the "ark" so called; the "ark" being a fair-sized house, with large veranda, built on a scow and then towed out by a tug boat or steam launch to any desired bay or island and anchored. The fishing is excellent and the smooth shadowed water between the islands cannot be surpassed for boating and canoeing.

In the past, islands were chosen by private individuals, and before they could get a deed the Department required a survey to be made and a plan and field notes filed showing the relative position of the island, giving its area and also properly connecting it with the township survey on the main land. In time these private surveys became quite numerous, and designations, by name or number, were duplicated, and owing to the difficulty of making proper connection with the township surveys on the main land, it was found that many inaccuracies crept in. The surveys sometimes overlapped each other, and in some cases the same islands, applied for by two parties, but under a different name or number, would be so inaccurately connected with the main land that the Department could not detect the error. Under these circumstances the Department decided to have a regular survey made, and last year issued instructions.

The islands lying between Waubaushene and Moose Deer Point belong to the Indians, and consequently the instructions were issued by the Department of Indian Affairs, and briefly read as follows:

"All islands, even if only mere rocks, are to be surveyed, with the exception of those already shown with reasonable accuracy, on Capt. Bayfield's or Commander Boulton's and Mr. Stewart's charts. All are to be connected with each other by triangulation, and also connected with the township surveys on the main land at convenient points."

“ Every island, however small, must be numbered, beginning at the extreme south, giving the first large or saleable island the number 50 and then consecutively. The system to be pursued is to give every large or saleable island a separate number and all small islands the same number as the main island with a letter added, for example: if the main island is number 50, the numbers of the adjacent small islands would be 50a, 50b, 50c, etc., etc., care being taken to include in each group only the islands that may properly be considered to be adjacent to the main island. A Book of Reference and Valuations is to be made, with the usual field notes, and a plan on a scale of ten chains to an inch, on mounted paper, in equal sections not greater than three feet by four feet.”

In accordance with these instructions I proceeded with the survey, beginning at the extreme south, measuring a base along a concession line on the main land and calculating the distance out to the first island, and from that point I carried on a system of triangulation, and, gradually extending it, located stations on all the large islands and prominent places on the main land, at the same time connecting them with the concessions and side lines of the townships. The stations were numbered consecutively, and the work was repeatedly checked by astronomical observations. The field notes were plotted every evening, and when corrections were required they were duly made.

By adopting this method of having fixed points on all the large islands and convenient places on the main land to tie in the traverse, I was enabled to see that everything came in correctly as the work progressed. A careful traverse of each island of reasonable size was then made with chain and compass, and, where necessary, with transit, and the very small islands and rocks were sketched in. The courses were then taken with a compass or angle with transit, as the case might be, from the nearest station on a traversed island already fixed by triangulation, and the distance was ascertained by means of micrometrical measurements.

The main land shore line for the whole distance was taken partly from the shore line, as shown on the township maps, and partly by actual traverse. The lot, concession and township lines, as shown on my plan, are connected with the islands by triangulation. In some cases it was a difficult matter to find the concession and side lines on the main land, the original blazes and posts having been, to a great extent, destroyed by fire; and often I found it necessary to go inland a mile or two to locate a line and then carefully trace it back to the shore.

A Book of Reference and Valuation was made and contained the following information. Under the heading “ Designation ” was given the number and name (if there was one) of the island, and under the heading “ Remarks ” a short description of each with reference to its timber, soil, boat harbors, boat landing, etc., etc.

The area and value of each and every island, however small, was ascertained. The areas varied from a thousandth part of an acre to hundreds of acres.

The numbers on each island were painted with white paint in plain figures, at least two feet long, on a rock in two and often three conspicuous places, generally in one place at the north end and in another at the south end. The notes show all bearings astronomic, distances in chains and links, and the areas in acres and hundredths.

An account of my experience with discs of various colors in taking the micrometrical readings on the islands and across water may not be uninteresting. The instrument used was a form of the double image micrometer, and was made by Mr. James Foster, Toronto. The discs I first used were of galvanized iron, 6 inches by 10 inches, one painted white and the other red, attached to a base rod, 10 links apart, and held in a vertical position, the lower disc six feet above the ground to avoid refraction as much as possible. Finding I could not see those colors clearly along the shore of the islands and across the water, I changed them to both black and then to both white, and again to both red, and finally found that one white disc and one red disc gave the best result. Not being satisfied, however, I had Mr. Foster make me a frame similar to that he constructed for the Department of the Interior, and used discs made of opal glass. With these I undoubtedly obtained the most accurate readings.

Of course a great deal depends on the weather, and while I got very satisfactory results by taking two readings of each distance on days that were favorable, I found that on days that were unfavorable four readings were necessary.

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EVIDENCE.

By J. L. MORRIS, C.E., O.L.S.,

Pembroke.

REFERENCE is made to "evidence" in three distinct sections of the Survey Act.

1. Sections 31-33, inclusive, where the mode of compelling a witness to give such evidence *and information* as he may possess, touching the boundary or limit in question, is given.

2. Section 60. In all cases where a surveyor is employed to run any side line or limit between lots, and the original post or monument, from which such line should commence, cannot be found, he shall obtain the best evidence that the nature of the case admits of, respecting such side line, post or limit.

3. Section 71. For better ascertaining the original limits of any township, concession, range, lot, or tract of land, every land surveyor acting in this Province shall and may administer an oath or oaths to each and every person whom he examines, concerning any boundary post or monument, or any original landmark, line, limit or angle of any township, concession, range, lot, or tract of land which such surveyor is employed to survey.

Section 72. All evidence taken by a surveyor as aforesaid shall be reduced to writing, and shall be read over to the person giving the same, and be signed by such person, or if he cannot write he shall acknowledge the same as correct before two witnesses, who as well as the surveyor shall sign the same.

The first reference, sections 31-33, inclusive, is explanatory only of the mode of compelling a witness to give evidence, and will not be further considered.

The second reference, section 60, under the heading of this paper, has reference only to the best evidence and information which the nature of the case admits of to determine side lines or limits of lots. It is not necessary to administer any oath or oaths nor to take affidavits for future use. It has been the supposition of most young surveyors that the statute compelled them in all cases to administer an oath to any witness whom they might examine with reference to the position of an original post or monument from which any side line should commence. Most surveyors during practice find that the administering of an oath is not inconvenient, yet no authority is given them under this section to do so.

Much useful information can be secured by interrogation of a witness without oath, whilst if the same witness were under oath he would be reticent and give little useful information.

The best evidence is the use of surveyor's chain, his plan, and field notes, to prove or disprove the statements which are made to him. Though as a witness on a suit, a surveyor may be asked if he swore his chainman, yet it is an exception if he is asked whether or not he gave an oath to witness concerning posts or boundaries.

The courts place little value on affidavits of witnesses examined by surveyors, as it has been found in many cases that the surveyor has shown carelessness in their preparation, and it is questionable if the evidence of any witness placed before a court by affidavits prepared by a surveyor on the ground, will have much weight affecting the decision of that court,

The surveyor is a unique personage in his official capacity. As a grand jury he opens the preliminaries by determining if there is evidence sufficient to proceed further; as examiner he helps the memory of the witness by hints from notes of former surveys; as cross-examiner he severely examines the witness, should he find signs of ulterior motives; and as judge he decides the value of the information given, under his own examination and cross-examination.

It is therefore not surprising that the courts are anxious to have the witness before them and judge of his evidence, where no pressure can be brought to bear upon him when making his statements.

It is wise and indeed beneficial to our profession that this is the case. The surveyor is careful and becomes an adept in determining the value of evidence produced before him, and will make use of no evidence which he would consider weak in a court of law. He falls back on that part of section 60 of the Survey Act, which gives more satisfaction to the surveyor and to the parties having the survey made, than any evidence which can be produced; viz., if the same cannot be satisfactorily ascertained, then the surveyor shall measure the true distance between the nearest undisputed posts, limits or monuments, and divide such distance into such number of lots as the same contained in the original survey, assigning to each a breadth proportionate to that intended in the original survey.

The cause of this dual satisfaction concerning a resurvey in this section of the country is the irregularity of the widths of lots and blocks in the original survey, and the settled conviction of the older settlers that during the years of lumbering operations, original posts were tampered with, by subordinates of the lumber-merchants.

A subdivision of the lots between original boundary lines is the best evidence to the land owner that he is receiving justice.

Again referring to sections 71 and 72, "For better ascertaining the original limits of any township," etc. The wording of the first part of this section 71 has a peculiar form, and refers to some former section of this Act where the mode of securing evidence regarding boundaries is laid down, and no doubt has reference to section 60 just discussed.

As section 60 has reference only to side lines, section 71 has reference to all boundaries referred to in this Act.

Where the position of any original post or monument, determining the limit of any township, concession, range, lot or tract of land is in question, we can easily see the necessity for the surveyor having the full powers to secure evidence affecting the work entrusted to him.

The possibilities of such evidence being worthless is great. "Personal interest of the parties giving the evidence; the surveyor requiring such evidence as proof of work previously done; including absurd information which the surveyor knows is very improbable." Other influences as well, affect evidence when taken by the surveyor on his work.

The reducing of all evidence to writing is necessary under section 72, and may at the discretion of the surveyor be filed or not in the Registry Office of the county.

Though the statement has been made that evidence by affidavit has much less effect in a court of law than personal evidence, yet for future reference it would be advisable to have all affidavits taken on work by surveyors, filed as records.

Would it not also be advisable to follow the example of Quebec Province, to have the notes and plans of all surveyors (deceased) filed at the Registry Office of the district in which he lived and practised; as no evidence is so valuable to the practising surveyor as the notes of the surveyor who has preceded him in local practice in the same section of the country. The notes of the earlier surveyors in all sections of the country have been destroyed or misplaced, and valuable evidence to the practising surveyor is lost.

DISCUSSION.

Mr. Gibson—Regarding one suggestion there, the surveyor should be more careful about taking the affidavits. I am very careful to do so. As to the value of those affidavits we take we cannot expect the courts will take them. If the party is living he can give evidence, you have to produce him; but if he is dead, then there may be a possibility of the affidavits being taken.

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SEWAGE DISPOSAL.

BY CAPT. W. F. VANBUSKIRK, C.E., O.L.S.,

Stratford.

THE question of sewage disposal has assumed considerable importance in Ontario during the last few years, as many cities and towns have constructed, or are constructing, sewerage systems, and will, in the near future, be forced to consider some means of purifying their sewage before it is turned into the rivers and streams.

The use of bodies of water as receptacles for sewage and refuse is as old a custom as employing them for washing, bathing, or drinking. The ancients acted like the moderns. We still look upon disease as a visitation of Providence; and we still pollute our supplies of water.

The maintenance of a body of water in a state of absolute purity is impossible, owing to the many sources of pollution along the banks; the legal right, therefore, of riparian owners to have the waters of a stream or river flow in its natural course without corruption, must be compromised.

Sewage, however, should never be discharged into a body of water used as a public water supply, and it should be also borne in mind that a sewage polluted stream is not a safe source of drinking water for animals.

In cases where streams are not used for public water supplies, or are not likely to be so used in the future, the question to be considered is, what degree of pollution is permissible without making the water offensive.

It will be found that, in nearly all cases, some means of purification or partial purification is desirable, even when not made compulsory by law.

Many of the prevalent ideas regarding sewage treatment have been gleaned from newspaper articles written by non-professionals, and may well be classed with those popular delusions which still cling even to educated minds.

The utilization of sewage, the restoration of all the human and animal manure, which the world loses, to the soil, instead of being discharged into bodies of water, has been the dream of thinkers for centuries. It is to a large extent still a dream.

In the early days of sewage utilization in England it was confidently expected that large profits would accrue from the application of sewage to land. Several companies were formed for the purpose; large sums were expended, but in not one single case have the sanguine anticipations of the promoters been realized.

The problems are those of to-day. Ancient history is of little value, since the discovery of the natural laws involved in the destruction of organic matter is of recent date.

All idea of making a profit, either by utilization in broad irrigation, or by the sale of sludge from settling tanks, must be discarded. Experience has proved that, ordinarily, little profit can be realized from sewage utilization, except in cases where irrigation, independently of the manurial ingredients of sewage, would be of value. We must be content to purify sewage in the least expensive manner and not attempt its utilization in a commercial sense. In the consideration of the subject it is important to thoroughly appreciate this fact.

The literature on the subject of sewage purification has become so voluminous that it is almost impossible to write anything that has not been said or written before; therefore in the following remarks on the subject no claim is made to originality. The attempt will be made, however, to present the best information in a concise form, merely emphasizing the importance and complexity of the subject.

The determination of the degree of purification required, and the best means of effecting it, are exceedingly difficult problems, and require special knowledge and skill in solving them. In any method of purification, the result will depend to a very large extent upon the skill bestowed upon the design of the works and the care exercised in their construction and operation, irrespective of the materials used or the process adopted,

NATURE OF SEWAGE.

The ordinary idea of sewage is a vile putrifying mass, possessing a most offensive odor. Such an idea arises from the inspection of cesspools and improperly constructed and operated sewers and drains. Ordinary sewage delivered at the outfall of properly constructed sewers is nothing more than dirty water; contains, approximately, one part mineral matter and one part organic matter to 998 parts water. Of the two parts of mineral and organic matter, about one-half is in suspension and can be strained out, provided the strainer be fine enough; the other half is carried in solution and cannot be taken out in the same way.

Sewage also contains almost incredible numbers of micro-organisms with the organic matter; and it is found impossible to remove them without also extracting the organic matter. The mineral matter may be regarded as harmless in most cases; so that the object of purification may be stated to be the removal of the one-thousandth part of organic matter and the bacteria.

In designing purification works for barracks, hospitals, prisons, etc., it should be borne in mind that the sewage is generally of greater density and concentration than that of towns.

QUANTITY OF SEWAGE.

Accurate information as to the quantity of sewage to be treated and the variation in the rate of flow in any one case is difficult to

obtain, and the question is one that must be very carefully studied in detail. Guess work is expensive. It may be stated that in places where storm water was kept out of the sewer system, the quantity is closely related to the water supply and varies with it. Variations in quantity of flow also occur through pervious joints, admission of cellar water, and more or less rain water from roofs.

The periods of greatest consumption of water occur in either very dry or very cold weather, while the greatest admission of ground water, etc., occurs during very wet weather. Obviously, the variation in quantity of flow will be very much less where the separate system is in operation than in places where storm water from streets, etc., is provided for. The advantages of uniformity are so great, and the cost of all methods of purification so considerable, that whenever it is necessary to purify sewage in any way all rain water should be kept out of the sewerage system if at all practicable.

Many different processes have been devised for the purification of sewage, and it would be impossible in a paper of this nature to describe very many of them. With the exception of a few remarks on bacterial purification, therefore, only those systems or methods will be considered which have been proved successful and which are in use to a considerable extent.

BACTERIOLOGICAL PURIFICATION.

The writer is of opinion that some system of cheap and effective bacteriological purification will be developed in the future, although the "Scott-Moncrief" system has not proved successful.

In the "Scott-Moncrief" system sewage is passed upwards through a filtering medium 14 inches in depth, composed of successive layers of flint, coke and gravel. The system depends on the following recognized truths:

"(1) That bacteria under favorable conditions are capable of indefinite multiplication.

"(2) That bacteria exist in sewage which are capable of peptonizing solid organic matter, or, in other words, of preparing it by a process comparable to that of digestion, for its final decomposition.

"(3) That in nature, the purification of the refuse of the organic world is effected by the life history of these or similar organisms."

The *Sanitary Record* describes a scheme of bacteriological purification devised by Mr. W. J. Dibdin, chemist to the London County Council, which appears to be both cheap and effective.

Mr. Dibdin obtained permission from the Sutton Council to experiment with one of the city settling tanks. The following is a brief outline of the experiment:

A complete system of underdrainage was first laid down, on which was placed a bed of burnt ballast four feet thick, and then water from a filter bed, which contained considerable numbers of micro organisms known as *micrococcus candicans*, was pumped upon the bed. The bed being now ready for sewage, it was accordingly

charged with 25,000 gallons, the full quantity it was designed to hold. No chemicals were used. The sewage was turned in exactly as it came from the sewers, and was left in the tank for two hours for the bacteria to do their work.

The effluent, though not pure enough to be portable, is said to have been certainly much cleaner and much better looking than that which comes from the settling tanks. At present two hours are allowed for the bacteria to do the desired work, and a period of aeration of the same length is then allowed in order to prevent the bed becoming choked.

BROAD IRRIGATION.

Broad irrigation or sewage farming is defined as "The distribution of sewage over a large surface of ordinary agricultural land, having in view a maximum growth of vegetation (consistently with due purification) for the amount of sewage supplied."

The land employed for this method of purification should be composed of a fairly light porous soil, as when the soil is heavy and wet the crops cannot stand much water, the sewage must be applied sparingly, so that a large area of land and much labor must be provided.

Experience has demonstrated that the land should have a subsoil of gravel or sand; that in most cases it should be under-drained by drains about five feet below the surface; and that in times of heavy storms other methods of treatment must be resorted to or the sewage turned into the stream without treatment.

The surface of land used should have a gentle slope, in order that the sewage may travel slowly forward in a lateral direction, and thus admit of the surface being regularly wetted and of the liquid draining off readily, so that the surface may dry readily after the application of sewage. Not only does the top soil require levelling to effect this, but the surface of the subsoil should be similarly disposed parallel to it, the top soil being carefully removed for the purpose, and afterwards replaced.

"The action of an irrigation field in the purification of sewage is threefold; the sewage is mechanically strained and the suspended matter separated; the dissolved organic matter is also removed by oxidation in the presence of bacteria, and the ammonia and minute quantities of nitric and sulphuric acids given off. The plants absorb the fertilizing substances, especially the dissolved organic matter, and in a lesser degree the products of the preceding process."

The main objection to sewage farming is the difficulty in finding a sufficient area of suitable land conveniently situated for the purpose.

The area required may be stated to be, approximately, one acre for each one hundred of population.

INTERMITTENT FILTRATION.

The Rivers Pollution Commission defines filtration as "The concentration of sewage at short intervals on an area of specially chosen porous ground as small as will absorb and cleanse it, not ex-

cluding vegetation, but making the produce of secondary importance. The intermittency of application is a *sine qua non* wherever complete success is aimed at."

The process consists of intermingling the sewage in the pores of the filter with sufficient air, for a sufficient time, in the presence of micro organisms which immediately establish themselves there.

A good filtering material should be composed of clean, sharp sand, with grains of uniform size, but good results have been obtained with even screened gravel.

The action of the beds is somewhat similar to that described in the case of broad irrigation.

Properly constructed filter beds can be depended upon to completely purify sewage at a rapid rate, as compared with irrigation fields. Roughly, an area of one acre of filter is sufficient to purify the sewage of one thousand of population, although a much less area gives satisfactory results in several towns the writer has examined.

Filters may be artificially constructed where suitable land is not available.

The following conclusions in regard to the action and practical working of filters are of interest in connection with the land treatment of sewage, and are extracted from a paper read by Mr. Lowcock before the Institute of Civil Engineers, vol. cxv., p. 229 :

"(1) Filtration is not only a mechanical, but also a chemical and biological process, when it is properly carried out, and when sufficient aeration is provided for.

"(2) That no chemical process yet devised will alone do more than remove the suspended matter in sewage and a very small proportion of the dissolved impurities.

"(3) That dissolved impurities can only be removed by the action of micro-organisms, *i.e.*, by nitrification ; and this can only be effected subsequently to the decomposition of the organic matter and the formation of ammonia, and in the absence of undecomposed organic matter.

"(4) That organic matter cannot be destroyed or converted into plant food until it has been dissolved.

"(5) That, as nitrification proceeds far more rapidly in a moistened and aerated porous soil than in a liquid, and as the nitrifying powers of soil are capable of cultivation, the process should be carried on by means of filtration, so that the organisms can be cultivated and supplied with food in the filter.

"(6) That the most important factor in the process of decomposition and nitrification, and the subsequent preservation of the nitrates formed, is an ample supply of air

"(7) That the suspended matters in sewage should not be allowed to pass on to the land or filter beds, as they clog the surface, and have to remain until decomposed before they can be destroyed."

CHEMICAL PRECIPITATION.

Various materials are used for the purpose of precipitating the solids of sewage in the tanks. Among those most frequently used are

lime, sulphate of iron, alumina, etc., or combinations of two or more of these.

Ferozone is the trade name for a precipitant used by the International Company. The following is a chemical analysis of a sample of ferozone, made by J. Carter Bell, A.R.S.M., county analyst, Cheshire, Salford, Birkenhead, etc. :

Moisture	20.00
Sulphate iron, anhydrous	16.28
Sesqui sulphate iron, "	6.07
Sulphate alumina, "	22.20
Carbon	4.47
Insoluble in water	15.20
Water of constitution and other matter not estimated.....	15.78
	100.00

Almost every sewage requires a precipitant especially suited to it ; for instance, a purely domestic sewage requires different treatment from sewage containing large quantities of manufacturing wastes. For this reason the manufacturers of ferozone alter the relative proportions of ingredients to suit the sewage to be treated.

The mixing race-way should be long enough to allow the chemicals to become well incorporated with the sewage before it enters the settling tanks.

SETTLING TANKS.

Settling tanks are now generally operated upon the continuous flow system, and are either long and narrow or circular in plan. In the long narrow tanks the sewage flows continuously through the set of tanks until one compartment has collected sufficient sludge to require cleaning. This tank is then cut out and left a short time, the clarified sewage being drawn off from the top gradually through a hinged pipe, generally controlled by a float. The sludge is then taken off in another pipe, the inside of the tank being scraped and swept out, washed and disinfected by hand before being again put in use.

The largest and most perfect system of tanks of this pattern in America is located at Worcester, Mass.

The following is a description of the "Caudy" circular tank, which is in use in many places in England and France :

The tank is circular, continuous upward flow. A tank 25 feet in diameter and 16 feet deep will treat, it is claimed, from 275,000 to 362,000 gallons per 24 hours. An open channel is formed in the masonry round outside of top for about three-quarters of the circumference, into which sewage flows from the mixing race-ways. In this channel are inserted several vertical pipes, which deliver sewage into tank a short distance above bottom, through pipes placed at an angle to the sides, in order to impart a rotary motion to sewage. Sewage rising to the top of tank flows into a series of parallel troughs

laid across the tank, and is conducted by them into an outlet channel, extending round the remaining part of the circumference, not occupied by the inlet channel. In the centre of the bottom, which is perfectly flat, is pivoted a horizontal perforated pipe, which reaches to side of tank, this pipe being pivoted on another pipe, which is carried up to within about two feet of the full water level, and at that point the sludge is discharged. The pivoted pipe is capable of being revolved from the outside of the tank by means of suitable gearing, and when the tank is being cleaned out the pipe is so revolved. The perforations in the pipe being upon the underside thereof, and only a few inches apart, and the pipe itself being but a very little above the bottom of the tank, it will be seen at once that the rotation of the pipe will draw in the sludge from the whole bottom surface of tank. The pressure of water in tank forces the sludge through the connecting pipe and out at the height of about two feet below water level, as above mentioned, from whence it can be run into a sludge pit.

The advantages claimed for this tank over all other forms are: The removal of sludge does not interfere with the flow of sewage through it, and the rotation of sludge pipe can be made to clean the sides of tank by attaching a suitable arrangement to it.

The time taken to remove sludge is extremely short—two to five minutes. The sludge produced is about twice as thick, and therefore only half the volume of that from any other tank.

The sludge is discharged from tank at a higher level and can be conducted to well without pumping.

The rotary motion imparted to the liquid in the tank has the effect of aggregating the fine particles of suspended matter, and thereby causing their complete and rapid removal by precipitation when the sewage is discharged into the tank, and obtaining the greatest and most effective work from the least quantity of precipitant and enabling the tank to purify the largest quantity of sewage per day.

SLUDGE.

Sludge is the necessary result of any chemical treatment of sewage, and its ultimate disposal is a serious problem. Most sludge is offensive in odor and possesses very little value as manure. The general experience has been that a town is lucky if it is able to induce anyone to haul the sludge away.

Sludge from the lime process is rather more offensive in odor and is bulky as compared to that produced by other precipitants.

Sludge may be run onto land from tanks, and there left to dry, or it may be pressed into cakes and burned or sold for manure. A glimpse at the masses of lime sludge deposited on land adjacent to the Worcester, Mass., precipitation works, is enough to convince one that it should not be deposited on land and left there for any length of time.

The sludge produced by the International system is apparently of some value, judging from the following analysis made by Mr. J. Carter Bell.

Analysis of two samples of International sludge, produced at Royton disposal works, and a sample of rotted farm-yard manure :

	Sample No. 1.	Sample No. 2.	Sample of ordinary rotted manure.
Moisture	61.000	50.500	75.424
Organic matter	14.998	18.630	15.922
Nitrogen equals .....	.694	.732	.....
Ammonia .....	.842	.888	.736
Silica	11.005	18.226	1.611
Lime	3.417	3.673	2.142
Oxides iron valumina	4.433	5.916	1.684
Phosphoric acid .....	.487	.520	.....
Phosphate lime	1.063	1.135	1.121
Chlorides and sulphates of magnesia and the alkalis	3.966	1.803	1.360

EFFLUENTS.

Chemical precipitation does not remove more than a very small proportion of the dissolved organic matter in sewage; and although the effluents may appear bright and clear on leaving the tanks, they are liable to become decomposed and foul a short distance down the stream into which they are turned.

The degree of purification obtained by different methods is ordinarily compared by the percentage of albumenoid ammonia removed. The following comparison of results obtained by several different methods is taken from the report of the Massachusetts State Board of Health, 1890 :

Conditions of Treatment.	Percentage of Albumenoid ammonia removed
Settled one hour—	
With 1,800 pounds of lime per 1,000,000 gallons	52
“ 650 “ alum “	51
“ 1,000 “ copperas and 700 pounds lime	57
“ 270 “ ferric oxide in form of ferric sulphate	59
“ no precipitant	21
Filtered through paper	39
“ intermittently through four or five feet of sand	98

It will be seen from the above that there is left in the effluent, from precipitation by chemicals, an abundant supply of food for the

unlimited growth of the bacteria remaining in the liquid, so that we must classify all chemical precipitation as methods of partial purification.

Where further purification is demanded the effluent from the precipitation tanks must be filtered or run onto irrigation fields before being turned into streams.

The Local Government Board of England will not loan money to towns for chemical precipitation works unless a considerable quantity of land is purchased for irrigation; generally one acre of land for 1,000 of population. They will, however, sanction the use of one acre of land for each 2,000 of population where the International system of purification is used.

The International system provides for filtering the effluent from precipitation tanks through artificially constructed filters of Polorite, sand and gravel.

The following are extracts from a report on the International system works at Acton, Middlesex, made by Prof. E. Frankland, at the request of Major Tulloch, R.E. (the chief engineer-adviser to the Local Government Board) :

“ These results show that the raw sewage contained a very large proportion of highly-polluting suspended matter, and an unusually large amount of foul organic matter in solution; and further, that the effluents from the subsidence tank and filter were derived from sewage of about equal polluting power as regards dissolved organic matter.

“ In the subsidence tank the suspended matter was reduced from 240.80 parts per 100,000 of raw sewage to 5.92 parts per 100,000 of tank effluent, whilst the effluent from the filter was free from suspended matter. It was clear and transparent. This is a satisfactory result.

“ The effect upon the dissolved organic matter in the subsidence tank is very remarkable, its amount being reduced to little more than one-tenth of that present in the original sewage.

“ In its subsequent passage through the filter, the dissolved organic matter is still further reduced to nearly one-sixteenth of that present in the original sewage. It is now in a state of purity greatly exceeding that prescribed by the standards of the Rivers Pollution Commission.

“ No chemical process of purification of sewage has ever in my experience approached this in efficiency; and if the results obtained at Acton can be accomplished in other places, a most important advance will be made in the purification of sewage of towns.

“ I need scarcely add that the effluent is not only clear but inodorous and inoffensive. It is, of course, not fit for dietetic purposes; but it may be admitted in large volumes into running water without creating a nuisance.”

The following are some of the results obtained under the International process :

Place.	Albumenoid Ammonia.		
	Crude Sewage.	Effluent.	Per cent. of Purification
Acton .....	.70	.035	95
Glasgow .....	.32	.28	12½
Salford .....	.68	.06	91
Stirling Asylum	3.414	.056	98½
Cahir, Cavalry Barracks	2.62	.498	81½
Hendon .....	.....	.....	98.7

In conclusion, it may be stated that the question of sewage purification is now so well understood that the familiar plea, "that sewage purification is as yet in too experimental a stage" to be considered practicable, no longer carries any weight.

DISCUSSION.

Mr. Campbell—I do not know that the question of Sewage Disposal is just in my line at the present time. I might say that in travelling round the Province I find that there is a disposition for the smaller towns and cities to undertake a system of sewerage. This, I think, is the first step which a town should take, and is really an important adjunct to a complete system of water works. A great many of our towns at the present time are taking their water supply from living streams, and invariably along the streams we find towns are discharging their sewage without any attempt at filtration or purification before it enters that living stream. The question of how the sewage of towns and cities should be treated before entering these living streams, is one which certainly deserves the greatest attention and consideration from our municipal engineers. You, Mr. President, I presume, will be more familiar with the question of sewage disposal than I am, and in having to deal with this subject, you, no doubt, are in a position to give us from the result of your experience some idea of the very great amount of skill which is required in judging of the merits of any of these different systems. The system of chemical filtration, of broad irrigation, of intermittent filtration, and I believe of mechanical filtration, are all systems which are demanding public attention at the present time, and I believe towns have adopted each of these. Engineers from their actual experience in the construction of these systems seem to be at a loss as to which one possesses the greatest merits and offers the greatest inducements to the towns requiring their adoption. Mr. VanBuskirk has evidently gone into this question very fully. I am well aware that he is a student of the sew-

age question, and judging from the comprehensive manner in which he has dealt with this subject, I have no doubt that in reading the paper over more carefully the engineers of this Province will find it of very great assistance to them in making reports to the Councils employing them. I see that it goes very fully into the necessity of protecting our water supplies, and of curing all sewage matter before it is deposited, even in some remote part of our now much settled country. I believe that the system, or that the theory of germ pollution of water supplies, the theory of decomposition, the microbe organism in water and sewage which was formerly held by scientists and experts has been largely exploded, and to-day the cause of disease is largely attributed to the disease-carrying germ of diphtheria and such diseases which are very prevalent at the present time in this country.

It is a question that I do not feel able to discuss here this morning just on the spur of the moment. Though I have given it some consideration, and from listening to-day I see that it has been fully and very ably handled, and I believe that it is well deserving of the most careful study by those who have anything to do with the question of sewage disposal in the different towns of the Province of Ontario.

I feel very much pleased with the manner in which the question has been dealt with, and I think that it will add very much to the valuable literature which this Association sends out from year to year. Our volume is increasing rapidly, and it is surprising to find how anxiously it is looked for by the members of the profession. I think it would be advisable to try and get those reports out as early as possible, because I am satisfied the municipal engineers all over the country look forward with a great deal of interest to your annual reports, and they take these papers and study them. And they believe it is better to get the report, and study the paper carefully and fully at home, than to come here and listen to it being read.

Mr. Wiggins—I heard Mr. Campbell say the question of sewerage did not come under his jurisdiction; he is saying what is hardly right; I think sewerage and drainage come together a great deal. In many towns the question of sewerage and drainage is considered at the same time, and certainly drainage should be considered in good roads. I thought Mr. VanBuskirk would probably have spoken on the question of the drainage of roads as well as of sewers. In towns I have had to do with, drainage and sewerage come together. In Brockville, when they put down a sewer pipe they put down a drain pipe alongside, and in Cornwall we have catch-basins all over the town which lead water into the sewers.

Mr. Gibson—I had a problem submitted to me on the local improvement system to put a system of sewerage into one of the suburban towns, in the township of York, adjacent to the city. We have no means of connecting with the city system. In fact it was impossible to do so, because they could not pay the money to make the connection even if they had the opportunity afforded them, on account

of the tax to be levied on it, so much for every foot of pipe laid down. The sewage had to be disposed of, and I looked up every system; the great drawback of all these systems was they cost too much for a small place. There is no question as to how we can dispose of the sewage in Toronto and in all these large cities, but if you have a problem submitted to you for a place like the village of Weston it is a different thing. Take the village of Moore Park, that I am speaking of. I went over every system and called upon the Inspector in Toronto, here, in reference to the sewers, and I carefully considered the matter, and acted according to the amount of money that was on hand. As there were no water works in the place, that added to the problem. We carried the rain water from the roofs into the pipes. I hit upon the scheme they go on in the wilderness, they always filter upwards. Much depends on the amount of pollution to be accommodated. We have two rooms, a partition across. The partition goes from the top down to three or four feet from the bottom, and there is a screen, a very porous one, the sewage has to pass through this, which keeps all the larger material out. Then there is a box of quick-lime in here and any other chemicals you wish to put in. The sewerage passes from the first chamber into the second, and there it has to rise and pass through a gravel bed of sand and this is covered with quick-lime. I did not put the quick-lime into the compartments at first to see the effect, and you would be surprised to see what a great deal of fungus started almost immediately at the out-let or top of the gravel filter, beautiful fungus too, something like the charlotte russe we had the other night at the dinner. (Applause) We have hit upon the system that seems to eat up this animal matter or whatever it was. We have a fall of 100 feet, and the chambers we prepared were almost on a level with the inlets. The next problem was to carry our 60 or 70 or 80 feet of pipes down to the bottom of the valley; our scheme was this, we ran the pipes forward on an easy grade and then dropped 4, 8, 10 or 12 feet. In order to protect our pipes we put brick walls across at intervals, so if water got under the pipes it would not wash them away. We put in a 4½-inch brick wall and carried that up above the top of the pipes. This has been in operation five or six years now, and we have not spent ten cents on it except to put in the lime. We adopted this system in Moore Park, and it has been operating there for years, and I am under the impression it is a success. For a larger filter we would increase the size of the chambers and have separate ones, distinct, so that one could be cleaned out while the others were in operation. It is a surprising thing how little material accumulates in the bottom of these chambers, the quick-lime seems to eat it up, and when it is taken out it has very little smell. At the outlet it is hardly discernable. This is only from the water closets of the houses; we do not allow the surface water to enter our system at all.

Mr. Ross—How much lime did you use in a year?

Mr. Gibson—I could not tell you, we used plenty of lime. When there is a flush of water in the spring or fall we flush it out. We have

outlet pipes for letting it off if we wish to. For instance, with three or four days' rain the whole thing will be taken down with a rush. And then we have a gate to get the sludge out. When you want to turn it out on the land it is easy to get rid of it.

Mr. Jones—What did your system cost a head ?

Mr. Gibson—I could not tell you exactly. The population is 500 or 1,000. No sludge should be allowed to enter the creek. That is a waste of material, for the farmers all want it and it is better for them to get it that way. I think even in the city of Toronto they might adopt something like this instead of turning it into the bay. With the fall of 100 feet into the creek there is very little chance for anything to form.

Mr. Ross—In your system, Mr. Gibson, you kill the bacteria with lime.

Mr. Gibson—We do not allow it to get cold. That sewage matter should not be allowed to germinate.

Mr. Davis—Does the gravel require to be renewed often ?

Mr. Gibson—We rake it over perhaps once in a season and throw in plenty of lime.

Mr. Davis—Have you anything that would dispose of the sludge ?

Mr. Gibson—We pay for having the sludge taken away. The whole of the water closet collecting is done by individuals in Toronto, and they make it up into manure for the farmers. For instance, at the present time you can hardly get any from the stables at all, it is taken up.

Mr. Campbell—You spoke of the drop. It was open to the atmosphere, there was no pipe at the place where it dropped ?

Mr. Gibson—We have a gully, where the air can circulate : there is quite a draft up this just like a chimney. We have a pipe running right down and then built the pipe into the man-hole and then dropped and came to another man-hole, and then dropped again. There was a man-hole at each drop.

Mr. Campbell—You spoke of building a brick wall to protect the pipe.

Mr. Gibson—That is across the pipe, a 4-inch wall.

Mr. Campbell—You put those walls pretty close to one another ?

Mr. Gibson—It depends upon what the fall is, what the drainage is. We have had the whole system working there for years, and it has not cost us ten cents except for putting in the line.

Mr. VanBuskirk—There is a new thing about the upward filtration. No filtration methods will serve to purify any sewage unless the filter is aired. I think in the case of the one Mr. Gibson de-

scribed that the filter is aerated, owing to the intermittency of the flow in the sewers. He says there is no water supply.

Mr. Gibson—We get water from the houses.

Mr. VanBuskirk—In any case I do not think that would thoroughly purify the sewage. It cannot possibly take off the bacteria, and in case of any disease, such as typhoid fever, in the village, they are very likely to be found in the water down the stream a short distance. I think it would be dangerous in a case where streams were used for water supplies, or to water cattle or anything of that kind.

Mr. Gibson—Do you propose cultivating bacteria, that one should live on the other, or what is the scheme?

Mr. VanBuskirk—A properly constructed filter, if it is operated intermittently and used well, has the faculty of cultivating bacteria. Those organisms you will find all about in the New York State Board of Health Report. They are cultivated in the ground, but they will not live in ground, or filter that is not aerated, that is if the filter is covered with water all the time. These bacteria will not greatly multiply, and the consequence is purification takes place. That is done at Berlin, at the sewage farm there, and there is no more intolerable nuisance. It has come through not understanding the true action and not carrying it out. I do not believe that it was ever intended to operate the Berlin system in the way it has been operated, in fact I am sure it was not. It was only intended as part of the purification scheme in any case, but there they do not even strain the sewage. All sewage before being turned into tanks or on the land should be strained by large strainers of iron bars to take out the heavy matter. The lime has the effect of aggregating the suspended matter. That is about one-half of the organic matter, and if you do not take that out you cannot take out the bacteria.

Mr. Gibson—Is not it a fact that all these sewage systems, unless a great expense is gone to, are failures?

Mr. VanBuskirk—They are unless properly operated. I have seen a great many places down in Massachusetts, and one in South Birmingham, where you could not wish to have anything better. They are perfect. The great cost there was the pumping. The cost of the farm itself is not much. Two men live there all the year round and they grow enough corn to live on.

[This Association is not responsible as a body for any opinions expressed in its Papers by Members.]

MACADAM FOR TOWN STREETS.

By A. W. CAMPBELL, C.E., O.L.S.,

Toronto.

THERE is a very common impression among the general masses of the people that macadamized roadways are all very well for country highways, but that for town streets a higher grade of paving material—brick, or wood, or asphalt—is necessary. This opinion, so adverse to macadam, has no doubt arisen from the common practice of terming a “ macadam ” road, any allowance between concessions that has had an irregular layer of gravel dropped along the centre of it. This was somewhat the idea people had of roads before the time of MacAdam, the main feature of whose roadmaking, however, was a firm, unyielding sub-soil, maintained in that condition by a thorough system of deep drainage ; and a covering of stone, impenetrable to moisture, and shaped so as to shed water quickly to the gutters. All kinds and classes of paving have their proper place, and, in its proper place, there is none more serviceable and capable of giving greater satisfaction than macadam.

One place in which macadam can be rightly employed is in paving certain town and city streets, those of a residential character, not subjected to traffic so great as to render the maintenance of macadam excessively expensive. There are, of course, other limitations which individual cases will suggest. Business thoroughfares, or a street in its business section, requires a less absorbative material, and one which presents a smoother surface, more easily cleaned. With horses standing, moving slowly, tied and pawing, as so frequently is the case on a business street, and generally with an excess of heavy traffic, a macadam pavement retains a great amount of street filth, is difficult to maintain, and should be, if possible, replaced with vitrified brick or asphalt. A well-kept macadam driveway is in keeping with well-kept boulevards, lawns and shade trees, the characteristics of a residential street ; it has a cool appearance, the dust can be readily kept down by sprinkling, and for light driving is the favorite among horsemen. Bicyclists, now an important section of the community, usually favor macadam, in preference to the more costly classes of pavement. A comparison of macadam with asphalt or vitrified brick, in point of utility and beauty, will not result unfavorably to the former.

Preliminary to undertaking the improvement of the streets of a town, levels should be taken on all the streets to establish a system of grades which will provide a proper union of street intersections. Care should, of course, be taken to equalize cuts and fills as far as practicable, and to utilize surplus earth in filling up the boulevards or low lots adjoining the street. In this, the handling of much earth is often necessary to obtain the best results.

In the finished street it is ordinarily advisable to have the crown of the roadway at about the same elevation as the surface of the sidewalk; and, in any case, the sidewalk should not be lower than the crown of the roadway. It will be necessary to excavate below this elevation in the centre of the allowance to provide for the reception of the road metal. The depth of this excavation must provide for the thickness of the metal to be used, and for surface drainage. The present tendency is to narrow the width of the driveway. It is found that to occupy a 66 foot allowance with a four foot walk on each side, and to devote the remainder to the driveway, is a needless expense, both in cost of first construction and in maintenance. From 22 to 26 feet is, on the great majority of the residential streets of towns, ample to accommodate traffic. A broad driveway is very handsome, but so also are broad stretches of nicely sodded boulevard, ornamented with shade trees. At present, on improved streets, we ordinarily find a row of shade trees outside the walk. In commencing the reconstruction of a street, it is generally advisable, if not absolutely necessary, to take up the sidewalk to permit a proper grading of the road allowance. When the earthwork is finished, the sidewalks may be placed immediately outside the row of trees, and the space originally occupied by it, sodded, and if the fences are removed, the strip is, in appearance, added to the depth of the lawn. This arrangement will usually leave a space for a strip of sod between the sidewalk and the carriageway. If this part of the boulevard can have a width of about two feet or more, it takes away a certain dusty, business appearance which it would otherwise retain. The sidewalk should have a distinct elevation above the sod, sloping slightly toward the roadway to provide for proper drainage. The strip of sod between the walk and curb should have a fall toward the curb of six or more inches, and on a 24 foot roadway having a one-foot crown at the same elevation as the walk, this will leave from 6 to 8 inches of curb exposed.

The crown referred to above, about one inch to the foot, will seem to many, perhaps, excessive. This applies to the newly made roadway and provides for settlement. Two-thirds of an inch is the convexity ordinarily adopted on newly constructed English and French roads; but with the material available in most localities of our Province it is not sufficient. I do not regard limestone, gneiss, fieldstone and gravel obtainable as sufficiently durable; hollows are apt to appear, dust accumulates, and unless there is ample fall for the water, it will be found lying upon the road surface. The tendency invariably is for traffic to use the centre of the roadway, and this is always increased with the narrower driveways. But in choosing between

two evils it is better practice, I find, to provide ample crown. It is better that travel should be less distributed than that water should lie in pools on the road.

The shape of the crown has been a subject of some discussion. A circular rise, I believe, to be the best principle to follow in practice. Two planes, joined at the top by a short curve, do not provide for settlements and wear. A flat ellipse, sometimes advocated, does not provide for settlement, and gives an unduly steep fall at the edges, increasing the wear at the sides, and practically narrowing the roadway.

For curbing, flagstone, which is easily obtained in many districts, is the more handsome and more durable material. A good substitute is 3 x 10 cedar, which should be spiked to cedar posts $2\frac{1}{2}$ feet long and 6 in. diameter. By bevelling the posts, the curbing may be inclined at an angle of about 30 degrees. It presents a better appearance than when perpendicular, the tops of the posts are protected, and there is less liability to decay.

In nearly every locality throughout the Province good material will be found within easy distance. Crushed stone is usually regarded as the only material for macadam roads; but MacAdam really used and advocated any material which would provide a good wearing surface, not readily penetrated by moisture. Thus we have, in Ontario, a choice of gneisses, limestones, field boulders, pit and creek gravels, or if we wish the best material, trap rock is available. Of these materials we have all qualities, from that which is exceedingly good to that which is little better than clay. The gneisses are usually a harder and tougher rock than the limestone, but the latter offsets this defect largely by their better cementing qualities. Fieldstone makes a very good metal if care is taken in its selection. Pit gravel usually needs screening and crushing, to remove sand and earthy matter, and to reduce the large stones to suitable dimensions. Creek gravel is often sufficiently clean to be applied directly to the road, but some attention should be given to breaking large stones. In choosing the metal, a judicious selection must usually be made between a cheaper and poorer material in the immediate vicinity, and a more expensive but more durable metal from a distance. The selection will be based on the expenditure permissible, and the nature of the traffic which is to be accommodated. The depth of stone needed will vary with the nature and extent of traffic, and the quality of stone used. Twelve inches is sufficient for the heaviest travel, and a thickness of seven inches is admissible. The coating should be heavier at the centre than at the curb. These measurements are after consolidation with a roller.

The use of binders is another question of considerable importance. The best that can be had is usually the clean chips and dust, the screenings of the metal used. The amount of vacuum in a surface covering consolidated without a binder is very considerable, but I regard the mechanical grasp which one stone takes upon another, under pressure, as infinitely preferable to the consolidation obtained by a

mixture of sand and stone. Sand attracts and retains moisture, while a vacuum will permit the water to pass away, at the same time affording space for the expansion of the frozen water retained. The action of frost on clean metal is much less serious than upon a roadway having a temporary bond of sand. Of course, rolling is an absolute necessity in obtaining a proper surface covering of crushed stone. Broken stone dropped upon a roadway permits water to pass into the sub-soil as through a sieve, and the process of consolidation not only results in a very great wear and waste of metal, but mixes it with the earth, which of itself is very injurious; and in so doing destroys the crowning, and therefore the proper surface drainage of the sub-soil. The subsoil should be crowned, and, like the covering, thoroughly consolidated by rolling. The metal should be applied in layers three or four inches thick, each layer being thoroughly rolled before the next is applied.

The weight of the roller should be from 10 to 15 tons, the former generally producing the better results. An excessive weight tends to crush the metal, especially if of the softer local varieties, instead of working it into position. The heavy rollers produce consolidation more quickly, but the lesser weights have more permanent results. Less than ten tons is not advisable, except in the instance of a horse roller, a cheaper, but not very satisfactory, substitute for a steam roller.

The necessity of underdrainage has been referred to. The means must usually be common field tile. The location and extent of drainage must depend on various circumstances, the nature of the soil, the opportunity for outlets, and whether or not there is a sewer beneath the roadbed. Ordinarily a three or four inch tile placed beneath the edge of the roadway on each side, and below frost line, is the best rule to follow, but this, if the soil is loose and porous and has a natural outlet for sub-soil water, may be more than is necessary. A line of tile placed in the centre of the road allowance disturbs the earth foundation and settlements are likely to occur, a condition which is difficult to repair and is very injurious to the stability of the road.

If gravel or broken stone is used on a business thoroughfare, the gutters should be cobble-stoned to protect them from the stamping of horses; but on residential streets this is not necessary, the angle between the road surface and curb forming a sufficient waterway. Outlets for surface and sub-drainage must be procured as frequently as possible so as to dispose of water before it gains force and headway. If a system of sewers exists, with provision for storm water, the matter is very much simplified. When necessary through settling basins, which should be very carefully guarded, to prevent obstruction.

Street improvement in towns is a matter to which municipal engineers have not been called upon in the past to give very much attention, nor have the advantages of well-built and tastefully designed streets received sufficient consideration from municipal councils or the public generally. To discover the best ways and means to do away with the existing shapeless and badly constructed roads which disfigure the majority of Ontario towns, and to replace them with works

which will give a park-like appearance, is a problem worthy of study; and in its solution the engineering profession must take an active part. The first step is to teach citizens what good streets are; when the public and councillors know this they will know that the engineer's services and advice must be necessary for their construction. When a man knows how and why a horse should be shod, he goes to a blacksmith, to the advantage of the horse, the owner and the smith.

Economy, a necessary part of the subject, must be measured by the standard of services rendered, as compared with the ultimate, not the primary cost. This primary cost varies very much with different localities, and any estimate would require considerable revision for each district. An average cost per mile of a driveway 22 feet wide may be placed at \$3,000. It is not well, however, to frighten the public with the estimate of a mile of street. Very few streets are a mile in length, and no citizen has to pay more than his own frontage. This, when extended over a term of years, is a very small annual amount, and the benefits resulting from the improvement, will popularize the expenditure. A man's standing is judged, to quite an extent, by the clothes he wears and the house he lives in. A town is criticized from a similar standpoint, and no municipality can afford to leave its public highways in a state of neglect. The condition of the streets of the majority of towns in Ontario is neither in keeping with true economy nor with an age of civilization.

DISCUSSION.

Mr. Campbell—The system in operation in the majority of towns in Ontario to-day is very poor. It is inefficient, incompetent, and in a majority of cases it would be a disgrace, a reflection upon the statute labor employed in the rural districts. It is very largely due to the fact that municipal councils are constantly using the appropriations of money applied or appropriated for this purpose as legitimate campaign funds! They simply scatter the money over the whole street area of the town, wherever it is demanded by one or more of the influential citizens. In this way the money is not put to the best use. If the money was properly concentrated and expended on a well defined system, which must be prepared by the local engineer, and followed out by him, the streets of the towns in the Province of Ontario as well as the roads of the rural municipalities would, in a short time, compare favorably with the streets of the towns of more settled countries.

Mr. Davis—I wish we could have that paper in the hands of our municipal councils. I read with very much pleasure and profit the pamphlet that was circulated by the Department, written I believe by Mr. Campbell some few years ago, in reference to road making. Of course that found its way into the hands of a good many people, and it opened the eyes of a large number of people in this Province to the fact that road-making in our towns is done in a very slipshod manner, and this article that is so full and comprehensive would be a valuable addition to the information that our municipal councils have

in reference to this matter. Councils never think of employing an engineer. I know of towns ranging from three to five thousand inhabitants in this Province who never think of consulting an engineer in reference to the expenditure of thousands of dollars annually. They leave it to their Chairman of the Street Committee to expend this money, and they do it in the same manner that their fathers and grandfathers did. I am sure a paper of this kind, not only in the hands of the surveyors and of the municipal engineers, but in the hands of the members of the councils, the people who have authority, would awaken them to a sense of the fact that they are squandering the money, as Mr. Campbell says. There is no doubt that he hits the nail on the head when he says this money is being used for campaign purposes.

Mr. Ross—I think this is a particularly valuable paper, and should be in the hands of all municipal councils. Of course papers somewhat similar have been scattered pretty well over the Province by the Good Roads Association, and other kindred associations, and it is well known Mr. Campbell is doing very valuable and efficient work in every county, and I look for great improvement in roadmaking from his efforts.

Mr. Niven—I quite agree with the remarks of Mr. Davis and Mr. Ross regarding the work Mr. Campbell has done. I know in a great many of our country towns the administration is worse than in some of the country places, some of the townships.

Mr. Gibson—Here is a by-law that was passed by the York Township Council, and it touches a little of the subject of our roads. The idea was heretofore the moneys in the Township of York had been frittered away; the engineer was only on fees. Now the engineer is on salary, and the effect of the by-law now is to compel compliance with the wishes of the engineer. [Mr. Gibson hands in copy of by law, which he read.]

Mr. VanBuskirk—Mr. Campbell has put the subject so well that he has left us nothing to say. Of course it will save us some trouble, but I think we have a grievance against Mr. Campbell for saying all that is to be said and not giving us a chance to say a word.

The Vice-President—I think we should be very much pleased to have the paper in our Proceedings as one of the papers of the members of this Association, and it will be very valuable for reference.

Mr. Campbell—I could do a great deal in the Province of Ontario towards the betterment of our roads, but I can do nothing by myself. I must have the services of the people and their co-operation, and that of the engineers, or my office may as well be dispensed with. It is a very large field to pass over the whole Province, and at best all I can do is to hold meetings here and there in different sections. The local engineers must be employed to do the work; all I can do is to stimulate an interest and educate the people in the interests of good roads, and it remains for them to make these good roads.

[*This Association is not responsible as a body for any opinions expressed in its Papers by Members.*]

“UNDISPUTED” POSTS, LIMITS OR MONUMENTS.

By HENRY CARRE, C.E., O.L.S.

Belleville.

SECTION 60 of the Land Surveyors' Act makes use of the above heading, but does not state what the word “undisputed” means. Is it sufficient for the owner of a lot of land to say “I dispute that post” to render it a *disputed post*, and cause the opposite party to go to all the expense of proving it to be a true “original post”? Is there no limit as to the time during which a “post limit or monument” having remained “undisputed” becomes so legally?

Some years ago the law gave a man legal possession of property, which really belonged to his neighbor, if he had held it in peaceable possession, and enclosed, for twenty years. Now the time limit is reduced to ten years. On the same principle why not grant the same privilege to a man who, owning bush land in a wild, unsettled country, has had his lands surveyed, by a duly authorized surveyor, who runs his lines, plants posts, and blazes the trees on either side the line, so that it can be easily traced, but who sees no necessity for building fences to keep deer and bears from roaming over it. This, according to the present law, does not give possession, even though the timber has been cut according to those lines, and the land bought and sold by them for thirty years past.

In many of the back townships in this district valuable mining privileges have been bought, on lands defined in this way, and it is considered safer, in sections where valuable timber is found, not to build fences, which in case of fire become nothing but trains laid to conduct the fire more quickly from point to point. Still, if you don't fence your land in, and your posts are destroyed, some other man buys the next lot to you and has a survey made; and you find that a fine lot of timber or a valuable mine, for which you paid a high price, is not on your land at all, and your neighbor who paid little or nothing for his lot, because *there was nothing on it*, “takes the cake.”

As time flies on, and old settlers die or move away, it is becoming more difficult to prove “old originals.” Fires have devastated the country and left nothing but bare rocks, which for years back were considered worthless, but are now found to contain valuable minerals. Old posts and lines have been wiped out of existence, and the difficulty of getting “undisputed posts” is great indeed in townships surveyed as “double fronts,” as far back as 1819.

19	Original Post	392
18		362
17	CON. IV	332
16		302
15	Original Post Destroyed in 1864	271 269.20
14		241
13	Surveyed & Fenced in in 1863	235.40 211 209.60
12	Original Post Standing in 1840. Destroyed in 1862	181 179.80
11	R's Post Post standing in 1863	151
10		149
9		120 119.20
8	R's Jog Post	90 89.40
7		60 59.60
6	Undisputed	50 29.80
	OPosts	0.00

This was the case in 1865-6 during the "Madoc gold fever," as it is called, when lands were bought and mining privileges granted for all sorts of land. Lines were then run and posts planted by surveyors from the best evidence then obtainable, but the fever wore off and the lands and boundaries were uncared for.

Now the fever is coming back to us. New processes for the extraction of minerals from the refractory ores of this neighborhood have been perfected, and mineral lands are once more coming to the front; and "right here," as our "confreres" across the line say, comes in the point I want to make. Are posts planted by surveyors in those days, which have been undisputed ever since, to be classed as "undisputed posts, limits or monuments"?

Old original posts are now hard to establish; it was easier in those days when men were crazy over mines. Surveyors had to be careful and sure they were right before running a line. The writer was one of them and knows something of the matter.

To show the confusion into which this matter has brought things—and it is easy to see the confusion will increase as property becomes more valuable—I have prepared a rough sketch of a concession line, showing the effect of different surveys, made at different times, and by different surveyors, all acting according to the law as they understood it. I may here say that in my own practice I have seen similar cases, though not all in the same locality as I now give them. Chainage is assumed so as to simplify matters.

Referring to sketch. In the year 1840 P.L.S. R. was called upon to "run lines" and establish the boundaries of Lot No. 9 in the 4th concession. He found "original monuments" planted in the year 1819 between 5 and 6 and 11 and 12, chained the distance, and gave each lot a width of 31.00 chs. The owner of Lot No. 9, like a wise man, fenced in his lot and cultivated it. The remaining owners held their lands according to the lines run by R., who had planted posts in front and at the "jog," in the centre of the concession. All were satisfied the survey was correctly made under the Act. I show R.'s work (— · — · — · —) thus, upon sketch.

In 1862 the post between 11 and 12 was destroyed by fire. It had stood on a high rocky knoll. Not a trace of it was left nor of the witness trees. The only thing remaining of R.'s work were the posts around Lot 9, the post between 10 and 11, and a portion of the blazed lines between 7 and 8 at the centre of the concession and jog post.

In 1863 the owners of Lot 13 in the 5th called upon P.L.S. B. to run his lines. He disputed the survey made by R., said that the lots were each a chain too wide, and as the post between 11 and 12 was destroyed, and no one could be found to prove it, the nearest point was an "old original" between 15 and 16. This was found and sworn to. Chaining from 5 and 6 post to 15 and 16 gave each lot 29.80 chs. Lot 13 was fenced in upon astronomic lines run by B., and no one objected. B.'s work is shown (— — —) thus.

The 15 and 16 post was destroyed in 1864, but astronomic lines run from it by B. were to be traced, also jog posts. B. was dead and his field notes could not be obtained.

The owners of Lot 17 in the 4th and 5th concessions required their lines run in 1886, and engaged P.L.S. Q. to run them. No trace or evidence of old post 15 and 16 could be found. B.'s and R.'s work was disputed; they, the owners, must have the subdivision made from 5 and 6, and would stand the consequences of its being disputed.

Q. chains from 5 and 6 posts, subdivides and finds each lot to be 30 chains in width, same as in the original field notes.

Q.'s work shown (—) thus on sketch. As Q.'s work was done in 1886, the owner of Lots 9 in the 4th, who had fenced in his land, also of 13 in the 5th, held their land "by possession," and could not be moved; but what about lines run by R., which had never been fenced? Some of the lots had been sold as mineral lands, and were considered very valuable. If R.'s survey held, they were all right; but if either B.'s or Q.'s held, then they lost.

Ques.—Where are the true lines of Lot 10 in the 4th? Sec. 60 says: "The limits of each lot so found shall be the true limits thereof," but the true limits vary, as the years roll on, and old posts are destroyed. What will it be one hundred years from now? Are lines which were legally run when the original posts were standing, and there was no possibility of doubt, to be passed over, and new lines run, making totally different limits to the lots, just because a certain post has been destroyed by fire, or quietly removed by some interested party? If so, what is the use of employing a surveyor to run your line, unless you are prepared to fence in your property, and maintain it so for ten years, before you have a sure title?

As stated above, why cannot lines so run and undisputed for a set term of years be made legal boundaries, as well as the concession lines run in the same way?

Were a law passed compelling property owners to register plans of any survey made for them, same as town plots, and that said plans be drawn to a fixed scale, showing plainly all existing monuments at the time of making the survey, the true astronomic bearings and distances of all lines established, with complete field notes of survey, would not that be of importance, if said plans and field notes were made legal evidence in court, and what an assistance it would be in case of a Topographical survey being made, if attention was paid by every surveyor, in making said plans, to fix the crossing of all travelled roads, streams or rivers, lakes, mountains or hills and swamps? These plans need not be very elaborate or costly, and the Registrar could file them away for each township and concession, so that a surveyor could have a chance to examine them, and guide himself accordingly. The law as it now stands gives nearly all I mention; but I think it might go a little further, and declare that plans and field notes must be filed in all causes, and it would add very little to the cost of survey, and do away with the danger of old field notes being lost.

I should like very much to be able to give a short sketch of the work and evidence taken at a trial for trespass, decided only a week or so ago, in which most of the points brought forward in this paper came forward, and I had intended doing so, but have been suddenly called away and I fear there will not be time to do it.

Hoping for a full discussion of the different points alluded to, and sorry that I cannot be with you all at the coming meeting, I come to a full stop; feeling very sorry that I have not the time to rewrite this all over again, and lick it into better shape.

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THE DITCHES AND WATERCOURSES ACT AS APPLIED.

By G. SMITH, O.L.S.,

Woodville.

THE writer has had some experience of the working of this Act during the past twelve years, and although in that period of time much has been done to improve it, he cannot but admit that much still remains to be done in that direction, before it can be, in his opinion, practically useful, if, as is supposed, its object is to afford a prompt means of getting an outlet for small drainage systems.

The proceedings are fairly good until the award is filed, after which the average onlooker would be puzzled to know whether the Act was made for the use of the farmers, or for the purpose of farming the farmers.

In the writer's experience the municipal councils generally consider their duty done when they have passed their by-law appointing their engineer, and seldom trouble themselves further until that official makes an award, in which, like the old man getting his jackass over the bridge, he fails to please all parties, when some of its members will not scruple to make capital for the next municipal election out of the dissatisfied element even at the expense of the professional reputation of their own engineer.

When the appealed award comes before the judge for hearing, it is generally on the day of the sitting of the Local Division Court, and when he is fatigued, after hearing, perhaps, several lengthy cases.

An adjournment follows, and although the engineer, and perhaps a couple of them, besides a dozen of witnesses may be in attendance, they must be all called together a second time.

When the case again comes up the appellants have warmed to their work and are arranged for action, when the question is raised as to who is going to defend the award. The council says the engineer must defend his own award. The judge rules that that official is a witness, and that only the respondents look to the council, and in the confusion the case goes on, and ends in a draw, or is not lost, chiefly because the engineer descends from his position of strict impartiality, and acts as advocate in defending his award.

Another adjournment follows, as the court feels called upon to inspect the premises, and then become apparent the weak points of the Act.

His Honor, attended by two or three lawyers, a couple of engineers, and about half a score of farmers, climbs fences, tramps through rough land or soft plowed ground and over ditches, etc. Meanwhile

his attention is called to the many different points under consideration, by as many different parties, and the writer has, when attending on more than one such occasion, wondered at the ignorance of our law-makers in imposing such a duty upon our county judges; and he is of the opinion, formed from close observation, that these gentlemen, while conscientiously striving to do their best, feel quite satisfied that any practical farmer is much better qualified to form a correct opinion as to the merits of such cases than they are.

The next proceeding is to hear argument by the opposing counsel, and the case drags along for months, during which time its fame has extended from one end of the township to the other, and even into those adjoining, and each prudent farmer who hears of it comes to the conclusion that he will let alone that "drainage matter" of his.

When the end comes and the award is sustained, the farmers wonder how such a big row—and such a big bill of costs too—could grow out of such a small matter.

When our lawmakers can succeed in forming a competent court to hear drain appeals, then, and not until then, will the countless number of watercourses, seen in all directions over the face of our country, be put into proper shape to speedily carry off the spring freshets, and so enable the better cultivation and use of the soil.

Our farmers manage their own cheese factories, creameries, and farm buildings in their own practical manner, with fair results, and none of these are of greater importance to our Province than drainage; then, why not let them manage that too? Can none of the writer's professional brethren suggest something?

How would it answer for each municipal council to appoint annually about a dozen drainage commissioners from among their ratepayers, and provide each one with a copy of the Act.

Have the drainage appeal made direct to the township clerk of the municipality wherein the drainage works were commenced.

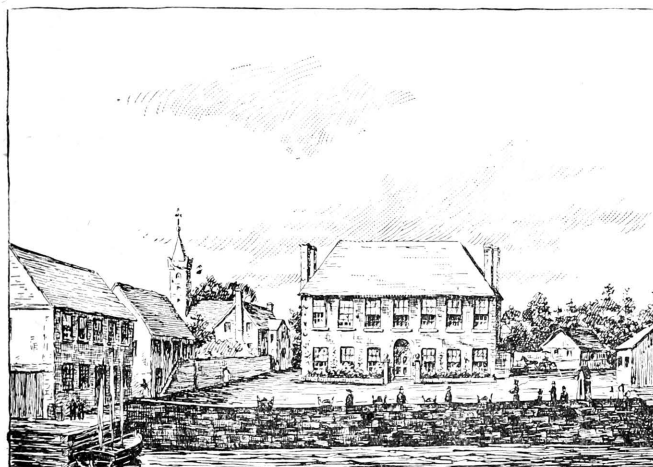
Have the clerk immediately notify all parties interested in the award to meet at his office, at an appointed time, at which meeting let him call upon each one to select a name from the lists of commissioners furnished by adjoining municipalities, and from the number of names so obtained, let the clerk ballot in the same manner as in the selection of jurors until he draws three names.

Let these three be sworn in by the clerk as a Board of Works having full power to hear and decide without appeal all matters relating to the award.

Let the commissioners' pay be \$2.00 per day, and mileage at 10c., and let no one be allowed to act in a municipality in which he has a vote, and outside of twenty miles from the municipality in which the award was made.

These are only suggestions, but they are the result of sixteen years' experience in drainage matters, and in the writer's opinion if such an arrangement could be made to carry out both the provisions of the Ditches and Watercourses Act and the Ontario Drainage Act, the drainage work undertaken would soon be increased tenfold.

APPENDIX.



BIRTH-PLACE OF SURVEYOR-GENERAL HURD, BERMUDA.

BIOGRAPHICAL SKETCH.

THE HON. SAMUEL PROUDFOOT HURD was born in Bermuda, 30th November, 1793. He was the son of Captain Thomas Hurd, R.N., Hydrographer to the Admiralty and Surveyor-General for the admeasurement and surveying of lands in Cape Breton. He was an officer in the Guards, and was present at the battle of Waterloo. He was appointed Surveyor-General of New Brunswick in 1825, and in 1830 was appointed to the same office for Upper Canada. He died 10th August, 1853.

The following is an extract from a letter written to the subject of this sketch by his father, Captain Thomas Hurd, on 30th June, 1815 :

“ We were all made happy yesterday by the receipt of two letters which assured us of your safety up to the 23rd instant, and we all flatter ourselves that you have no more (or at least very little) personal risk to undergo, but only much fatigue at times. I shall nevermore recount my naval services on board the ‘ Hercules ’ under Rodney, or in the ‘ Unicorn ’ under Ford, or of our great exploits in other fights

where I have been present—they are all eclipsed by the 18th June. Long may you live to relate and enjoy the honor you have acquired by flashing your maiden sword in an action which has no parallel in history. The enquiries after you are numerous and flattering. Amongst others I have one congratulatory note from Major Rennel, who says that you have had the happiness of seeing at the very commencement of your military career what few general officers have had the opportunity of witnessing during their lives. He also adds, that the worst being now over, all that follows is plain sailing—a substantial peace must be the consequence of such a glorious victory, and you will return to us with a delightful and enviable feather in your cap and receive the applause of everybody. At any period after this campaign you may quit the army with honor.”

LETTER OF APPOINTMENT AS SURVEYOR-GENERAL OF UPPER CANADA.

DOWNING STREET, 2ND SEPT., 1829.

SIR,—I have the honor to acquaint you that his Majesty has been pleased to appoint Samuel Proudfoot Hurd, Esquire, to be Surveyor-General of Upper Canada in the room of Mr. Ridout, deceased, and I am to acquaint you that on his arrival in the Province you will put him in possession of the office.

[Sgd.] G. MURRAY.

To Major-General Sir John Colborne.

During his term of office as Surveyor-General in Upper Canada, the claims of the United Empire Loyalists appear to have occupied a good deal of attention. Among his papers is to be found a copy of a report made to His Excellency, Sir John Colborne, Lieutenant-Governor of Upper Canada, by the Inspector-General on the subject of lands granted to United Empire Loyalists, etc., accompanied by a letter to himself.

GOVERNMENT HOUSE,

TORONTO, MAY, 1834.

SIR,—I am directed to transmit to you the accompanying report of the Inspector-General of Accounts on the subject of United Empire Loyalists' claims; and to acquaint you that the Lieutenant-Governor desires that this document may be made public and communicated to the agents of United Empire Loyalists applying at your office for location tickets, as it may be convenient to them to be informed that all grants sanctioned under the proclamation of 1789 will probably, in future, be unconditional.

I am also to state that, in conformity to the order of the 14th February last, no locations are to be granted to the agents of United Empire Loyalists in the townships in which 10,000 acres have been

already granted on United Empire Loyalists' rights, but that United Empire Loyalists who intend to settle on their lots are to be located in any of the townships open for location.

I have the honor to be, sir,

Your most obedient humble servant,

[Sgd.] WM. ROAN.

S. P. Hurd, Esq., Surveyor General.

The report of the Inspector-General closes with this memorandum :—

It may be satisfactory to the U. E. Loyalists, etc., to be informed that the quantity of land described or located, or for which orders have been duly filed in favor of U. E. Loyalists, and also of Militia claimants, amounts :

For U. E. Loyalists, to.....	1,664,600 Ac.
“ Militia Claimants.....	504,100 “

Giving a total of..... 2,168,700 “
being equal to the number of acres at the disposal of the Crown, in 45 $\frac{3}{4}$ townships.

In the names of some of our Toronto streets we find traces of Captain Hurd's presence at the C. L. Department, Bathurst street, Portland Street and Clinton street, having been all named by him from reasons of personal friendship, after Earl Bathurst, the Duke of Portland and General Sir H. Clinton, G.C.B., respectively.

It may not be amiss in concluding this sketch to quote from two very interesting documents, relating to the father of the subject of this sketch, namely, his commission as Surveyor-General of Cape Breton, and the instructions given him as to his duties in the discharge of that office. Both of these are signed by King George III. and also by William Pitt.

The commission begins “ George the Third, by the Grace of God King of Great Britain, France and Ireland, Defender of the Faith, and so forth—To all to whom these presents shall come, greeting : Know ye that we, reposing especial trust and confidence in the abilities, care and fidelity of our trusty and well beloved Thomas Hurd, have nominated, constituted and appointed, and by these presents do nominate, constitute and appoint him, the said Thomas Hurd, to be our Surveyor-General in our Province of Cape Breton in America, with power to the said Thomas Hurd to do, execute and perform by himself, or his sufficient Deputy or Deputies, all things whatsoever belonging to the said office ; To have, hold, exercise and enjoy the same during our pleasure, together with all salaries, fees, perquisites, profits and advantages thereunto or of right, belonging or appertaining.”

After charging the said Thomas Hurd, his Deputy or Deputies to observe and follow all such rules, orders and instructions as “ We, or

the Commissioners of Our Treasury or our High Treasurer or Our Committee of Council relating to Trade, etc., and all Our Governors, Lieutenant-Governors, Commanders-in-Chief, etc., shall see fit to order, direct and appoint," the document concludes with, "Given at our Court at Saint James's, this 24th day of March, 1785, in the 25th year of Our Reign."

The instructions begin "Instructions to be observed by Thomas Hurd, Esquire, Surveyor General for Admeasuring, Surveying and setting out of Lands in Cape Breton," and go on to say that "Whereas We have been Graciously pleased to give Instructions to Our Trusty and Well-beloved Joseph Frederick Waller Desbarres, Esquire, Our Captain-General and Governor-in-Chief of Our Island of Cape Breton for the Regulation of his conduct in granting Lands to Our Loyal Refugees who have taken Refuge in that Island and others who may become settlers therein; and among other things to signify Our Will and Pleasure that no Grant whatever be made of Land within our said Island until Our Surveyor-General of the Woods, or his Deputy lawfully appointed, shall have viewed and marked out such Districts within Our said Island, as Reservations to us, Our Heirs and Successors, as shall be found to contain any considerable growth of Mastig or other Timber fit for the use of Our Royal Navy."

The instructions provide for the "Deputy Surveyors" taking an oath previous to their entering on the duties of their office, and also for their giving good and sufficient security for the due and faithful execution thereof.

Every person employed as a chain bearer, to assist in the survey of the lands, is also to be sworn before entering upon his duties.

When surveys are to be made at the expense of the Crown it is provided that, if they can be spared, the chain bearers and other assistants are to be had from the troops doing duty in the Island.

When the survey of any district is completed maps are to be delivered to the Governor or Commander-in-Chief for the time being, in order to their being transmitted "home." Great care is to be taken in returning plans to the Governor to show how much of the land surveyed is barren and rocky and how much plantable. The lands to be surveyed by virtue of Warrants from the Governors are to be run in such a manner as to allow to each tract an equal and proportionate share of local advantages, as nearly as can be, in respect to the vicinity and access to the sea shore, to rivers, or highways, when the lands shall be near the sea shore or rivers; and in the interior parts the tracts surveyed are to be as nearly as may be run in squares.

These instructions are dated from "Saint James's, this 20th day of April, 1785. In the twenty-fifth year of Our Reign."

OBITUARY.

MR. WILLIAM ROBERT BURKE.

Mr. William Robert Burke was the son of the Rev. Canon Burke, of Belleville, who was himself once a Provincial Land Surveyor. He was born in Canada, near the town of Renfrew, on 13th Aug., 1855. Having finished his education in the Canadian schools, he entered the Dominion Telegraph office in Prescott, and rapidly gained promotion in that company, holding several important posts, being employed as manager at Pictou, N.S., North Sidney, Cape Breton, and Halifax, N.S. On the breaking up of the company, he settled at Ingersoll, and had charge of the N.W. Telegraph office there. Desiring to embrace the profession of Land Surveyor, he was apprenticed to Mr. J. D. Evans, P.L.S., of the firm of Evans & Bolger, Belleville, and having passed the necessary examinations, he was sworn in as a P. L. Surveyor on April 5th, 1878; he also qualified as a Dominion Land Surveyor, and had charge of several important surveys under both the Dominion and Provincial Governments, and gave every satisfaction to his employers.

He married Miss A. J. Ferguson, of Cookstown, in December, 1896. He was latterly in a poor state of health, and died suddenly at Ingersoll on June 10th, 1897.

His high principles and generous kindness made him beloved by his many friends and relatives. His wife, his father, mother and sister survive him to deplore his loss.

MR. RICHARD COAD.

With much regret we have to announce the death of Mr. Richard Coad, a member of our Association. He was the eldest son of Richard and Elizabeth Coad, of the Township of Eckfrid, in the County of Middlesex. He was born in London, Canada, on August 16th, 1856, and was educated for the profession of Land Surveyor, and after being articulated for three years with the firm of Wadsworth, Unwin & Browne, P. L. Surveyors, in Toronto, and passing the necessary examinations, he was sworn in, and admitted to practise as a P. L. Surveyor for Ontario, in October, 1879. He commenced practice in West Middlesex, and in 1884 removed to Glencoe, and soon after entered into partnership with Mr. James Robertson. He was well known in his practice for his knowledge in regard to drainage questions. He was employed by the Ontario Government to survey new townships in the

Algoma and Nipissing districts; and he made many municipal surveys under Government instructions. He was also agent for the Canada Company. He was highly esteemed by the members of his profession, and after the incorporation of the Ontario Land Surveyors, he was chosen as one of the members of the Board of Examiners, which office he retained till the time of his death.

He ever proved himself worthy of public confidence and esteem, by his unflinching uprightness and sound common sense.

He leaves a wife and three children to mourn his loss.

MICHAEL DEANE.

The death of Michael Deane, C.E., D.L.S., which occurred at Windsor, Ont., April 3rd last, removed from our ranks one of the oldest and most prominent land surveyors in Canada. Mr. Deane was born in the parish of Birr, or Parsonstown, King's County, Ireland, April 25th, 1819, and began the study of his profession at Dublin University at the age of seventeen. He was employed on the ordinance surveys in Ireland, and in his twenty-first or twenty-second year he went to England. There he was engaged on municipal works in London and Darlington, and in the construction of the London and Manchester Railway, where, for a time, he worked under the celebrated civil engineer, I. K. Brunel. In 1847 he came to Canada, and was admitted as a Provincial Land Surveyor, May 28th, 1848. After a short stay at Gananoque, he took up his residence at Lindsay, where he resided for forty-five years. In 1869 he headed the surveying party employed by the Government to lay out the extensive Crown Lands in the Nipissing District, and took part in the construction of the Toronto and Nipissing Railway and of the Grand Trunk Railway from Lindsay to Kingston. In the latter section of the province he built many bridges and other public works.

The Dominion Government sent Mr. Deane to Manitoba and the Northwest Territories in 1878. There he remained for fifteen years, during which time he assisted in laying out many townships. His adventures in that wild region were many, and when he could be induced to recount some of them, the recital was deeply interesting. But the labors and privations of that region, added to the burden of seventy-four years, had impaired his health, and in 1893 he retired from active service, removing with his family to Windsor, Ont., where he resided until death ended a long life spent in usefulness.

Mr. Deane was highly respected by a large circle of friends for his sterling integrity and upright character. He left an unblemished record of fifty-five years' practice of his profession. His wife, two sons and three daughters survive him. The ending of a life like this, connecting the present day with the history of the early settlements in the Dominion, is the loss of an important link with the past. After his years of labor, we may say "he sleeps well," with all eternity to rest in.

MR. J. R. PEDDAR.

Mr. J. R. Peddar was a native of Waterloo County, having been born at Doon on June 5th, 1868. After attending school at Doon and Blair, he went to the Berlin High School for some years. From it he entered the School of Practical Science, Toronto University, and graduated in 1890. After the usual apprenticeship with an O. L. Surveyor, he passed the required examination, and obtained the certificate of O. L. Surveyor on Nov. 10th, 1891, and in the year 1892 he was elected an Associate Member of the Canadian Society of Civil Engineers. He was employed on important water, sewerage, and railway works. In 1895 he was elected Provisional Director of the Grand Valley Railroad, and was occupied with the plans and surveys for that road when he was taken ill; he gradually lost strength and vigour until he passed peacefully away on Jan. 17th, 1897, greatly regretted by his sorrowing family and friends.

MR. CLIFFORD E. THOMSON, O.L.S.

The late Mr. Clifford E. Thomson, O.L.S., was born at Inverness, Ontario, in 1837. He served his apprenticeship with Mr. Chas. Unwin, O.L.S., and was afterwards employed in the survey of Longford and Stephenson Townships in Ontario, and of other townships in the North-West Territories. For many years he has occupied on the staff of different railway companies in the location of railroads in the United States. He was City Engineer of Jersey City for some time. During the location of the Hamilton and Northern Railway, Ont., he was Chief Engineer.

We regret that we have to record his death in Chicago, in December, 1896.

MR. CHARLES J. WHEELOCK.

Mr. Charles J. Wheelock was removed from amongst us on 4th July, 1897, after a protracted and painful illness. He was born in County Wicklow, Ireland, more than 83 years ago, and was brought up as a Land Surveyor and Civil Engineer. In 1850, accompanied by his wife and three children, he came to Canada, and settled in Toronto. In order to be permitted to practise his profession in this country, he had to study under a Canadian Surveyor. In 1856 he removed to Orangeville, which was then a small village, where he commenced to practise, and proved an active spirit in all the early enterprises calculated to benefit the town and neighbourhood. He was one of the promoters of the "Orangeville Tramway Co." He was Engineer for a portion of the Toronto, Grey and Bruce Railway, and subsequently located the line of the Credit Valley Railway from Cheltenham to Orangeville. He also laid out the Hockley Road from Orangeville to Hockley. For many years he was County Engineer for Wellington County, and assisted in the construction of the fine system of gravel roads in that county. He was besides, Township

Engineer for twelve of the neighbouring townships, and in this capacity located and superintended the construction of over 300 miles of drains, together with many other works.

He ever gave patient, painstaking and conscientious attention to the works he was entrusted with, and they bear enduring testimony to his ability as an Engineer as well as to his artistic taste.

He was also a poet of no mean calibre.

A man of undoubted honour and integrity, his kindly disposition endeared him to his wide circle of friends and acquaintances.

His wife, two sons and four daughters survive him.

In Memoriam.

NAME.	LATE RESIDENCE.	DATE OF P.L.S. CERTIFICATE.	DATE OF O.L.S. REGISTRATION.	DIED.
Bolger, Francis	Lindsay	10th October, 1863.....	1892.....	3rd November, 1895.
Bowman, Leander Meyer.....	Toronto	14th April, 1892.....	1892.....	20th September, 1895.
Burke, William Robert	Ingersoll	5th April, 1878	1892.....	10th June, 1897.
Coad, Richard	Glencoe	8th October, 1879	1892.....	17th May, 1897.
Deane, Michael	Windsor	26th May, 1848	19th December, 1892...	3rd April, 1897.
Gibbs, Thomas Fraser.....	Adolphustown	31st May, 1841	1892.....	17th April, 1893.
Haskins, William	Hamilton.....	5th July, 1855	1892	5th July, 1896.
Howitt, Alfred.....	Gourock	12th January, 1856	1892.....	6th May, 1896.
Peddon, James Robert.....	Doon.....	10th November, 1891.....	23rd December, 1892...	17th January, 1897.
Robinson, William	London	—May, 1846.....	1892.....	11th October, 1894.
Thomson, Augustus Clifford.....	Chicago	14th January, 1861	1892.....	— January, 1897.
Walsh, Thomas William	Simcoe	25th April, 1842.....	1892.....	14th March, 1895.
Whealock, Charles John	Orangeville	—, 1856.....	1892.....	4th July, 1897.

LIST OF OFFICERS OF THE ASSOCIATION OF SURVEYORS

1886 TO 1892 (BEFORE)

OFFICERS.	1886-7.	1887-8.	1888-9.
President	Geo. B. Kirkpatrick	Geo. B. Kirkpatrick	A. Niven
Vice-President	John Galbraith.....	John Galbraith.....	Villiers Sankey.....
Secretary-Treasurer	Willis Chipman ...	Willis Chipman ...	Willis Chipman ...
Councillors	M. J. Butler	M. J. Butler	John McAree.....
	E. Stewart.....	Villiers Sankey.....	H. B. Proudfoot....
	Villiers Sankey.....	P. S. Gibson.....	W. R. Aylsworth...

1892 TO 1897 (SINCE)

OFFICERS.	1892-3.	1893-4.	1894-5.
President	E. Stewart.....	E. Stewart.....	M. J. Butler.....
Vice-President	M. J. Butler.....	M. J. Butler.....	M. Gaviller.....
Secretary-Treasurer	A. J. VanNostrand .	A. J. VanNostrand .	A. J. VanNostrand .
Members of Council	Hon. A. S. Hardy..	Hon. A. S. Hardy..	Hon. A. S. Hardy..
	P. S. Gibson	Geo. B. Kirkpatrick.	Villiers Sankey*....
	M. Gaviller	A. Niven	Herbert J. Bowman.
	John McAree	P. S. Gibson	Geo. B. Kirkpatrick
	Villiers Sankey*....	M. Gaviller.....	A. Niven
	A. Niven	J. McAree	P. S. Gibson.
	Geo. B. Kirkpatrick	Villiers Sankey*....	Willis Chipman ...

**TION FORMED IN 1886 BY THE LAND
OF ONTARIO.**

INCORPORATION).

1889-90.	1890-1.	1891-2.	1892 (to 1st July).
A. Niven.....	Villiers Sankey....	Villiers Sankey.....	E. Stewart.
Villiers Sankey.....	E. Stewart.....	E. Stewart.....	M. J. Butler.
Willis Chipman	A. J. VanNostrand .	A. J. VanNostrand .	A. J. VanNostrand.
E. Stewart.....	H. B. Proudfoot....	M. J. Butler.	John McAree.
John McAree.....	M. Gaviller	H. B. Proudfoot....	M. Gaviller.
P. S. Gibson.....	T. H. Jones.	M. Gaviller.....	P. S. Gibson.

INCORPORATION).

1895-6.	1896-7.	1897-8.
M. Gaviller.....	Willis Chipman....	T. Harry Jones
Willis Chipman....	T. Harry Jones	P. S. Gibson.....
A. J. VanNostrand .	A. J. VanNostrand .	A. J. VanNostrand .
Hon. A. S. Hardy..	Hon. A. S. Hardy..	Hon. J. M. Gibson .
P. S. Gibson.....	Geo. B. Kirkpatrick	Villiers Sankey*....
F. L. Foster.....	A. Niven	J. W. Tyrrell.....
Villiers Sankey*	P. S. Gibson	Geo. B. Kirkpatrick
Herbert J. Bowman	F. L. Foster.....	A. Niven
Geo. B. Kirkpatrick	Villiers Sankey*....	F. L. Foster
A. Niven	Herbert J. Bowman	J. L. Morris (vice P. S. Gibson)

* Chairman of Council.

LIST OF MEMBERS.

15th July, 1897.

The names of those members granted exemption by By-laws ratified by the Association are marked*.
The names of those granted exemption by By-laws passed by Council since the annual meeting are marked†

NAME AND P.O. ADDRESS.	DATE OF ADMISSION BY BOARD.
Abrey, George Brockitt, Toronto Junction <small>D.L.S., Town Engineer.</small>	10th Jan., 1860
Allan, John Richard, Renfrew <small>Grad. S.P.S.</small>	6th Nov., 1894
Anderson, John Drummond, Trail, B.C.	13th April, 1892
Aylsworth, Charles Fraser, Sr., Madoc <small>D.L.S.</small>	2nd April, 1861
Aylsworth, Charles Fraser, Jr., Madoc	8th Jan., 1886
Aylsworth, John Sidney, Selby, P. O. Box 23 <small>D.L.S.</small>	9th Jan., 1871
Aylsworth, William Robert, Belleville, P.O. Box 2 <small>D.L.S.</small>	8th Nov., 1861
Baird, Alexander, Leamington <small>D.L.S.</small>	7th July, 1877
Barrow, Ernest George, Hamilton <small>D.L.S., M.C.S.C.E., Assistant City Engineer.</small>	4th Oct., 1877
Bazett, Edward, Burk's Falls <small>D.L.S.</small>	8th July, 1881
Beatty, David, Parry Sound <small>D.L.S.</small>	12th July, 1869
Beatty, Herbert John, Eganville <small>Grad. S.P.S.</small>	8th Nov., 1893
Beatty, Walter, Delta <small>D.L.S., M.F.P.</small>	19th July, 1858
Bell, Andrew, Almonte <small>D.L.S.</small>	6th Oct., 1866
Bell, James Anthony, St. Thomas <small>D.L.S., Co. Engineer, Elgin; City Engineer St. Thomas.</small>	11th Oct., 1875
Bigger, Charles Albert, Ottawa, 68 Daly Ave.	6th Jan., 1882

LIST OF MEMBERS.

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NAME AND P.O. ADDRESS.	DATE OF ADMISSION BY BOARD.
Bolger, Thomas Oliver, Kingston D.L.S., City Engineer.	6th July, 1865
Bolton, Ellsworth Doan, Ottawa, Geo. Survey Dept., B.A.Sc. (McGill).	7th Nov., 1895
Bolton, Jesse Nunn, Toronto, 264 Major st. D.L.S.	6th April, 1867
Bolton, Lewis, Listowel D.L.S.	9th July, 1864
Booth, Charles Edward Stuart, Kingston, 196 Colborne st	6th April, 1882
Boswell, Elias John, Rat Portage Grad. S.P.S.	7th Nov., 1896
Bowman, Clemens Dersteine, West Montrose	10th July, 1879
Bowman, Herbert Joseph, Berlin Grad. S.P.S., Town Engineer.	7th Jan., 1887
Bray, Edgar, Oakville D.L.S.	6th Oct., 1866
Bray, Harry Freeman, Oakville	10th July, 1882
Bray Samuel, Ottawa, Dept. of Ind'n Affairs C.E., D.L.S.	6th Jan., 1877
Brown, David Rose, Cornwall D.L.S.	10th Oct., 1850
*Brown, John Smith, Kemptville D.L.S.	8th July, 1852
Browne, Harry John, Toronto, 17 Toronto st. D.L.S., C.E.	6th July, 1872
Browne, William Albert, Toronto, 17 Toronto st.	10th April, 1876
Burt, Frederick Percy, New York, N.Y. Manager and Treasurer Eng. News Pub. Co., Tribune Building.	8th July, 1885
Butler, Matthew Joseph, Napanee, P O Box 359 M.I.C.E., M.A.S.C.E., M.C.S.C.E., C.E.	11th Jan., 1878
Byrne, Thomas, Sault Ste. Marie D.L.S.	15th July, 1862
Caddy, Cyprian Francis, Campbellford D.L.S.	10th July, 1860
*Caddy, Edward C., Cobourg D.L.S.	18th Dec., 1846
Caddy, John St. Vincent, Ottawa, 559 King st. D.L.S.	6th Oct., 1866
Cameron, Alfred John, Peterborough	9th April, 1889
Campbell, Archibald William, Toronto, Parl. Bldg. Provincial Instructor in Road Making.	10th April, 1885

NAME AND P.O. ADDRESS.	DATE OF ADMISSION BY BOARD.
Carre, Henry, Belleville, P.O. Box 203..... <small>City Engineer, B.A. and C.E. (Trin. Coll., Dublin), D.L.S.</small>	8th Nov., 1861
Carroll, Cyrus, Rat Portage..... <small>M.C.S.C.E., D.L.S.</small>	10th Jan., 1860
Casgrain, Joseph Philippe Bâby, Morrisburg..... <small>D.L.S., P.L.S. (Que.), C.E., A.M.C.S.C.E.</small>	5th Jan., 1887
Cavana, Allan George, Orillia..... <small>D.L.S.</small>	8th July, 1876
Chalmers, John, Rat Portage..... <small>Grad. S.P.S.</small>	14th April, 1896
Charlesworth, Lionel Clare, Rat Portage..... <small>Grad. S.P.S.</small>	14th April, 1896
*Cheesman, Thomas, Mitchell..... <small>D.L.S.</small>	11th July, 1856
Chipman, Willis, Toronto, 103 Bay st..... <small>Retiring President of Association O.L.S., B.A.Sc. (McGill), M.A.S.C.E., M.C.S.C.E.</small>	4th Oct., 1881
Code, Abraham Silas, Alvinston.....	14th April, 1896
Cozens, Joseph, Sault Ste. Marie..... <small>D.L.S.</small>	7th July, 1875
Creswicke, Henry, Barrie..... <small>D.L.S.</small>	8th July, 1864
*Cromwell, Joseph Miller Oliver, Perth..... <small>D.L.S.</small>	1st Oct., 1846
*Davidson, Alexander, Arkona..... <small>D.L.S.</small>	11th Oct., 1858
Davidson, Walter Stanley, Arkona.....	9th April, 1884
Davis, Allan Ross, Wabigoon..... <small>B.A.Sc. (McGill).</small>	8th Jan., 1886
Davis, John, Alton.....	5th April, 1878
Davis, William Mahlon, Woodstock..... <small>Grad. R. M. Coll.</small>	11th April, 1885
Deacon, Thomas Russ, Rat Portage..... <small>Grad. S.P.S., Town Engineer.</small>	12th Nov., 1892
Deans, William James, Oshawa.....	11th July, 1884
DeGurse, Joseph, Windsor, P.O. Box 167..... <small>Chief Eng., L.E. & D.R.R.</small>	5th April, 1883
DeMorest, Richard Watson, Sudbury..... <small>M.E.</small>	9th April, 1889
Dickson, James, Fenelon Falls..... <small>D.L.S., Ins. of Crown Land Surveys.</small>	6th April, 1867
Dobbie, Thomas William, Tilsonburg..... <small>D.L.S.</small>	11th July, 1856

LIST OF MEMBERS.

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NAME AND P.O. ADDRESS.	DATE OF ADMISSION BY BOARD.
Doupe, Joseph, Winnipeg, Man., 169 Edmonton st.	13th Jan., 1863
<small>D.L.S., P.L.S. (Man.), C.E. (McGill).</small>	
Ducker, William A., Rat Portage	6th April, 1882
<small>D.L.S., P.L.S. (Man.)</small>	
Ellis, Henry Disney, Toronto.	7th April, 1877
<small>D.L.S.</small>	
Esten, Henry Lionel, Toronto, 157 Bay st	7th Jan., 1887
Evans, John Dunlop, Trenton	8th July, 1864
<small>D.L.S., Chief Eng., Cent. Ont. Ry.</small>	
Fair, John, Brantford.	13th April, 1875
Fairbairn, Richard Purdom, Toronto, 127 Major st.,	7th Oct., 1876
<small>Surveyor for Dept. of Pub. Works.</small>	
Fairchild, Charles Court, Simcoe	9th April, 1894
<small>Grad. S.P.S.</small>	
Farncomb, Alfred Ernest, London, 213 Dundas st.,	9th April, 1895
Farncomb, Frederick William, London,	
213 Dundas st.	6th Nov., 1889
Fawcett, Thomas, Ottawa, Dept. of Interior	6th Jan., 1881
<small>Dom. Topographical Surveyor.</small>	
Fitton, Charles Edward, Orillia, Box 142	10th April, 1879
<small>D.L.S.</small>	
FitzGerald, James William, Peterborough, Box 333,	13th July, 1857
<small>D.L.S.</small>	
Flater, Frederick William, Chatham	9th April, 1888
Foster, Frederick Lucas, Toronto, 157 Bay st.	9th April, 1863
<small>D.L.S.</small>	
Francis, John James, Sarnia, P.O. Box 304	16th Oct., 1861
<small>D.L.S.</small>	
*Fraser, Charles, Wallaceburg	5th Aug., 1847
<small>D.L.S.</small>	
Galbraith William, Bracebridge	4th April, 1883
<small>D.L.S.</small>	
Gamble, Killaly, Toronto, 193 Bloor st. e.	6th April, 1888
<small>D.L.S., P.L.S. (Man.), Captain R.A. (Ret'd).</small>	
Gardiner, Edward, St. Catharines.	6th Jan., 1866
<small>D.L.S.</small>	
Gaviller, Maurice, Collingwood, Box 773.	6th Jan., 1866
<small>C.E. (McGill), D.L.S.</small>	

NAME AND P.O. ADDRESS:	DATE OF ADMISSION BY BOARD.
Gibbons, James, Renfrew.....	15th April, 1890
<small>Grad. S.P.S.</small>	
Gibson, Harold Holmes, Willowdale.....	8th Sept., 1891
*Gibson, James Alexander, Oshawa.....	7th April, 1855
<small>D.L.S.</small>	
Gibson, Peter Silas, Willowdale.....	19th July, 1858
<small>C.E., M.S. (Mich. Univ.), D.L.S., M.C.S.C.E., Engineer Tp. of York.</small>	
Gilliland, Thomas Brown, Eugenia.....	11th July, 1868
<small>D.L.S.</small>	
Gillon, Douglas John, Fort Frances.....	9th Nov., 1895
<small>Grad. R.I.E.C.</small>	
Graydon, Aquila Ormsby, London.....	8th July, 1880
<small>City Engineer.</small>	
Green, Thomas Daniel, Ottawa, Dept. of Indian Affairs.....	7th Jan., 1885
<small>D.L.S.</small>	
Griffin, Albert Dyke, Woodstock, P.O. Box 612....	11th Nov., 1890
Hanning, Clement George, Preston, Lock Box 130..	19th July, 1858
<small>D.L.S., C.E., (Trin. Coll., Dublin).</small>	
Hart, Milner, Toronto, 103 Bay st.....	11th July, 1863
<small>D.L.S.</small>	
Harvey, Thomas Alexander, London, 1 Oxford st..	13th Nov., 1893
Heaman, John Andrew, London, Albion Building ..	16th Nov., 1896
Henderson, Eder Eli, Henderson P.O., Maine.....	7th April, 1887
<small>Grad. S.P.S.</small>	
Henry, Frederick, London, Albion Building.....	7th April, 1887
*Hermon, Royal Wilkinson, Rednersville.....	13th July, 1857
<small>D.L.S.</small>	
Hewson, Thomas Ringwood, Hamilton, 42 James st. n.....	6th July, 1877
<small>D.L.S.</small>	
Hobson, Joseph, Montreal, G. T. Ry. Office.....	3rd Oct., 1855
<small>D.L.S., Chief Eng. Grand Trunk Railway System.</small>	
Hopkins, Marshall Willard, Rat Portage.....	13th Nov., 1893
<small>B.A. Sc. (McGill), A.M.C.S.C.E., Chief Eng. I.R.E. Co.</small>	
Hutcheon, James, Guelph.....	10th Nov., 1891
<small>Grad. S.P.S.</small>	
Innes, William Livingstone, Peterborough, 372½ Water st.....	14th April, 1892
<small>C.E. (Toronto Univ.)</small>	
Irwin, James Moore, Rat Portage.....	27th Dec., 1893
<small>D.L.S.</small>	

LIST OF MEMBERS.

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NAME AND P.O. ADDRESS.	DATE OF ADMISSION BY BOARD.
James, Darrell Denman..... B.A., B.A.Sc. (Toronto Univ.)	3rd Nov., 1891
James, Silas, Toronto, 77 Victoria st..... D.L.S.	19th July, 1858
Johnson, Robert Thornton, Rat Portage.....	9th April, 1889
Jones, Charles Albert, Petrolea..... D.L.S.	8th April, 1881
Jones, John Henry, Sarnia..... D.L.S.	10th Oct., 1863
JONES, THOMAS HENRY, Brantford..... President Association O.L.S., City Engineer, B.A.Sc. (McGill).	10th Oct., 1878
*Keefer, Thomas Coltrin, Ottawa..... D.L.S., C.E.	14th Aug., 1840
Kennedy, James Henry, St. Thomas, P.O. Box 434..... C.E. (Tor. Univ.), M.C.S.C.E.	7th April, 1887
Kippax, Hargreaves, Huron, South Dakota..... C.E. (Tor. Univ.), Assistant to Surveyor-General	7th July, 1877
*Kirk, Joseph, Stratford, P.O. Box 373..... D.L.S.	16th Feb., 1843
Kirkpatrick, George Brownly, Toronto, Dept. of Crown Lands..... D.L.S., Director of Surveys.	13th April, 1863
Klotz, Otto Julius, Ottawa, 437 Albert st..... C.E. (Mich. Univ.), Dom. Topographical Surveyor.	6th Jan., 1876
Laird, James Steward, Essex..... D.L.S.	6th April, 1867
Laird, Robert, Rat Portage..... Grad. S.F.S.	11th Nov., 1887
Lewis, John Bower, Ottawa, Brunswick House.	4th Oct., 1883
Lougheed, Aaron, Port Arthur..... D.L.S.	12th Nov., 1888
*Low, Nathaniel Edward, Wiarton..... D.L.S.	11th July, 1856
Lumsden, Hugh David, Toronto, 63 Homewood ave..... D.L.S., M.I.C.E., M.C.S.C.E.	4th Jan, 1866
*Lynch-Staunton, Francis Hardwick, Hamilton.... D.L.S.	11th Oct., 1856
Macdougall, Allan Hay, Port Arthur..... D.L.S.	11th April, 1859
Mackenzie, William, Rat Portage, Hilliard House..... Grad. R.M.C.	11th April, 1896

NAME AND P.O. ADDRESS.	DATE OF ADMISSION BY BOARD.
MacKenzie, William Lyon, Vankleek Hill <small>Asst. Eng. M. and O. Ry.</small>	7th April, 1887
MacNabb, John Chisholm, Hamilton, 111 Elgin st. <small>C.E.</small>	8th Jan., 1880
MacPherson, Duncan, Montreal <small>Eng. Dept. C.P.Ry.</small>	9th Jan., 1884
McAree, John, Rat Portage <small>Dom. Topographical Surveyor, B.A.Sc. (Toronto).</small>	6th April, 1867
*McCallum, James, Fort Frances <small>D.L.S.</small>	30th Mar., 1849
McCubbin, George Albert, St. Thomas, Box 423	9th Nov., 1895
McCulloch, Andrew Lake, Galt <small>Grad. S.P.S., A.M.C.S.C.E.</small>	10th Nov., 1888
McDonell, Augustine, Chatham, 4 & 5 Ebert's Block <small>D.L.S.</small>	11th July, 1863
McDowall, Robert, Owen Sound <small>Town Engineer, Grad. S.P.S.</small>	11th Nov., 1890
McEvoy, Henry Robinson, St. Marys <small>D.L.S.</small>	10th July, 1875
McFadden, Moses, Neepawa, Man. <small>D.L.S.</small>	1892
McFarlen, George Walter, Toronto, Court House. <small>Grad. S.P.S.</small>	11th Nov., 1889
McGeorge, William Graham, Chatham, 5 Sandwich st. w. <small>D.L.S.</small>	8th Jan., 1866
McGrandle, Hugh, Huntsville	5th Jan., 1883
McKay, Owen, Windsor, P.O. Box 167. <small>Grad. S.P.S.</small>	7th Jan., 1887
McKenna, John Joseph, Dublin	9th July, 1860
McLatchie, John, Ottawa, 28 Stanley ave. <small>D.L.S., P.L.S. (Que. & Man.)</small>	9th Jan., 1864
McLean, James Keachie, Edmonton, N.W.T. <small>D.L.S.</small>	8th April, 1876
McLennan, Murdoch John, Williamstown <small>B.A.Sc. (McGill).</small>	13th Nov., 1893
McLennan, Roderick, Toronto, 115 Avenue rd. <small>D.L.S.</small>	20th June, 1846
McMullen, William Ernest, St. John, N.B. <small>Assistant Engineer, C.P.R.</small>	11th Nov., 1892
McNab, John Duncan, Owen Sound	9th Oct., 1879
McPhillips, George, Rat Portage <small>D.L.S., P.L.S. (Man.)</small>	9th July, 1885

LIST OF MEMBERS.

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NAME AND P.O. ADDRESS,	DATE OF ADMISSION BY BOARD.
Malcolm, Sherman, Blenheim	11th Oct., 1858
<small>D.L.S.</small>	
Manigault, William Mazyck, Strathroy, P.O. Box 300.	8th July, 1876
<small>D.L.S.</small>	
Marshall, James, Holyrood	6th Oct., 1866
<small>D.L.S.</small>	
Miles, Charles Falconer, Rat Portage, Hilliard House, 13th Jan., 1862	
<small>D.L.S.</small>	
Miller, Frederick Fraser, Napanee	8th Jan., 1885
Moore, John Mackenzie, London, Albion Building	9th Oct., 1879
Moore, John Harrison, Smith's Falls	11th Nov., 1889
<small>Grad. S.P.S.</small>	
Morris, Alfred Edmund, Perth	10th April 1879
Morris, James Lewis, Pembroke	7th July, 1886
<small>D.L.S. C.E. (Toronto Univ.)</small>	
Mountain, George Alphonse, Ottawa	9th Jan, 1884
<small>M.C.S.C.E., D.L.S., P.L.S. (Que.)</small>	
Murdoch, William, Rat Portage	10th Jan., 1860
<small>D.L.S., C.E.</small>	
Murphy, Charles Joseph, Toronto, 157 Bay st.	6th Oct., 1886
Newman, William, Windsor, 57 Sandwich st. w.	12 Nov., 1892
<small>Grad. S.P.S.</small>	
Niven, Alexander, Haliburton	8th July, 1859
<small>D.L.S.</small>	
Ogilvie, John Henry, Rat Portage	8th April, 1876
<small>D.L.S.</small>	
Ogilvie, William, Ottawa, Dept. of Interior	12th July, 1869
<small>D.L.S.</small>	
O'Hara, Walter Francis, Chatham	14th April, 1892
<small>D.L.S.</small>	
Paterson, James Allison, Toronto, 23 Adelaide st. e., 5th April, 1878	
<small>C.E.</small>	
Patten, Thaddeus James, Little Current	5th Jan., 1883
Peterson, Peter Alexander, Montreal. P.Q.	16th July, 1863
<small>Chief Engineer Can. Pac. Ry.</small>	
Pinhey, Chas. Herbert, Ottawa, 630 Wellington ave. 12th Nov., 1888	
<small>D.L.S., Grad. S.P.S., A.M.C.S.C.E.</small>	

NAME AND P.O. ADDRESS.	DATE OF ADMISSION BY BOARD.
Proudfoot, Hume Blake, Bonheur	6th Jan., 1882
D.L.S., C.E. (Toronto Univ.)	
Purvis, Frank, Eganville	7th April, 1875
D.L.S.	
Rainboth, Edward Joseph, Ottawa	11th Nov., 1887
D.L.S.	
Rainboth, George Charles, Aylmer, Que.	11th July, 1868
D.L.S., P.L.S. (Que.)	
Ritchie, Nelson Thomas, Kincardine	9th Nov., 1888
Roberts, Vaughan Maurice, St. Catharines	5th April, 1887
Robertson, James, Glencoe	11th July, 1885
Grad. S.P.S.	
Roger, John, Mitchell	10th Nov., 1888
Grad. S.P.S.	
†Rombough, William R., Durham	14th Nov., 1848
D.L.S.	
Rorke, Louis Valentine, Sudbury	14th April, 1890
D.L.S.	
Ross, George, Welland	10th July, 1879
B.A.Sc. (McGill.)	
*Rubidge, Tom S., Cornwall	9th Feb., 1849
D.L.S., Asst. Eng. Dep. Rys. and Canals.	
Russell, Alexander Lord, Port Arthur	16th April, 1873
D.L.S.	
Sankey, Villiers, Toronto, City Hall	11th Jan., 1878
D.L.S., City Surveyor.	
Saunders, Bryce Johnston, Fort William	7th Jan., 1885
B.A.Sc. (McGill), D.L.S.	
Scane, Thomas, Ridgetown	7th Jan., 1865
D.L.S.	
*Schofield, Milton C., Guelph	28th Sept., 1843
D.L.S.	
Schwitzer, John Edward, Rat Portage	16th Nov., 1896
B.A.Sc. (McGill.)	
Seager, Edmund, Rat Portage	8th July, 1861
D.L.S.	
Selby, Henry Walter, Dinorwie, C.P. Ry.	8th Jan., 1876
D.L.S.	
Sewell, Henry DeQuincy, Rat Portage; cable, "Quincy," Toronto	9th July, 1885
D.L.S., A.M.I.C.E.	

LIST OF MEMBERS.

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NAME AND P.O. ADDRESS.	DATE OF ADMISSION BY BOARD.
Silvester, George Ernest, Sudbury. Grad. S.P.S.	12th Nov., 1892
Sing, Josiah Gershom, Meaford. D.L.S.	9th Jan., 1879
Smith, Angus, Ridgetown Grad. S.P.S.	14th April, 1896
Smith, George, Woodville, Box 77	7th April, 1881
Smith, Henry, Toronto, Crown Lands Dept. Supt. Colonization Roads, D.L.S., M.C.S.C.E.	8th Nov., 1861
Speight, Thomas Bailey, Toronto, Yonge St. Arcade, D.L.S.	6th Jan., 1882
Squire, Richard Herbert, Brantford, Box 169. B.A.Sc. (Toronto).	14th April, 1896
Steele, Edward Charles, Goderich, Box 169	9th April, 1889
Stewart, Elihu, Rat Portage. D.L.S. Crown Lands Mining Agent.	8th April, 1872
Stewart, John, Montreal. D.L.S.	11th Nov., 1887
Stewart, Walter Edgar, Rat Portage	12th April, 1892
Stewart, Geo. Alexander, Banff, N.W.T.	8th June, 1879
*Strange, Henry, Rockwood D.L.S., C.E.	30th Nov., 1838
Taylor, William Verner, Gananoque Grad. S.P.S.	7th Nov., 1896
Tiernan, Joseph Martin, Tilbury Centre	7th Jan., 1886
Traynor, Isaac, Dundalk, D.L.S.	16th April, 1873
Turnbull, Thomas, Winnipeg, Man., C.P.R. Office. D.L.S., C.E. (Toronto Univ.)	6th July, 1878
Tyrrell, James Williams, Hamilton, 42 James st. n. Co. Eng. for Wentworth, C.E. (Toronto Univ.), D.L.S.	8th April, 1885
*Unwin, Charles, Toronto, 157 Bay st. D.L.S.	12th April, 1852
Ure, Frederick John, Woodstock, C.E.	7th April, 1887

NAME AND P.O. ADDRESS.	DATE OF ADMISSION BY BOARD.
VanBuskirk, William Fraser, Stratford <small>Grad. R.M. Coll.</small>	7th April, 1888
VanNostrand, Arthur J., Toronto, Yonge St. Arcade. <small>D.L.S.</small>	30th Oct., 1882
Wadsworth, Vernon Bayley, Toronto, 103 Bay st. <small>D.L.S.</small>	9th April, 1864
Wagner, William, Ossowa, Man.	12th April, 1897
Walker, Alfred Paverley, Toronto, Room 508 Union Station, C.P.Ry., Eng. Office <small>A.M.C.S.C.E.</small>	6th Jan., 1882
Wallace, Charles Hugh, Hamilton, 206 Bay st. s.	9th Nov., 1889
Ward, Archeson Thomas, Wabigoon	10th April, 1897
Warren, James, Walkerton, Box 190 <small>D.L.S., A.M.C.S.C.E.</small>	7th Oct., 1864
Watson, John McCormack, Orillia, P.O. Box 224.	13th April, 1892
*Weatherald, Thomas, Goderich, P.O. Box 273. <small>D.L.S., C.E.</small>	12th Jan., 1856
West, Robert Francis, Orangeville	7th April, 1881
*Wheelock, Charles John, Orangeville. <small>D.L.S.</small>	11th July, 1856
Wheelock, Charles Richard, Orangeville <small>Treasurer County of Dufferin.</small>	7th Jan., 1886
Whitson, James Francis, Toronto, Crown Lands Dept.	9th Jan., 1886
Wicksteed, Henry King, Cobourg <small>D.L.S., C.E.</small>	7th Jan., 1886
Wiggins, Thomas Henry, Cornwall <small>Grad. S.P.S., D.L.S., Town Engineer.</small>	10th Nov., 1891
Wilde, John Absalom, Sault Ste. Marie	9th April, 1889
Wilkie, Edward Thomson, Carleton Place <small>D.L.S.</small>	11th April, 1891
Williams, David, Kingston <small>D.L.S.</small>	9th April, 1864
†Winter, Henry, Thornyhurst <small>D.L.S., C.E.</small>	11th July, 1853
*Wood, Henry O., Billings' Bridge. <small>D.L.S.</small>	10th Oct., 1855
*Yarnold, William Edward, Port Perry, P.O. Box 44. <small>D.L.S.</small>	7th April, 1854

REGISTERED AND WITHDRAWN.

The names of those who have become " Associates " under By-law No. 39 are marked

NAME AND P. O. ADDRESS.	DATE OF ADMISSION BY BOARD.
Apsey, John Fletcher, Cumberland, Queen City Hotel, Md.	6th Jan., 1886 <small>Grad. S.P.S.</small>
Blake, Frank Lever, Toronto, Meteorological Office.....	13th April, 1875 <small>D.L.S.</small>
Bowman, Arthur Meyer, Mahan, Beaver Co., Pa . .	11th Nov., 1887 <small>Grad. S.P.S., Staff of U.S. Engineers.</small>
Bowman, Franklin Meyer, Bellevue, Allegheny Co., Pa	11th April, 1892 <small>Grad. S.P.S., Engineer Structural Iron Works.</small>
Brady, James, Victoria, B.C., Box 815.....	15th July, 1862 <small>M.E.</small>
Burnet, Hugh, Victoria, B.C.....	5th April, 1887 <small>P.L.S. (B.C.)</small>
Cambie, Henry John, Vancouver, B.C.....	8th July, 1861 <small>P.L.S. (B.C.)</small>
Coleman, Richard Herbert, Toronto, 204 King st. e.	6th Oct., 1877
Drewry, William Stewart, Ottawa, Dept. of Interior.....	5th April, 1883
Edwards, George, Thurso, Que.....	6th Jan., 1866
Fowlie, Albert, Orillia	13th Jan., 1863 <small>D.L.S.</small>

NAME AND P.O. ADDRESS.	DATE OF ADMISSION BY BOARD.
Galbraith, John, Toronto, Sch. of Prac. Science <small>M.A., D.L.S., Prof. Engineering.</small>	13th April, 1875
Gibson, George, St. Catharines.	10th April, 1860
<small>D.L.S.</small>	
*Gilmore, Robert, Toronto, 22 Russell St.	
<small>D.L.S.</small>	
*Harris, John Walter, Winnipeg, Assm't Com. Dept.	6th Oct. 1866
<small>P.L.S. (Man.), D.L.S.</small>	
Hermon, Ernest Bolton, Vancouver, B.C.	7th Oct., 1885
<small>P.L.S. (B.C.), D.L.S.</small>	
Jephson, Richard Jermy, Calgary, Alta	7th April, 1877
<small>P.L.S. (B.C.), D.L.S.</small>	
Johnson, Sydney Munnings, Rossland, B.C.	9th Nov., 1895
<small>B.A.Sc. (Toronto).</small>	
Kains, Tom, Victoria, B.C.	11th July, 1873
<small>Surveyor-General, B.C.</small>	
Lane, Andrew, Sparrow's Point, Md.	4th April, 1895
<small>Grad. S.P.S., Draftsman Maryland Steel Co.</small>	
Lendrum, Robert Watt, South Edmonton, Alta.	8th Jan., 1874
<small>D.L.S.</small>	
Livingstone, Thomas Chisholm, Winnipeg, Man.	10th Jan., 1859
<small>D.L.S.</small>	
MacLeod, Henry Augustus F., Ottawa, 340 Cooper st.	11th Oct., 1856
<small>C.E., D.L.S.</small>	
MacMillan, James Alexander, Calgary, Alta.	6th Jan., 1877
<small>P.L.S. (B.C.)</small>	
Magrath, Charles Alexander, Lethbridge, Alta.	1st Nov., 1881
<small>B.A.Sc. (McGill), D.L.S.</small>	
Moore, Thos. Alexander, London, South.	12th Nov., 1892
Munro, John Vicar, New York, N.Y., 359 W. 31st st.	9th April, 1895
Pearce, William, Calgary, Alta.	12th Oct., 1872
<small>Dom. Insp. of Mines.</small>	
Ponton, Archibald William, Regina, Assa.	9th April, 1880
<small>D.L.S.</small>	
Pope, Robert Tyndall, Ireland.	13th April, 1875
<small>C.E., D.L.S.</small>	

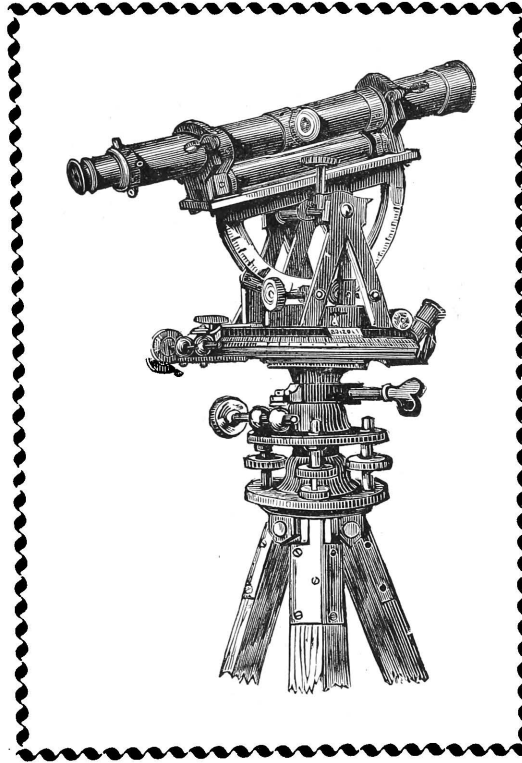
LIST OF MEMBERS.

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NAME AND P. O. ADDRESS.	DATE OF ADMISSION BY BOARD.
Reid, James Hales, Bowmanville, Box 35 C.E., F.G.S.	6th Oct., 1860
Reiffenstein, James Henry, Ottawa, Dept. of Interior D.L.S.	16th April, 1873
Reilly, William Robinson, London, 361 Simcoe st. D.L.S., P.L.S. (Man.)	7th April, 1881
Rogers, Richard Birdsall, Peterborough B.A.Sc. (McGill), D.L.S.	9th Jan., 1879
Ross, Joseph Edmund, New Westminster, B.C. P.L.S. (B.C.)	11th Nov., 1890
Sanderson, Daniel Leavens, Coral, Mich	4th Oct., 1882
Shaw, Charles Æneas, Victoria, B.C., P.O. Box 815	6th Oct., 1877
Sherman, Ruyter Stinson, Vancouver, B.C. P.L.S. (B.C.)	12th April, 1890
Simpson, George Albert, Winnipeg, Man., N. P. & M. R'y	7th Oct., 1864
Spry, William, Toronto C.E., D.L.S.	19th July, 1858
*Stewart, Louis Beaufort, Toronto, Sch. of Prac. Science Dom. Top. Surveyor, Lect. in Surveying.	6th April, 1882
Strathern, John, Vancouver, B.C. P.L.S. (B.C.), D.L.S.	5th Oct., 1876
Tracey, Thomas Henry, Vancouver, B.C. P.L.S. (B.C.), C.E., D.L.S.	8th April, 1870
Vicars, John Richard Odium, Kamloops, B.C. P.L.S. (B.C.), D.L.S.	5th Jan., 1887
Weekes, Abel Seneca, Wetaskiwin, Alta D.L.S.	12th April, 1890
Wheeler, Arthur Oliver, New Westminster, B.C. P.L.S. (B.C.), D.L.S.	8th July, 1881
Willson, Alfred, Toronto, 204 King st. e. D.L.S., Com. Canada Company.	6th Oct., 1866
Wilkins, Frederick William, Ottawa, Dept. of the Interior	6th Jan., 1877
D.T.S.	

SUMMARY.

Active members subject to dues.....	210
Active members exempted from dues.....	23
Withdrawn from practice (including Associates).....	48
Dead	<u>12</u>
Total number enrolled since incorporation.....	293



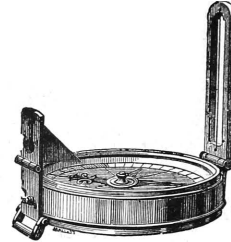
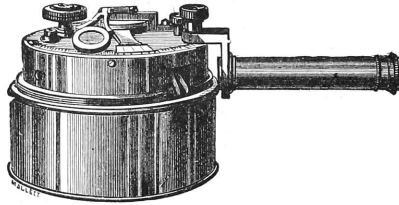
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Manufacturer of

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STEEL TAPES, METALLIC TAPES,
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MANUFACTURER OF


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Opera and Field Glasses

Repairs to any of the above promptly attended to

13 KING ST. W., TORONTO



JOHN MACAULAY,
Acting Surveyor General, 1836 to 1838.

No. 13.

PROCEEDINGS

OF THE

ASSOCIATION

OF

Ontario Land Surveyors

At its Sixth Annual Meeting since Incorporation

HELD AT

TORONTO

22nd February and 8th, 9th & 10th March

1898

Being the Thirteenth Annual Meeting of Land Surveyors for Ontario.

The Seventh Annual Meeting of the Incorporated Association will
be held in Toronto, commencing on Tuesday,
28th February, 1899.

PRINTED FOR THE ASSOCIATION BY
HENDERSON & CO., LOMBARD STREET,
TORONTO.

PATRONIZE OUR ADVERTISERS.

NOTICES.

Members and others can be supplied with copies of the Annual Reports for 1886, 1887, 1888, 1889, 1891, 1892, 1893, 1894, 1895, 1896 or 1897 by remitting fifty cents to the Secretary for each copy required.

Separate copies of Mr. Esten's "Head Notes of Reported Land Cases" have been printed for the Association, and may be obtained from the Secretary at a cost of twenty-five cents each.

In addition to exchanges from eight kindred societies, copies of "The Ontario Land Surveyors' Act" and "The Surveys Act," also the Report of the Clerk of Forestry will this year be sent free of charge to each member and associate not in arrears of dues.

Each member of the Association is reminded of the fact that for the next Annual Meeting a good programme should be forthcoming, and to ensure this it is not now too early to consider subjects for papers and reports.

Members are invited to inspect and to contribute additions to the growing collection of works, etc., at the Repository.

Published annually by the Association of Ontario Land Surveyors. Edition, 1,350 copies; price, 50 cents.

PATRONIZE OUR ADVERTISERS.

PREFACE.

To the Members of the Association of Ontario Land Surveyors :

The Proceedings of the Association at its Sixth Annual Meeting are herewith presented.

The Association is to be congratulated upon the generally increasing activity shown by the various standing and special committees.

Two serious but unavoidable delays have arisen to make the issue of this Report much later than was contemplated.

Respectfully submitted on behalf of the Council,

A. J. VAN NOSTRAND,
Secretary.

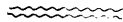
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ASSOCIATION OF
ONTARIO LAND SURVEYORS

(INCORPORATED 1892)

Organized 23rd February, 1886.



OFFICERS FOR 1898-99.

PRESIDENT.

P. S. GIBSON, O.L.S., - - - - Willowdale.

VICE-PRESIDENT.

HERBERT J. BOWMAN, O.L.S. - - - Berlin.

CHAIRMAN OF COUNCIL.

VILLIERS SANKEY, O.L.S., - - - Toronto.

SECRETARY-TREASURER.

A. J. Van Nostrand, O.L.S., - - - Toronto.

MEMBERS OF COUNCIL.

HON. J. M. GIBSON, Toronto,
J. L. MORRIS, Pembroke, } For Term ending April, 1901.
F. L. FOSTER, Toronto,
VILLIERS SANKEY, Toronto, } For Term ending April, 1900.
J. W. TYRRELL, Hamilton,
G. B. KIRKPATRICK, Toronto, } For Term ending April, 1899.
ALEX. NIVEN, Haliburton,

AUDITORS.

A. W. CAMPBELL, - - - - Toronto.
H. L. ESTEN, - - - - Toronto.

BANKERS.

Imperial Bank of Canada (Yonge Street Branch), Toronto.

BOARD OF EXAMINERS.

Villiers Sankey, Toronto, Chairman.

A. J. Van Nostrand, Toronto, Secretary-Treasurer.

Geo. B. Kirkpatrick, Toronto, for term ending April, 1901,	} Appointed by Lieut-Gov. in Council.
M. J. Butler, Napanee, for term ending April, 1900,	
P. S. Gibson, Willowdale, for term ending April, 1901,	} Appointed by Council of Management.
A. Niven, Haliburton, for term ending April, 1901,	
M. Gaviller, Collingwood, for term ending April, 1900,	
B. J. Saunders, Brockville, for term ending April, 1900,	

STANDING COMMITTEES, 1898-9.

LAND SURVEYING.—A. Niven (Chairman), C. F. Aylsworth, Jr., E. Bazett, R. W. DeMorest, Wm. Galbraith, M. Gaviller, W. L. Innes, T. Harry Jones, T. B. Speight.

DRAINAGE.—Geo. Ross (Chairman), Lewis Bolton, A. S. Code, C. C. Fairchild, F. W. Farncomb, J. B. Lewis, O. McKay, Jas. Robertson, Geo. Smith.

ENGINEERING.—Willis Chipman (Chairman), E. G. Barrow, M. J. Butler, A. J. McPherson, D. MacPherson, J. L. Morris, W. F. Van Buskirk, A. P. Walker, H. K. Wicksteed.

ENTERTAINMENT.—A. P. Walker (Chairman), H. L. Esten, R. P. Fairbairn, Henry Smith, T. B. Speight, J. F. Whitson.

PUBLICATION.—Killaly Gamble (Chairman), H. J. Browne, Geo. B. Kirkpatrick, C. J. Murphy, A. J. VanNostrand.

TOPOGRAPHICAL SURVEY.—Otto J. Klotz (Chairman), Geo. B. Abrey, C. A. Bigger, M. J. Butler, Willis Chipman, G. A. McCubbin, B. J. Saunders, J. E. Schwitzer, E. Stewart.

SPECIAL COMMITTEES.

POLAR RESEARCH.—J. W. Tyrrell (Chairman), E. D. Bolton, Willis Chipman, William Ogilvie, J. A. Paterson, H. B. Proudfoot, L. B. Stewart, J. N. Wallace.

REPOSITORY AND BIOGRAPHY.—H. L. Esten (Chairman), A. G. Cavana, Willis Chipman, M. Gaviller, G. B. Kirkpatrick, M. C. Schofield, C. Unwin, H. O. Wood.

EXPLORATION.—James Dickson (Chairman), G. B. Abrey, W. R. Aylsworth, Jos. Cozens, A. R. Davis, W. M. Davis, J. Doupe, E. Stewart.

PROGRAMME OF THE
Association of Ontario Land Surveyors

(INCORPORATED.)

AT ITS SIXTH ANNUAL MEETING HELD IN TORONTO,
MARCH 8th, 9th AND 10th, 1898.

PROGRAMME.

Tuesday, March 8th—Morning at 10 o'clock.

AT THE REPOSITORY, PARLIAMENT BUILDINGS.

Meeting of Council.
Meeting of Standing and Special Committees.

Afternoon at 2 o'clock.

Reading of minutes of previous meeting.
Reading of Correspondence.
Report of Council of Management (including Reports of Board of Examiners and Secretary-Treasurer.) Villiers Sankey, Chairman, Toronto.
President's Address.
Report of Committee on Publication. Killaly Gamble, Chairman, Toronto.
Report of Committee on Repository and Biography. H. L. Esten, Chairman, Toronto.
Report of Committee on Polar Research. J. W. Tyrrell, Chairman, Hamilton.
Paper—"Irrigation of Dominion Lands." A. W. Ponton, Regina, Assa.
Paper—"Acetylene Gas and its uses." V. M. Roberts, St. Catharines.
Paper—"Specifications." Jas. Hutcheon, Guelph.
Paper—"Progress on Lake of the Woods." H. DeQ. Sewell, Rat Portage.

Evening at 8 o'clock.

Paper—"Unrecorded Original Field Notes." J. J. Murphy, Toronto.
Report of Committee on Exploration. E. Stewart, Collingwood.
Paper—"The Economic Resources of the Hudson Bay District." J. W. Tyrrell, Hamilton.
Paper—"Forestry in its Relation to Land Surveying." Thos. Southworth, Toronto.
Paper—"Some Causes of Loss in Gold Mining in Ontario." Capt. J. D. Williams, Rat Portage.

Wednesday, March 9th—Morning at 10 o'clock.

Report of Committee on Engineering. A. W. Campbell, Chairman, Toronto.
Paper—"The Sewage Purification Works of Worcester, Mass." W. F. Van Buskirk, Stratford.
Paper—"Sand Cement." M. J. Butler, Napanee.
Paper—"Sudbury Water Works." L. V. Rorke, Sudbury.
Paper—"The York Street Bridge." A. P. Walker, Toronto.

Afternoon at 2 o'clock.

Report of Committee on Land Surveying with Question Drawer. M. Gaviller, Chairman, Collingwood.

Paper—"Assessment Plans." P. S. Gibson, Willowdale.

Paper—"An Illustration of the Necessity for Accurate Descriptions." Geo. Ross, Welland.

Paper—"Evidence." M. J. Butler, Napanee.

Report of Committee on Topographical Survey. Otto J. Klotz, Chairman, Ottawa.

Paper—"Lake Erie Survey." Otto J. Klotz, Ottawa.

Evening at 8 o'clock.

ANNUAL DINNER.

A. P. Walker, Chairman of Committee on Entertainment.

Thursday, March 10th—Morning at 10 o'clock.

Report of Auditors. H. L. Esten, Toronto, and A. R. Davis, Napanee.

Report of Committee on Drainage with Question Drawer. W. G. McGeorge, Chairman, Chatham.

Paper—"The Kinburn Swamp Drain." F. W. Farncomb, London.

Paper—"Arbitrators and Witnesses." H. J. Bowman, Berlin.

Paper—"The use of Field Tile for Large Drains." W. M. Davis, Woodstock.

Report of Committee on Entertainment. A. P. Walker, Chairman, Toronto.

Afternoon at 2 o'clock.

Ratification of New By-Laws.

Unfinished Business.

New Business.

Nomination of Officers (President, Vice-President, Two Members of Council, Secretary-Treasurer, and Auditors.)

Appointment of Scrutineers.

Adjournment.

ASSOCIATION OF
ONTARIO LAND SURVEYORS
(INCORPORATED 1892)

Minutes of the Sixth Annual Meeting

(Thirteenth Annual Meeting of Land Surveyors for Ontario)

MARCH 8TH, 9TH AND 10TH, 1898.

Minutes of regular meeting.

The Association met at the Repository, in accordance with the statute, on Tuesday, 25th February.

Members present:—Messrs. W. A. Browne, C. J. Murphy, H. L. Esten, A. P. Walker, A. T. Ward, A. J. Van Nostrand, K. Gamble, A. W. Campbell, W. A. McLean, B. J. Saunders, F. J. Robinson, R. P. Fairbairn, Henry Smith, G. B. Kirkpatrick, J. F. Whitson, H. B. Proudfoot.

Moved by Mr. Esten, seconded by Mr. Browne, That Mr. A. P. Walker take the chair. Carried unanimously.

Mr. Walker then presided.

Moved by Mr. Campbell, seconded by Mr. W. A. Browne, That whereas it has been considered advisable, in the interests of the Association, that the Annual General Meeting of the Association be adjourned until the 8th day of March prox. Be it resolved that the meeting be so adjourned. Carried.

The meeting was then adjourned.

(Signed)

A. P. WALKER, Chairman.

Tuesday, 8th March, 1898, at 10 o'clock a.m., the meeting of the Council and of Committees took place at the Repository.

Two o'clock p.m. the President, T. Harry Jones, Esq., opened the meeting.

The first business was the reading of the minutes of the previous meeting.

It was moved by Mr. M. J. Butler and seconded by Mr. George Ross, That the minutes as printed in the proceedings be taken as read and confirmed. Carried.

READING OF CORRESPONDENCE.

The Secretary, Mr. Van Nostrand, read a letter from Mr. E. G. Barrow, the City Engineer of Hamilton, extending an invitation on behalf of that city to hold the next annual meeting in Hamilton.

The President nominated a committee, composed of Messrs. M. J. Butler and George Ross, to whom the invitation be referred, and that they draft a suitable reply acknowledging the courtesy of the Mayor of Hamilton in reference to this matter.

The Secretary also read communications from Sandford Fleming, K.M.G.; C. E. Gauvin, Quebec; Joseph Kirk, Stratford; W. F. King, Capt. E. Deville, Surveyor-General, Ottawa; Herbert Wallis, ex-president Can. Soc. C. E.; C. H. McLeod, Secretary of Can. Soc. C. E., and E. S. Jenison.

The question raised in the communication of Mr. E. S. Jenison was referred to the Committee on Land Surveying.

The President introduced Mr. W. Hamilton Merritt, M. E., to exhibit to the Association a field equipment for prospectors.

Mr. Merritt then delivered an address thereon.

The President, at the conclusion of Mr. Merritt's remarks, extended the thanks of the Association for his kindness in presenting the outfit for their inspection.

The President then read his address, which was received with applause.

Mr. Sankey presented the report of the Secretary-Treasurer. He asked that the report of the Board of Examiners and Council of Management be deferred to a later period in the meeting. He then moved that the Secretary-Treasurer's report be referred to the auditors for report.

The President nominated Mr. Ross, in the absence of Mr. Davis, to act with Mr. Esten as auditors.

The report of the Committee on Publication was then read by Capt. Gamble, who moved the adoption of the report, seconded by Mr. J. W. Tyrrell. Carried.

Mr. H. L. Esten then read the report of the Committee on Repository and Biography. He then moved it be adopted, seconded by Mr. Kirkpatrick. Carried.

The President stated that an album had been obtained by the Secretary and requested that all the members present their photographs to the Association for insertion therein.

The President requested Mr. H. H. Gibson, in the absence of Mr. V. M. Roberts, of St. Catharines, to read a paper on "Acetyline Gas and Its Uses."

A paper on "Progress on the Lake of the Woods" was read by Mr. H. DeQ. Sewell, of Rat Portage.

A paper on "Water Power from the Niagara River," by Mr. V. M. Roberts, was then read by Mr. D. D. James.

It was then moved by Mr. James, seconded by Mr. Jones, That the meeting adjourn. Carried.

5.30 o'clock p.m.

EVENING SESSION.

March 8th, 1898.

Chairman—Before calling on Mr. Stewart to read his report, I would beg to nominate the committee about which I spoke this afternoon to confer with a similar committee appointed by the Canadian Society of Civil Engineers, to consider their proposed bill. I would nominate Messrs. Sankey, Butler, Niven and Gaviller to act on behalf of the Association.

Mr. E. Stewart read "Report of Committee on Exploration," and moved its adoption.

Mr. Niven seconded the motion. Carried.

Chairman—I would now ask Mr. Southworth to read his paper on "Forestry in Its Relation to Land Surveying."

Paper read by Mr. Southworth.

Chairman—I will now call upon Mr. Tyrrell to read his paper on “The Economic Resources of the Hudson Bay District.”

Mr. E. Stewart—Before that I think we owe a vote of thanks to Mr. Southworth. I don't know that we are permitted to give a vote of thanks to a member, but I think when an outsider comes in he deserves the thanks of the Association.

Chairman—That is the only reason why a formal vote of thanks was not immediately given to Mr. Southworth; we have a regulation of that kind, but I think this is an occasion when making an exception will not form a precedent.

Mr. Gaviller—I have much pleasure in seconding the motion.

Mr. Stewart—I think, Mr. Chairman and President, that the only thing we have to regret is that Mr. Southworth was not appointed a great many years ago. I think in our newer territories an immense amount of waste has been incurred in various ways.

In the first place a great many districts have been surveyed and set apart for settlers—at least have been made free grant lands—and settlers have gone into districts that really should have been preserved for forest growth, being more valuable for that than for anything else.

Then, again, with regard to fires, there is no question that since the system of Fire Rangers has been established fires are much less frequent than formerly, and in a report on explorations last year I think I referred to this. When I speak of explorations I mean roughly explored, simply to find out what is a good agricultural district, a good timber district, or a mineral district. I have very much pleasure in moving a vote of thanks to Mr. Southworth.

Chairman—Moved by Mr. Stewart and seconded by Mr. Gaviller, that the thanks of this Association be tendered to Mr. Southworth for his paper read to us on “Forestry in its Relation to Land Surveying.” Carried.

I have much pleasure, Mr. Southworth, in presenting you with the thanks of this Association.

Mr. Southworth—Mr. President, I thank you and the gentlemen of the Ontario Land Surveyors' Association very much for the cordial manner in which you have received my weak attempt for your entertainment. I am thoroughly delighted that the matter has received the attention it has, and I hope that all the surveyors will just keep in view that we have a large area of country now unproductive that can be made a revenue-producing territory from this time forward with proper management.

Chairman—I will now call upon Mr. Tyrrell to read his paper upon “The Economic Resources of the Hudson Bay District.”

Paper read by Mr. Tyrrell.

Chairman—I would now ask Captain J. D. Williams, of Rat Portage, to read his paper on “Some Causes of Loss in Gold Mining in Ontario.”

Paper read by Captain Williams.

Adjourned till 10 a.m. March 9th.

MORNING SESSION.

March 9th, 1898.

Chairman—The *Canadian Engineer*, which has always been very good in reporting our proceedings, and in fact reporting all matters at all times in connection with the Association, has sent us a number of copies of the February number. That number contains two portraits of Mr. Ogilvie, one taken as he used to be, and one taken as he is, and the numbers are for distribution among any of the members who may desire them.

I would now call upon Mr. Campbell for the Report of the Committee on Engineering.

“Report of Committee on Engineering” read by Mr. Campbell.

Mr. Campbell moved the adoption of the report, seconded by Mr. Saunders.

Chairman—It has been moved by Mr. Campbell, and seconded by Mr. Saunders, that the report of the Committee on Engineering be adopted. Carried.

Chairman—I would now ask Captain W. F. Van Buskirk, of Stratford, to read his paper on “The Sewage Purification Works of Worcester, Mass.”

Paper read by Mr. Van Buskirk.

Chairman—I will now call upon Mr. Butler to read his paper upon “Evidence.”

Paper read by Mr. Butler.

The next paper on the programme is one on the “Sudbury Water-Works,” by Mr. L. V. Rorke, of Sudbury.

Mr. Rorke is not present. Perhaps Mr. James would kindly read this paper to the Association.

Paper read by Mr. James, Jun.

Professor McLeod entered and was introduced to the Association.

Prof. McLeod—I thank you for the kind welcome, and I can only say I have been very much delighted indeed to come here and to listen to the papers treating, as they do, upon interesting subjects in connection with engineering.

I, of course, have a special mission. I was to meet particularly those gentlemen who are considering the question of legislation, which the Canadian Society of Civil Engineers, of which I am Secretary, have in their hands.

Chairman—I now ask Mr. Tyrrell to read his “ Report of Committee on Polar Research.”

Report read by Mr. Tyrrell.

Mr. Tyrrell moved, seconded by Mr. Van Nostrand, that the report of the Committee on Polar Research as read be adopted. Carried.

Adjourned to meet at 2 p.m. in Private Bills Committee room.

AFTERNOON SESSION.

March 9th, 1898.

Chairman—I will call upon Mr. Jas. Hutcheon, of Guelph, to read his paper upon “ Specifications.”

Paper read by Mr. Hutcheon.

Chairman—I will now call upon Mr. Walker to read his paper upon “ The York Street Bridge.”

Paper read by Mr. Walker.

Chairman—I would now call upon Mr. George Ross, of Wel-land, to read his paper on “ An Illustration of the Necessity for Accurate Descriptions.”

Paper read by Mr. Ross.

Chairman—I would now call upon Mr. P. S. Gibson to read his paper on “ Assessment Plans.”

Paper read by Mr. Gibson.

Chairman—Before calling on Mr. Gaviller to read his report of the Land Surveying Committee, I would ask Mr. L. B. Stewart, in the absence of Mr. Klotz, if he will kindly read the "Report of Committee on Topographical Survey."

Report of Committee on Topographical Survey read by Mr. L. B. Stewart, who moved that it be adopted, seconded by Mr. Butler. Carried.

Before calling on Mr. Gaviller I might state that Mr. Milton C. Schofield, a gentleman who was admitted to the work of land surveying some fifty-five years ago, has kindly prepared for the Association a list of reported cases.

Now, we have already included in our reports a list of such cases, I think prepared by Mr. Esten, and it is likely that many of these cases reported are already included, so it will be necessary that these be considered by a committee, and I would suggest that this be referred to the Committee on Land Surveying. Of course it will not be taken up by this year's committee; it will take some time to revise these cases and look up the statutes, but I think Mr. Schofield's work should be recognized, and I have drawn up a motion, if it will be kindly moved by someone, that the list of reported cases so kindly furnished by Mr. Milton C. Schofield, of Guelph, be referred to the Committee on Land Surveying, so that the same may be prepared for insertion in our reports. I think that will cover the matter.

Mr. Gaviller—I might mention, Mr. Chairman, that in that list the particulars are not given sufficiently to look the cases up. In some cases there is no record of what report they are in, and also it would require an extensive law library to hunt up those cases and make a few remarks upon each for insertion. That takes some time, and besides we must have a library at our hand to be able to do so.

Motion by Mr. Gaviller, seconded by Mr. Gibson. Carried.

Mr. Kirkpatrick—If any of these subjects are interesting to the profession I think it would be a good thing if a synopsis were given.

Mr. Gaviller reads "Report of Committee on Land Surveying, with Question Drawer."

Chairman—Mr. Butler will now read his paper on "Sand Cement." Mr. Butler is an expert in this matter, and from what information he has given me it will be interesting to each of us.

Paper read by Mr. Butler.

MORNING SESSION.

March 11th, 1898.

Chairman—I will ask Mr. Esten to read the report of the auditors.

“Report of Auditors” read by Mr. Esten, who moved the adoption of the report, seconded by Mr. Niven. Carried.

Chairman—In the absence of Mr. Farncomb, of London, I would ask the Secretary to read his paper on “The Kinburn Swamp Drain.”

Paper read by Mr. Van Nostrand.

Chairman— I would now ask Mr. H. J. Bowman, of Berlin, to read his paper on “Arbitrators and Witnesses.”

Paper read by Mr. Bowman.

Chairman—In the absence of Mr. Davis and his partner, Captain Van Buskirk, I would ask Mr. Code if he would read the paper prepared by Mr. Davis, of Woodstock, on “The Use of Field Tile for Large Drains.”

Paper read by Mr. Code.

“Report of Committee on Entertainment”—Mr. A. P. Walker, Chairman of Committee.

Mr. Walker—I may say I think everyone was satisfied with the dinner; that the number present was greater than at any previous dinner, so far as I am aware; we had a great many guests, I think thirteen in all, including representatives from the Canadian Society of Civil Engineers, and I think everything passed off remarkably well.

The usual practice in the past has been for the report of the Entertainment Committee to be taken as read, and I would move that this report of the Entertainment Committee be taken as read and printed in the proceedings.

Seconded by Mr. Niven. Carried.

Chairman—Professor McLeod, of McGill University, Secretary of the Canadian Society of Civil Engineers, is with us, and would like to say a few words to this Association upon the question of affiliation. No action will be taken by us at present until the report comes in from our committee, but I am sure that all the members of the Association will be very glad if Mr. McLeod

can throw any light upon the question. I will now call upon Professor McLeod.

Professor McLeod—Mr. President, I recognize, of course, that a large number of the members of your Association are members of the Canadian Society of Civil Engineers, but there may be some who perhaps have not got a very distinct idea of what our aim is.

First of all the Canadian Society of Civil Engineers is a body having a Dominion incorporation. As such it has the ordinary rights of incorporated bodies. The Dominion, of course, has no power to grant exclusive professional rights—these powers are given by the Acts of the Federation to the Provincial Legislatures, so that in order to secure any exclusive rights along the lines of professional work it is necessary to go to the Provinces.

Now, our intention is to go to the provinces and to ask them to define the professional status of the Engineer in the several provinces, to say what he has a right to do, and what he has a right to do exclusively—the object, of course, being to make the profession of civil engineering a close corporation in the several provinces. Our Act, then, as we bring it before the Local Legislatures, is not an Act of Incorporation; it is simply an Act to define the status of the Civil Engineer in the provinces, and it is along those lines we have been working heretofore.

As many of you know, an Act drawn up on these lines was before the Quebec Legislature last year, and is now law in the Province of Quebec, so that after a period of one year has elapsed—that period will elapse at the end of the present year—it will not be legal for anyone to practise civil engineering in the Province of Quebec unless he has conformed to the Act, unless he has become a member of the Canadian Society of Civil Engineers, or had some rights granted to him as a civil engineer prior to the time of our legislation. As a matter of fact, there are none.

Now, in advocating our proposition, we have drawn up a memorandum to explain our position before the members of the several Legislatures to whom we present this Bill. I might just review briefly what that memorandum states.

First of all, it goes on to say that in the European countries, including Great Britain, engineers are required to pass an examination, or to be regularly apprenticed for a term of years before they can call themselves Civil Engineers, or practise as such.

In Canada civil engineering is the only learned profession to which an unqualified person can claim to belong, and the civil engineer is the only professional title which can be assumed by any person.

The statement that it is necessary to pass an examination in

Great Britain may seem not to be quite in accordance with the fact, but, as many of you know, it is practically impossible for a civil engineer to practise in Great Britain unless he is a member of the Institution of Civil Engineers. That body something like three or four years ago, perhaps more—I haven't the exact date—passed a resolution making it necessary for students who desired admission to the Institution to pass an examination. That was the first step. More recently, only a year ago, they made it necessary that members desiring admission to the rank of Associate, that is a junior position to full membership, similar to our own Associate, should pass an examination. So that practically in Great Britain for a man to enter civil engineering by examination, he must submit to the examination proposed by the Institution.

Then, as you all know, in France and in Germany, and many of the other countries, engineering is very largely, almost exclusively, a State matter. So that there also it is necessary that a civil engineer shall submit to certain requirements in order to secure his standing as an engineer.

Now, the objects which the Society have in view in seeking this legislation scarcely need to be stated. However, perhaps, I had better run over these.—(Reads from proposed Bill.)

Following that, we go on to define the difference in the office of civil engineers and land surveyors, but in this body I think that is quite unnecessary, it being properly understood.

Then the Bill, as laid before the Local Legislatures, has been submitted to the law officers of the Government and approved by them, and of course these law officers, particularly in the Province of Quebec, where we had a very long and careful consultation with them, would naturally be the guardians of any legislation that had granted powers to other bodies, so that we took very great care there that we were not treading on the toes of the land surveyors in any way. Our Society does not desire to act in an aggressive spirit, its sole aim being the advantage of the profession as a body.

It courts a free discussion and interchange of views with all whom the legislation may in any way affect, and should any branch or branches of the profession not desire to participate in the benefits to be sought under the Act, the Society would not for a moment desire to include such in the proposed legislation.

It seems to me, however, that for the successful organization of any profession it is essential that there should be a representative corporation deriving its powers from the Crown, to be entirely free from bias. I think, sir, that is a principle recognized by your own body.

It has been argued that no private corporation has any right to arrogate to itself the powers we are seeking, but I think all members of any learned profession will see that the profession can

be much better regulated by the body immediately concerned than by any other body.

Then, as regards another matter, which perhaps requires explanation in view of what I think appeared in the Toronto press, and perhaps generally in the press of Canada, because people who spread abroad the report take great pains to publish themselves as fully as they can—that is, in regard to the report which came from the Mining Association when it met in Montreal, somewhat over a week ago. (Reads.) It was reported that our Bill, the Bill of the Canadian Society, had been killed in the Nova Scotia Legislature, and there was a resolution carried approving of the action.

Now, this was simply setting up a man of straw in order to knock him down. There never was any such proposition before the Nova Scotia Legislature, and, as a matter of fact, we long ago excluded this Mining Association from the operations of the Act, because we had gathered that they considered that they were the representatives of mining engineers in Canada.

I suppose you know, as we all know, it is not an engineering body at all. It is a body of mine owners, a very important body, no doubt, in the country, but still not a body of engineers, and we should be very sorry if any other branch of the profession should feel that they could not be included in the legislation we are asking. However, if representation of that character is asked, the Society will, of course, at once exclude them from the operations of the Act, as we do not for a moment wish to be in the position of asking legislation for an unwilling body.

Then, as concerns my object in coming to you, it is to assure this Association there is no desire on the part of the Canadian Society of Engineers to do anything that will obstruct in any way the Land Surveyors. We want to work in harmony with this body, and of course we want the co-operation and assistance of the members of the Society who are members of our own Association.

I thank you very much, Mr. Chairman, for giving me this opportunity, and would be glad to answer any questions that may be asked.

Chairman—I am sure we have listened to Prof. McLeod with a great deal of pleasure, and thank him for his courtesy in appearing before us as a body; and while any discussion of the matter before the report of our Committee comes in will be out of order, yet, as Prof. McLeod has kindly offered to answer any question propounded in reference to the matter, I would like to ask if this proposed legislation was approved of by the Association of Quebec Land Surveyors?

Prof. McLeod—Well, the answer to that is yes and no. We experienced some difficulty, but when we came before the Legis-

lature we found that the members of the Legislature took very strongly the view that the Land Surveyors of the Province of Quebec had no right at all to say anything about what was not concerned directly with land surveying; that they were protected in their own profession, and they had no right to interfere with other bodies. That was the plain fact, and legislation went through on that understanding.

The reports of Council and Board of Examiners were next read by the Chairman, Mr. Sankey, and, after discussion, adopted.

Moved by Mr. Gaviller, seconded by Mr. Niven, That we have learned with regret of the removal by death since our last meeting of Messrs. E. C. Caddy, J. M. O. Cromwell, Michael Deane, C. J. Wheelock, H. Creswicke, Richard Coad, W. R. Burke, Jos. DeGurse and J. C. MacNabb, and that the Secretary be requested to convey to the relatives this expression of sympathy for them in their bereavement and to insert in the forthcoming Annual Report an obituary notice of each, except in the case of those already published. Carried.

The President—There are two By-laws for ratification. Will the Secretary kindly read them ?

Moved by Mr. Van Nostrand, seconded by Mr. Niven, That By-laws Nos. 45 and 46, as read in the Report of the Council of Management, be ratified. Carried.

The President—It was thought advisable, as there have been so many changes made in the Acts by the recent amendments which have been passed, that a Manual be prepared for Land Surveyors containing the Acts and Amendments to the Registry Act, and portions of the Municipal Act relating to surveys, this to be prepared by the Council and to be put in the hands of every surveyor. I don't know what the expense will be in connection with it, but it is a thing every surveyor should have, and it will be very useful to him.

Moved by Mr. Gibson, seconded by Mr. Butler, That the Council be instructed to prepare a manual containing the different Acts and portions of Acts relating to land surveying and drainage, and a list of the special Acts, and to furnish each active member of the Association with a copy free of charge. Carried.

Moved by Mr. Van Nostrand, seconded by Mr. Niven, That Mr. J. J. Murphy's paper, "Unrecorded Original Field Notes," be taken as read and printed in the proceedings. Carried.

Moved by Mr. Gaviller, seconded by Mr. Gibson, That Mr.

Otto J. Klotz' paper on "Lake Erie Survey," be taken as read and printed in the proceedings. Carried.

Moved by Mr. Van Nostrand, seconded by Captain Gamble, That any omissions or clerical errors in the records of the proceedings of this meeting now in the hands of the Secretary and stenographer be corrected by the Committee on Publication before publishing the same. Carried.

Moved by Mr. Saunders, seconded by Mr. Gaviller, That the Report of the Committee on Drainage be taken as read and printed in the proceedings. Carried.

Moved by Mr. Niven, seconded by Mr. Gibson, That the Association take an intermission of five minutes. Carried.

NOMINATION FOR PRESIDENT.

The President—The time is about up, and we will proceed with the nomination for officers, and the first is that of President.

Mr. Niven—Mr. President, I have much pleasure in proposing as President a gentleman, who but for his excessive modesty, would probably have been President long ago. I refer to my friend, Mr. P. S. Gibson. I think that you will all admit that he has taken an active part in the affairs of the Association ever since its commencement, and would no doubt have been President long ago had he desired it. Even now, I understand, he would like to get out, but I think the time has come when we should have him as our President. I have much pleasure in proposing Mr. Gibson.

Mr. Gaviller—Gentlemen, I have much pleasure in seconding the nomination made by Mr. Niven of Mr. Gibson as President.

The President—There being no other nominations, I have very great pleasure in declaring Mr. P. S. Gibson elected as President of the Association of Ontario Land Surveyors. (Applause.)

NOMINATIONS FOR VICE-PRESIDENT.

Mr. Saunders—I have pleasure in nominating Mr. H. J. Bowman for the office of Vice-President.

Mr. Kirkpatrick—I have very much pleasure in seconding that.

The President—Mr. H. J. Bowman has been nominated by Mr. Saunders and seconded by Mr. Kirkpatrick. There being no other nominations, I have great pleasure in declaring Mr. H. J. Bowman elected as Vice-President of the Association. (Applause.)

NOMINATION FOR SECRETARY-TREASURER.

Mr. Butler—Mr. President, I have very great pleasure indeed in nominating Mr. A. J. Van Nostrand for the position of Secretary-Treasurer. I do not think we can afford to let Mr. Van Nostrand out.

Mr. Gibson—I have very much pleasure in seconding his nomination. He is getting old in the service. I see he has a gray hair here and there. He is a faithful servant.

The President—Moved by Mr. Butler, seconded by Mr. Gibson, That Mr. A. J. Van Nostrand be elected to the position of Secretary-Treasurer. Carried.

The President—There are two retiring members of Council this year—Mr. F. L. Foster, of Toronto, and Mr. J. L. Morris, of Pembroke—Mr. Morris having served only the one year, he being elected on the retirement of Mr. Gibson, not having the full term of service.

NOMINATIONS FOR MEMBERS OF THE COUNCIL.

Mr. Gaviller nominated Mr. Morris.

Mr. Butler nominated Mr. George Ross.

Mr. Kirkpatrick nominated Mr. F. L. Foster.

Mr. Campbell, nominated by Mr. W. F. Van Buskirk.

AUDITORS.

Mr. Niven nominated Mr. Campbell.

Mr. Morris nominated Mr. Esten.

The President—There being no other nominations, I declare Mr. Campbell and Mr. Esten elected as Auditors. (Applause.)

The President—The appointment of scrutineers rests with the President, I believe. I hereby appoint Captain Gamble and Mr. J. F. Whitson.

Mr. Butler—Mr. President, seconded by Mr. Sankey, I move that you do now leave the chair, and that the President-elect take the chair. Carried.

Chair taken by Mr. Gibson.

Mr. Butler—Mr. President, I have very great pleasure indeed in moving that a vote of thanks be extended from the Association to the retiring President, Mr. Jones, for the efficient and able manner in which he has fulfilled his duties during the past year. He has

brought an added dignity to the Ontario Land Surveyors' Association.

Mr. Gaviller—I have much pleasure in seconding Mr. Butler's motion. Our President has certainly been a model presiding officer and one which, in future years, it would be well to follow. His method of putting questions to the meeting has been admirable. I have much pleasure in seconding the motion.

Mr. Gibson—Gentlemen, I do not suppose this is a matter for a long discussion. Mr. Jones, I have much pleasure in extending to you the thanks and congratulations of the Association.

Mr. Jones—Gentlemen, I cannot find words to express my thanks for your kind motion. My connection with the Ontario Land Surveyors has been one of pleasantness only. I was one of the charter members and, with two exceptions, have attended every annual meeting, but all my associations with the Society have been most pleasant, and not only so, but most profitable to me. I thank you for your kindness.

Mr. Jones then returned to the chair.

Mr. Gaviller—I think there is one more duty to perform, and that is with regard to our hard-worked Secretary. I have pleasure in moving that this year the amount of the remuneration be \$180. Perhaps some member of the Association would think the amount not sufficient. I would be very happy to amend the motion.

Mr. Niven—I think, Mr. Chairman, Mr. Gaviller should make the amount \$200. (Applause.) I know Mr. Van Nostrand does a great deal of work. The correspondence is something very large in the office, and I think that if we pay him \$200 we are getting off pretty cheaply.

Mr. Gaviller—I have great pleasure in amending my motion and making the amount \$200. I don't think it one cent too much for the amount of work.

Mr. Walker—In connection with this matter, I might say that we have heard a great deal about the economy of the Ontario Government and other institutions, but I don't think that any Society that I know of is run on such economical basis as this Association. If we look at the accounts of other Societies, we see items for telephone rent and librarian's fees, rent of rooms, and all such things as that. Now, in this case, everything seems to be supplied by the Secretary-Treasurer, and I think that it is well worth \$200, and is small remuneration for Mr. Van Nostrand's services.

Mr. Gibson—I am quite of the same opinion. Mr. Van Nostrand not only has the duties of the Secretary-Treasurer to

carry out, but I think he does pretty much all of the work besides. I was Secretary-Treasurer once, and I found out before I was through I was President and everything else.

Mr. Campbell—I would like to say, too, Mr. President, I do think we should give Mr. Van Nostrand at least \$200 a year. If he has as much trouble in connection with every member of the Association as he has with myself, I would think it advisable to make it \$400. I am heartily in accord with this resolution.

The President—Before putting the motion, I might just say I heartily agree with all that has been said in reference to Mr. Van Nostrand. I think the retiring President last year suggested that the question of having a paid Secretary-Treasurer ought to be taken up by our Association. Nothing is provided at present in the Constitution or By-laws for paying the Secretary-Treasurer in any way, and every year it has to come up in the form of a motion.

Moved by Mr. Gaviller and seconded by Mr. Niven, that the Secretary-Treasurer be paid the sum of \$200 for his services during the past year. Carried.

Mr. Van Nostrand—Mr. President and gentlemen, I must thank you for this oft-repeated mark of esteem you have shown me. I feel that I ought to be pretty nearly a back number by this time in my office, and I suggested that others be nominated and take the position while I stepped out, but for the present I desire to accept your kindness. I feel sure that you have acted generously in giving this additional grant, but you may over-estimate your generosity to a certain extent, because there has been at least \$20 to \$25 worth of extra strain on my modesty from the four or five speeches made, and I hope that fact will be considered.

Apart from joking, I may say that, although I am Secretary-Treasurer and perhaps have to do nearly everything that is being done in that office, I have always found a great deal devolves upon the Chairman of Council. When I have been puzzled, I have always had Mr. Sankey to fall back upon, and I have given him a great deal of trouble and expense in the loss of time. When we are speaking of granting salaries to different people and giving a money consideration for the time spent I feel very small indeed in accepting anything when I see so much time devoted to the interests of the Association by others who get nothing for it. Of course I don't mean to say that anything would be accepted by them, but I would like it understood that I do not claim credit for anything like all the work done.

Mr. Gibson—Mr. President, it is suggested that I say something to show I want the office to which I have been elected.

There is one thing that occurred to me in reference to our land surveyors. A man once said to me he wanted to do something in this world. He wasn't an Ontario Land Surveyor. I said he had better get married; if he got married his boys might do something.

Now, with reference to land surveyors when they are entered on the roll or list of Ontario Land Surveyors in good standing and get into practice, their names will remain on the history of our country in documents and papers long after the Governors-General and Lieutenant-Governors of our Province have been forgotten. Only yesterday one of our youngest land surveyors was mentioned by the court. Turn up the old documents, you find such and such surveyors' names; so if you wish to have yourselves recognized in future generations as having been men filling positions of trust, who were looked up to and respected, and put in positions where they were expected to do the fair thing between man and man, you will turn to the list of Ontario Land Surveyors and find we have them acting as arbitrators, and I believe they do their duty fully as well as any other class of men.

Take, for instance, Mr. W. Ogilvie. See what a character the men in our great North-West Territory give him.

Now, with reference to our Association, I have had the idea that when a young man wishes to become a land surveyor his aim should be to be qualified as a land surveyor, a civil engineer and a municipal lawyer, then he is equipped for his work.

I remember a man stating of a land surveyor, "That man is a land surveyor, he is an engineer, and he is a municipal lawyer." And I declare, gentlemen, you cannot get along very well without being the three. When you are called upon in your public position as a land surveyor they always assume you are a civil engineer, anyway. (Applause.)

Mr. Bowman—Mr. President and gentlemen, I thank you very much for your kindness in electing me as Vice-president for the ensuing year. I shall endeavor to assist the President and help on the ends of the Association in every way possibly. I think it is a case that does not often taken place, that a gentleman should be President and one of his ex-apprentices be Vice-president, as it happens this year, but the boys are coming to the front.

Moved by the Secretary, seconded by Mr. Walker, that a vote of thanks be given to the members of the press.

Responded to by Mr. Greenwood, of the World, and Mr. Boltby, of the Globe.

The President—Moved by Mr. Gaviller, seconded by Mr. Saunders, that a committee consisting of Messrs. Kirkpatrick.

Niven and Sankey be appointed to look after the interests of our Association in any legislation which may be proposed by the Canadian Society of Civil Engineers.

The President—Is it your pleasure that the motion should be passed, gentlemen ?

The President— Mr. Butler, would this resolution cover the ground ?

Mr. Butler—It leaves the whole authority to these three men.

Mr. Jones—As we are not adjourned yet, Mr. Sankey has a report ready that could be read and then this motion, which is already passed, could stand in reference to that report. Mr. Sankey has taken a good deal of trouble to put it in definite shape.

Report read by Mr. Sankey, who moved the adoption of the report, seconded by Mr. Niven.

The committee appointed to meet a committee of the Canadian Society of Civil Engineers in Ontario beg to report as follows:

The committee met the representatives of the Engineers' Society and discussed the proposed Bill with them. As this Bill is one which will be of great importance to almost every surveyor in Ontario, your committee feel that they cannot at present advise any definite expression of opinion by the Association as a body with regard to it. Your committee has not sufficient information before it to be able to advise as to the appropriateness of the limit of \$1,000 value of work as defined in the Bill for the standard of an engineering work. The Bill does not specify on what standing in the Engineering Society Ontario Land Surveyors will be admitted, nor the fees which they will be required to pay. The Bill does not specify what powers, if any, the Society has for increasing or decreasing the fees payable by the members to the Society. The Bill does not make provision for the possibility of a member retiring from practice and again resuming practice. These appear to be the most important points on which definite information is desirable, but the whole question being one of such great personal importance to most of the members of our Association, the committee would recommend that steps be taken to bring the matter before the individual members of the Association for their opinion as to the effect of this legislation before any action binding the Association as a body be taken. A reasonable method of carrying this idea out would be to ask the Engineers' Society to put in the form of a letter its idea of the position in which an Ontario Land Surveyor who is now and has been in the habit of doing general engineering work in this Province would be placed on the

passing of this Bill if he does not see fit to join the Engineers' Society, and referring to such clauses of their constitution and Bill as would enable each surveyor to clearly understand the position in which he will stand. This information should be forwarded to each of our members and a definite expression of opinion asked before the Association should bind itself as to what action it may take in the matter.

(Signed) V. SANKEY,
Chairman of Committee.

The President—It has been moved by Mr. Sankey and seconded by Mr. Niven, that the report of the Committee re Civil Engineers' Bill be adopted.

Mr. Morris—I would just say, as a member of the Land Surveyors, that the report as presented by Mr. Sankey, and his being on the committee appointed to deal with that question, will meet with the approval of the Land Surveyors throughout the Province. I don't think there will be any dissent from the action they may take after hearing that report.

The President—Motion carried.

This other motion I will put as a substantive motion. It is moved by Mr. Gaviller, seconded by Mr. Saunders, that a committee consisting of Messrs. Kirkpatrick, Niven and Sankey be appointed to look after the interests of our Association in any legislation that may be proposed by the Canadian Society of Civil Engineers. Carried.

Moved by Mr. Walker that we adjourn. Carried.

MEMBERS IN ATTENDANCE AT THE REGULAR SIXTH ANNUAL MEETING.

22ND FEBRUARY, 1898.

W. A. Browne.	G. B. Kirkpatrick.	B. J. Saunders.
A. W. Campbell.	C. J. Murphy.	Hy. Smith.
H. L. Esten.	W. A. McLean.	A. J. Van Nostrand.
R. P. Fairbairn.	H. B. Proudfoot.	A. P. Walker.
K. Gamble.	F. J. Robinson.	A. T. Ward.
	J. F. Whitson.	

MEMBERS IN ATTENDANCE AT THE ADJOURNED
SIXTH ANNUAL MEETING.

8TH, 9TH AND 10TH MARCH, 1898.

L. Bolton.	H. H. Gibson.	H. B. Proudfoot.
H. J. Bowman.	P. S. Gibson.	F. J. Robinson.
H. J. Browne.	W. S. Gibson.	Geo. Ross.
W. A. Browne.	T. R. Hewson.	V. Sankey.
M. J. Butler.	Jas. Hutcheon.	B. J. Saunders.
A. W. Campbell.	D. D. James.	H. DeQ. Sewell.
W. Chipman.	Silas James.	Henry Smith.
A. S. Code.	C. A. Jones.	Wm. Spry.
R. H. Coleman.	T. H. Jones.	E. Stewart.
John Davis.	G. B. Kirkpatrick.	L. B. Stewart.
H. L. Esten.	W. A. McLean.	J. W. Tyrrell.
R. P. Fairbairn.	A. J. McPherson.	W. F. Van Buskirk.
J. Galbraith.	J. L. Morris.	A. J. Van Nostrand.
K. Gamble.	C. J. Murphy.	A. P. Walker.
M. Gaviller.	A. Niven.	A. T. Ward.
	J. F. Whitson.	

RESULT OF ELECTIONS.

President.....P. S. Gibson.....(by acclamation).
Vice-President.....Herbert J. Bowman.....(by acclamation).
Secretary-Treasurer.....A. J. Van Nostrand.....(by acclamation).

*Members of the Council of Management elected for the ensuing
three years :*

J. L. Morris. F. L. Foster.

Auditors for the ensuing year : (by acclamation).

A. W. Campbell. H. L. Esten.

I hereby declare the above named members of the Council of
Management elected.

A. J. VAN NOSTRAND,
Secretary-Treasurer.

Certified correct.

K. GAMBLE,
J. F. WHITSON,

Scrutineers of Ballots.

PRESIDENT'S ADDRESS, MARCH 8TH, 1898.

GENTLEMEN OF THE ASSOCIATION OF ONTARIO LAND SURVEYORS:

It affords me great pleasure to welcome you to this, the thirteenth Annual Meeting of our Association, after the arduous duties which during the past two weeks I have no doubt many of you were called upon to perform, and on account of which our meeting is held a fortnight later than the regular date.

To a Divine Providence we render thanks for His goodness to us in the past, and His aid we implore for our future guidance.

It is gratifying to see so many members present, and while we miss the familiar faces of some of those who in other days contributed to the success of our meetings, it is satisfactory to know that in many cases their absence is owing to the fact that our members are in so great demand in doing important work in the development of this Canada of ours.

I have to announce the removal by death of eight members of our Association: Edward C. Caddy (Cobourg), J. M. O. Cromwell (Perth), Michael Deane (Windsor), Charles John Wheelock (Orangeville), Henry Creswicke (Barrie), Richard Coad (Glencoe), Wm. Robt. Burke (Ingersoll), and J. C. McNabb (Hamilton). Further reference to these events will be found in our obituary column.

The past year has been a progressive one in the history of our Association.

In December, 1896, a special meeting of our Association was called by Mr. Chipman, the President, and important amendments to the Land Surveyors' Act were drawn up. At our last annual meeting a good deal of our time was taken up in considering these and other amendments to this Act, and a draft bill was approved by the Association, and the Committee on Legislation instructed to bring the same before the Honorable the Commissioner of Crown Lands; and as a result the bill, excepting the part relating to the Registry Act, has become law and is embodied in the Revised Statutes of Ontario now being issued. In reference to the proposed amendments to the Registry Act, it will be necessary to have them brought before the Legislature at its next meeting.

In the Act as passed, among other important amendments, provision was made for raising the standard at both the preliminary and final O. L. S. examinations, and for holding but one examination during the year; for the prompt confirmation of municipal surveys; and for the simplifying of the method of survey in certain parts of the Province.

The Act of Incorporation has also been amended by making provision for compelling the attendance of witnesses at the meet-

ings of the Council when cases of irregular practice are being considered.

The Association is under a debt of gratitude to the Hon. J. M. Gibson, the present Commissioner of Crown Lands, and to the Hon. Arthur S. Hardy, the former Commissioner of Crown Lands, and now Premier of Ontario, who as officers of this Association and members of the Government, have done so much to forward the interests of the Association in matters of legislation, and who have always given a kindly and ready response to the requests of the Association.

The Canadian Society of Civil Engineers have applied to our Association for its assistance in obtaining an Act of incorporation from the Ontario Legislature similar to one they have already received from the Province of Quebec. Between our Association and a Society which has among its numbers so many of our members the kindest feelings should exist. I will, with your permission, at an early stage of our proceedings nominate a small committee from our Association to confer with a similar committee already appointed by the Canadian Society of Civil Engineers, and to report to the Association as to the nature of the proposed legislation sought and its bearing on us as a body; so that during the present session we may take whatever action we may deem advisable in the matter.

During the past year our gracious sovereign, Queen Victoria, completed the sixtieth year of her reign, and we, in common with all loyal subjects, rejoiced in the celebration of her Diamond Jubilee. Canada, as the largest and most important of the British possessions, through its representatives, occupied a place in the historic celebration of that event second to that of no other country.

The meeting of the British Association for the Advancement of Science, held in Toronto in August last was another historic event worthy of notice, some interesting papers being contributed at that meeting by members of our Association.

Owing to the better knowledge obtained in reference to the Yukon Territory, that portion of our heritage to-day occupies the thought of the English-speaking nations of the earth, and thousands are rushing to obtain a share of the Klondyke gold. The work of defining the boundaries and exploring the resources of this territory was performed by members of this Association. We are glad to know, too, that not only as explorers, but in a literary sense, members of this Association are taking an important part in making the resources of our country better known. "Across the Sub-Arctics," by Mr. J. W. Tyrrell, O.L.S., deserves all the praise which this work has called forth from the press.

By reference to the programme for this session, it will be seen

that a great number of very interesting papers have been contributed, and it is hoped that the new members as well as the old will freely take part in their discussion. We all expect to learn much from the exchange of ideas. Let us feel, too, that we each should have a part in contributing to the success of our meeting.

I thank you, gentlemen, for the high honor conferred upon me in electing me to the office of President, and would now ask your attention to the further business awaiting our consideration.

T. HARRY JONES,

President of the Association of Ontario Land Surveyors.

March 8th, 1898.

REPORT OF THE COUNCIL OF MANAGEMENT.

MR. PRESIDENT,—The report of the Council includes the report of the Board of Examiners, and also the report of the Secretary-Treasurer.

The Council had a special meeting 29th March, 1897; a regular meeting on the 8th of April, 1897; a special meeting on the 29th December, 1897, and a regular meeting on the 17th February, 1898.

The revision of the Act last year as submitted by the Committee on Legislation came up in the form of a Bill before the Ontario Legislature in 1897. It is now on the Revised Statutes of Ontario, as Chapters 180 and 181.

The Council desire to point out that no portions of the Registry Act, of the Land Titles, of the Municipal Act, or of the several Acts in which surveyors are mentioned, are included in either of these chapters; and they decided that the Council will issue a manual of the two chapters above named and all the other sections of the various Acts which apply to surveyors.

The attention of surveyors in the Province generally is called to the rearrangement of many of the old clauses that they have known for now probably 20 or 25 years to be almost on a certain page of the book, there is a considerable change and close reading of the new Act is decidedly necessary.

As no copies of the Act are yet to be had in the form of the two chapters, the Council would suggest that either a paper be presented next year or that some committee be appointed now to meet and issue something in the form of a paper or a memoran-

dum with regard to the changes so as to have the various changes before the members of the Association, and not wait until some case comes up before them for attention and then find out they have to go and learn the statute that governs the matter in hand.

Under the head of changes in the By-laws of the Association there are just one or two that will have to be changed, and one or two that it is advisable to change, in addition to those mentioned in the Report of the Board of Examiners.

No. 6, the present By-law, is : " There shall be three regular meetings of the Council in each year, one to be held on the first day of the Annual Meeting of the Association, and one during each of the meetings of the Board as prescribed by the Act." There is only one meeting of the Board now, and the Council suggest as follows: There shall be two regular meetings of the Council in each year, one to be held during the Annual Meeting of the Association and one at the Annual Meeting of the Board of Examiners in the month of February.

Under By-law 11, the report of the Board of Examiners now received should be made in the month of November. The Council recommends that the Board of Examiners shall make its report at the Annual Meeting of the Association.

With regard to some of the duties of the Secretary-Treasurer, it has been suggested that the report of the result of the examinations should be sent to the Commissioner of Crown Lands, the officers of the Association, and to the successful and unsuccessful candidates. That means a few cents in postage; that is the result of that, and the advantages are obvious.

With regard to the examinations, reference is made to the subjects and the marks in the report of the Board of Examiners, but these matters are under the head of By-laws No. 28 and 29, and if you accept the suggestions of the Board, of course these will be corrected.

That constitutes all the changes in the By-laws that the Council wish to bring before you.

With regard to unprofessional conduct, several cases came before the Council last year. The cases in point were surveyors signing the certificate now required by the Commissioner of Crown Lands on plans and field notes of mining locations. As you are aware, that certificate reads : " I hereby certify that the foregoing plan and field notes are correct and are prepared from actual survey made under my personal supervision." Now, the whole difficulty occurs in those words, " personal supervision." In May of last year the question was submitted to the Council. There was no opportunity of calling a special meeting of the Council, but the Secretary, as instructed by me, issued a letter to the members of the Council asking what each individual member thought of the meaning of

those words. The result was a circular sent to about 38 surveyors in the western part of the Province who are principally engaged in mining matters, stating that it was considered by the Council that "personal supervision" meant "that the surveyor making such certificate should be personally present and direct the survey at the time of its performance, as in the case of any other survey regarding which he may be called upon to give evidence in a court of law."

One case was brought before the Council, giving particulars of a surveyor in the western part of the Province who had signed this certificate on applications for two or three mining locations. The matter was investigated and it was perfectly clear the surveyor had not been on the ground. A pupil of his had gone out with the parties interested, had made the survey, and the plan and field notes now on record in the Crown Lands Department are signed by the surveyor.

The Council desired to make this a test case, and on consulting our solicitors, we were advised by them first of all, that the Council was the proper place to try the case to see if the man was guilty of unprofessional conduct or not. The advice we got was, that it was better for the Council to try him than to bring him before a police magistrate, which would be the first court to take him to for improper practice; he would possibly be fined \$5 there, and the next time he infringed might perhaps be fined \$5 or \$10 again.

On looking into the Act as it then stood, we found we had the power to try a surveyor for unprofessional conduct. The evidence must be taken by a proper stenographer and the party, if punished, has an appeal to the High Court of Justice for Ontario. On the advice of our solicitors then, we went before the Government and we got an addition to our powers, and that was that a subpoena issued by the Council has the same effect as a subpoena issued by the court. The weak point in our case heretofore was we had not the power to compel the attendance of the person accused, or of a witness. Now we have. I may say, with regard to this particular case, no further action has been taken by the Council. The matter complained of happened some six months ago, and as the Annual Meeting was approaching, we desired to have instructions from the Association as to what action should be taken in this case, or in any other cases in the future.

I may say that, with regard to the Commissioner of Crown Lands, when the matter was up before him, there was a very great objection to making any alteration in the Act so recently passed as 1897. However, when he saw the condition that the matters were in, he very readily and without any trouble whatever had the proper correction made. See Chapter 18 Ont. Stat. 1898.

The Council would ask to get either a ratification of their interpretation of the words "personal supervision," or that the Association itself should define it so that in future the Council will have some distinct definition to be guided by.

At the regular meeting held in February, an application was received from the Canadian Society of Civil Engineers enclosing a draft of the Bill and asking for the co-operation of this Association. The matter appeared to the Council to be one of such importance, and the Annual Meeting was so nearly at hand, that it was suggested that the President should name a small committee on the first day of the meeting to consider this matter.

Under the head of New By-laws, there are two that the Council passed during last year and now present for ratification.

By-law No. 45, passed by the Council 8th April, 1897.

"Whereas, any registered surveyor desiring to give up practice, can have his name removed from the list of practitioners at any time upon giving written notice of such desire; and whereas it is desirable that such surveyors may contribute papers and secure the reports of the transactions of this Association. Therefore, this Council hereby enacts that such surveyors shall have the aforesaid privileges upon the payment of an annual fee of one dollar, and their names shall be printed in the list of members in the Annual Report of the Association and properly marked."

By-law No. 46, passed by the Council 17th February, 1898.

"Whereas, under Sub-sec. 4, Sec. 42, chap. 180, R.S.O. 1897, the Association may, by by-law, exempt from the payment of the annual membership fee to the Association any land surveyor who has been in the actual practice of his profession for a period of 35 years or more as a duly qualified land surveyor; and whereas, George Alexander Stewart has satisfied the Council that he had been in practice and so qualified for a period of not less than thirty-five years previous to the date of the assenting to of Chapter 34 of the Ontario Statutes of 1892. Be it resolved that the said George Alexander Stewart is hereby exempted under the said Sub-section 4 of Section 42, Chapter 180, R.S.O., 1897."

There is just one more matter which the Council desires to bring before the Association, and that is the amendment proposed last year with regard to registered plans and compiled plans of cities, towns and villages. The proposed amendments to those sections of the Registry Act were submitted with the rest of our proposed legislation to the revisers of the Act, and they received the approval of Mr. Scott, who is the member of the commission to whom such matters were referred.

When the rest of our amendments were sent to the Commissioner of Crown Lands last year these were sent among them. but

on the Law Clerk finding they were amendments to the Registry Act, they were not included in our Bill.

The members of the Council who had charge of this matter did not find out until too late that it was the Attorney-General's Department, not the Department of Crown Lands, to which this matter belonged, and when the matter was brought before their attention this year we were told the Government did not propose to make any changes in the Acts revised the year previously. There was no objection to the amendments, and without any absolute promise, I may say there is no reason to doubt that at next session of the Legislature we will get these very desirable amendments placed in the Statutes.

Respectfully submitted,

VILLIERS SANKEY,
Chairman of Council.

REPORT OF THE BOARD OF EXAMINERS.

The Board of Examiners met in April of 1897, and also in February of 1898. The following candidates passed the preliminary examination:—

APRIL, 1897.

Herbert Paterson, Rat Portage.
Roland Andrew McGuire, St. Catharines.
Charles Wilfrid McPherson, Toronto.
Robert Law Benson, St. Catharines.
Edward Francis Troughear Handy, Emsdale.

FEBRUARY, 1898.

John Herbert Jackson, Windsor.

The successful candidates for final examination were duly sworn and admitted to practice, as follows:—

APRIL, 1897.

Archibald John McPherson, B.A. Sc. (Toronto), Galt.
Archeson Thomas Ward, Toronto.

FEBRUARY, 1898.

James Nevin Wallace, B.A., B.E. (Dublin), Hamilton.
James Samuel Dobie, B.A. Sc. (Toronto), Port Arthur.
William Walter Meadows, Grad. S. P. S., St. Thomas.
Franklin Joseph Robinson, Grad. S. P. S., Middlemarch.
William Arthur McLean, Toronto.
William Butterton Ford, Hamilton.
Wilbert Silas Gibson, Willowdale.
John James Newman, Windsor.

George Laing Brown, Grad. S. P. S., Pembroke, passed a supplemental examination and was duly sworn in.

Articles were filed by apprentices as follows:—

ARTICLES FILED.

NAME OF PUPIL.	NAME OF SURVEYOR.	RESIDENCE.	DATE OF ARTICLES.	TERM.
Proudfoot, Hart, W., Grad. S.P.S.....	H. B. Proudfoot	Toronto	6th May, 1897	1 year.
Carpenter, Henry Stanley, C.E. (Toronto)	H. J. Bowman	Berlin	1st June, 1897	1 year.
McPherson, Charles Wilfrid	J. F. Whitson	Toronto	7th April, 1897	1 year 8 months.
Reinhardt, Carl, B.A., Sc. (McGill)	A. E. Morris	Perth	3rd May, 1897	1 year.
Laing, William Francis, Grad. S.P.S....	M. W. Hopkins	Rat Portage	7th June, 1897	1 year.
McGuire, Roland Andrew	V. M. Roberts	St. Catharines	4th May, 1897	3 years.
Nicholson, Charles John, Grad. S.P.S....	J. W. Tyrrell	Hamilton	1st April, 1897	1 year.

TRANSFERS OF ARTICLES FILED.

NAME OF PUPIL.	TRANSFERRED FROM.	TRANSFERRED TO.	DATE OF TRANSFER.	TERM EXPIRES.
Wallace, James Nevin, B.A., B.E. (Dub.)	C. H. Wallace	H. W. Selby	8th May, 1897	7th Nov., 1897.
Laing, William Francis, Grad. S.P.S....	M. W. Hopkins	J. E. Schwitzer....	13th Nov., 1897	7th June, 1898.
McPherson, Charles Wilfrid	J. F. Whitson	B. J. Saunders	7th June, 1897	7th Dec., 1898.
Robinson, Franklin Joseph, Grad. S.P.S.	T. R. Deacon	Walter Beatty	1st July, 1897	11th Jan., 1898.
Armstrong, John	T. R. Deacon	Thos. Turnbull....	26th July, 1897	26th Oct., 1897.

The following bonds were approved and filed as provided in the Act:—A. J. McPherson and A. T. Ward.

The recommendation of the Board of last year that there should be only one examination per annum was made legal by the recent changes in the Act, and it does not seem that any inconvenience has been occasioned thereby.

Owing to the above-mentioned changes in the Act, a rearrangement of some of the By-Laws and Rules and Regulations of the Board have become necessary, and these are now submitted for the approval of the Association.

As you are aware, there are two new subjects added to the preliminary examination, namely, Canadian History and Geography. They will change in a small degree the standing of the subjects, but there are other subjects of the same class, such as Linear Drawing, and other subjects of that kind. The Board are of opinion that a total of 50 marks, with a minimum of 25, for these two subjects, will be sufficient; in other words, requiring a minimum of 50 per cent.

With regard to some of the other subjects in the Preliminary Examination, the Board think that under the head of Numbers One and Two, that is, Penmanship and Orthography, Dictation may take the place of these two. It would be clearly within the spirit of the Act. Dictation would be just as good a test of a man's acquirements in Penmanship and Orthography as asking him to write an Essay or anything of that kind.

Of course candidates at future examinations will have to be warned that that is the proposed method of examination.

With regard to Arithmetic, the Board are of opinion the minimum should be 60; it is now 40. In other words, it is now 40 per cent., and the Board are of opinion that it should be 60 per cent.

With regard to Euclid, the four books, the marks now stand at 30 per cent.; the Board recommend 60 per cent. I may add the reason of that is that Euclid and Plane Trigonometry, and some of those similar subjects, when they are brought up in the Final Examination, take up a great deal of time, and it is better to have those subjects more fully dealt with in the Preliminary Examination, and then when the men come up for their final there is more time for Astronomy and Surveying.

With regard to Plane Trigonometry, we think the standard should be 60 per cent.

Mensuration of Superficies, 30 per cent. out of 50 per cent.

And the two other, that is, Geography and History, should be 25 out of 50.

With regard to the final subjects, "Botany and the Forest Flora of Canada" has been added on.

The other subjects that I would like to draw your attention to are as follows:—In Algebra, 50 per cent. is not too high for the minimum, and 60 per cent. in Plane and Spherical Trigonometry.

In laying out of Curves, 30 out of 60 is considered fair.

With regard to the Survey Act, 90 out of 150.

Levelling, 50 per cent.

Principles of Evidence and Drawing up Affidavits, 35 out of 50.

Taking of Field Notes and Preparing Plans, 50 per cent.

Geology and Mineralogy, 40 out of 75.

Now, that will necessitate an increase of the total minimum.

As you are aware, a man who just makes the minimum marks on each subject cannot pass, because the original By-laws provide that he must at least make under our old regulations a total of 900 marks.

The Board are of opinion that the total should be increased to 1,000, so that a candidate must make at least 1,000 marks to pass. That will be a fraction over 62 per cent.

We did propose 1,100, I may say, but that was thought a little too high, and of course a great deal depends upon the papers and the class of the examination.

With regard to By-law No. 31, it would be advisable to let the Board of Examiners make from time to time such regulations as it considers necessary for the proper carrying out of the examinations. At present the Council makes them.

When the Board of Examiners meet and have these matters before them, I think it would be the proper body to control the carrying out of the examination.

With regard to Rule No. 4, a little clerical change will be made; we don't fold our papers now, we attach them to a cover.

There are two rules that the Board suggests for adoption.

The first one refers to preliminary candidates. Each applicant for examination, previous to apprenticeship, or person exempt from such examination by law or by resolution of the Board, shall on or before the first day of the examination as to the first, or with the transmission of articles to the Secretary as to the latter, also transmit to the Secretary a statement, signed by himself, on form A (to be procured from the Secretary), setting forth the place and date of his birth, the nationality of his parents, his father's occupation, the course of his education, and the schools and other places of instruction which he has attended.

With regard to applicants for final examination the following is suggested: Each applicant for final examination shall, in addition to the other requirements of the Act or By-laws, on or before the first day of the examination, transmit to the Secretary a statement, signed by himself, on form B (to be procured from the Secre-

tary), setting forth the nature of the work performed by him, or in which he has assisted, during his apprenticeship or at any previous time; the locality in which such works were performed, and also the names of the schools, colleges or other places of instruction attended by him.

The Board has to report a very great improvement in the qualifications of the candidates who have presented themselves at the recent examinations, both preliminary and final. This is no doubt partly due to the printing of the examination papers, and the Board would recommend that in future a selection of these papers be printed every second year.

Forms of articles and transfers are now printed and can be procured from the Secretary.

VILLIERS SANKEY,
Chairman of Board.

REPORT OF THE SECRETARY-TREASURER.

MR. CHAIRMAN,—I beg leave to submit the following report of the official business of the Association transacted in my department between 23rd February, 1897, and 8th March, 1898.

The following circulars were issued:—

No. 37	Ballot for 1897-8.....	225	copies.
" 38	Explanation of ballot, with names of candidates....	225	"
" 39	Concerning Crown Lands circular of 1st April, 1897	230	"
" 40	Re dues for current Association year	75	"
" 41	Announcing annual meeting for 1898	325	"
" 42	Announcing adjournment of annual meeting.....	325	"
" 43	Programme for annual meeting	375	"
	Copies of 1897 amendments to Survey Act.....	225	"
	Crown Lands circular of 1st April, 1897, re certificate for mining plans.....	225	"
	Letters and accounts sent from Secretary's office.....	830	
	Post Cards	35	
	Letters and Post Cards received.....	518	
	Copies of 1897 Proceedings sent to Exchanges	605	
	Copies of 1897 Proceedings sent to members	233	
	Exchanges sent to members.....	600	

The exchange of reports for members was continued with the Engineering Society of the School of Practical Science and with our sister societies in Michigan, Illinois, Iowa, and Ohio, that with Indiana has been revived upon a very satisfactory basis, and arrangements have been made for an exchange with the newly-organized Wisconsin Engineering Society.

Some of these exchanges have not yet come to hand, but are expected at an early date, and will then be distributed.

By Amount paid Disbursements in Board of Examiners			
account			\$569 60
“ Balance on hand in Savings account, 8th March, 1898	\$1,027	97	
“ “ “ “ Current account 8th March, 1898	684	22	
			<u>1,712 19</u>
			\$3,001 81

A. J. VAN NÖSTRAND,
Secretary-Treasurer.

Mr. Sankey—I beg to move the adoption of the Report of Council together with those of the Board of Examiners and Secretary-Treasurer, but later on it will be necessary to move the adoption of these two by-laws separately.

The President—Moved by Mr. Sankey, seconded by Mr. Niven, that the Report of the Council of Management be adopted.

DISCUSSION.

Mr. Sankey—I would ask Prof. Galbraith if he would be kind enough to give his ideas on the subject of examinations. I refer particularly to the matter of whether it is well to put a high minimum on a subject or let the test of the candidate's efficiency be more upon the class of the paper he gets than upon the actual standing of marks. That is the point the Board of Examiners would like information upon.

Prof. Galbraith—Mr. President, this question of standards and of papers is of perennial interest. It is coming up continually, and I suppose that in any institution, such as universities, those professors and teachers who are acting continually as examiners have perhaps the best means of forming an opinion on the subject. I know that we usually have to discuss this question when passing students every year. Once a year this has to be gone through, and whatever experience we have acquired during the year is added to past experience, and so on, so that I have formed fairly decided opinions upon the method of examinations.

Now, in the first place, as far as the Statute is concerned, I understood certain regulations as to marks are fixed. Is this the case ?

Mr. Sankey—In answer to that, I may say the subjects are mentioned in the statute; the Association cannot add any subjects on, but the marks assigned to a new subject are fixed by by-law of the Council. Of course, the Council can pass all such by-laws in the interest of the Association, and therefore in that way the marks are really statutory.

Prof. Galbraith—Well, as far as any allotment of marks for the subject is concerned, and as far as the minimum required for passing in such subjects is concerned, I think that the prominence given to that sort of thing may be altogether misleading.

I do not care what marks are assigned, at least I do not care very much. It is not an important matter what marks are assigned, to a subject, or what the minimum assigned for passing in a subject is. It has to be taken in connection with all the rest of the examination.

Again, you have to consider in connection with the marks and the minimum the nature of the paper, and even when you know the nature of the paper and the marks and the minimum it is extremely hard to make any hard and fast rule.

Now, the third difficulty arises from the personal inclinations and feelings of the different examiners. Some tend to be severe, others to be easy. The question is, what is the fair thing for the profession and the candidate when you take all these things into consideration ?

In the first place, let every examiner acquaint himself with the statutory rules as to numbers of marks allowed to the paper and the minimum.

Then let him arrange a paper in accordance with his knowledge of those marks, so that he can see, after a rough reading of that paper, that a man who has not made 30, or 40, or 50, or 90, or whatever you may put as the minimum, does not know the subject well enough to pass.

If the examiner has arranged his paper in accordance with those marks and his judgment, then it is pretty straight.

I know my regulations as to the minimum required, I read over the candidate's answers, and with a great many candidates there is no doubt at all, I pass them at once. But it is the men who are on the edge that you have to be careful about, and with these men you may have to read the answers at least twice, sometimes even three times. Then mark and allot the value of such answer that you think it deserves, according to the number of marks you allotted to each question.

Now then, glance over it again, asking yourself the question, does this man know his work well enough for our purpose ? If that is your candid opinion, then this ought to be put down; your marks then ought to be revised. Remember your first glance at them is simply to help you to see whether your paper itself is what you thought it was; whether it was the proper class of paper to assign to that standard. And if you think on the whole that that candidate does not know enough for the purposes required to pass, then he ought to be marked under the minimum, no matter what you value his marks at.

In other words, if you think, on the whole, that a man deserves his minimum, give it to him.

Now, a candidate passes under different examiners, and there are degrees of slackness and hardness, some too slack and others too hard. The meeting of the examiners removes this. They see how one candidate has gone through with a second and a third, and each examiner has a chance to see how his neighbors have treated each one; so, by discussion among themselves, the easy examination may be made hard and the hard may be made easy. They can settle that.

Now, I think that as far as the individual examiner is concerned, he ought to ask himself the question, does the candidate know the subject well enough for the purpose for which we require this. The examiners then should occupy themselves with this other problem of equalizing standards and then asking the question over again, and then mark them. You can see how all that may be done without any standard at all. You need not print marks or standards or anything, but let an examiner make what he thinks a fair paper, and it serves the purpose in the long run, only there is a little assistance in marks. It helps to keep you straight yourself in your work. It is of assistance. That is the way I feel about it.

Mr. Sankey—I am obliged, indeed, to Prof. Galbraith for the way he has answered the question.

I might point out, though, there is a difficulty. I think probably the way our difficulty came up was this: We are examining a man as to his absolute knowledge in geography or trigonometry, or astronomy; we are examining a man in some fourteen or fifteen subjects to see whether he is fit and proper to be an Ontario Land Surveyor, and in deciding the ratio that these answers bear to that fact is where I think our Board of Examiners have found their difficulty.

There is clearly a difference between a Board of Examiners such as ours and the examining body of a college where each man is bound to give a certain standard in his particular subject. The one subject there possibly has a greater importance, with us the total, that is, a certain number of subjects are grouped together. We have to see that the candidate has such a knowledge of all those in the aggregate as will warrant our giving him a certificate. I may say that idea has just struck me since Prof. Galbraith has spoken as to the actual number of the marks. These are of assistance to the examiner. The object of the examination, it appears, has a very great effect upon the attitude the examiner or the Board as a whole should take.

Prof. Galbraith—I think it is altogether from the point of view of what the purpose of the examination is that the paper should be

set and read. I think that is always the case. And I think it is also true that in every combined examination there are some subjects of less importance than others.

Mr. Sankey—Of course anyone will notice, in reading our by-laws, the Board and the Council endeavored to go closely into that matter. Some subjects require higher marks than others in matters considered of greater importance to surveyors than others. For that purpose the examination of these under the by-law was set in that very way.

Prof. Galbraith—I think the great value of the meeting of the examiners afterwards to discuss the results is just in that, that they have an opportunity of knowing each other's opinions and of feeling what the important subjects are, and if there is an unimportant subject they may decide to disregard the rule about it. They are the final arbitrators, and what they want is substantial justice and fairness for the purpose of the examination.

The President—Just before we adjourn, I would like to ask for an expression of opinion from the members of the Council's definition of "personal supervision."

Mr. Morris—Mr. Chairman, with regard to the personal supervision of surveys, I know that in the outlying districts of Algoma, Nipissing and Rainy River, surveyors have found it a necessity to employ the assistance of students to do much of their work. Now, the Crown Lands Department having found fault, or, rather, complaints having been made to the Council, of certain surveys, we are very apt to go to the other extreme and require the surveyor, as stated by the Chairman of the Council, to be able to go into a court of law and give such evidence as will establish each survey.

The question is, what evidence is required to establish a survey in a court of law. If it is necessary for the surveyor that he must see the survey through from beginning to completion, then we tie the surveyor, practically limit him as to the amount of work he is able personally to control during the year. Now, we know that in a Government survey the surveyor has competent assistants to do much of the work, and that they complete much of the work without his supervision.

Now, I think that if the survey has been begun under his inspection, the surveyor should have the same privileges as the Government allows to its own surveyors when making township surveys in employing competent assistants. It is all that could be asked in those outlying sections, and I think that a surveyor should not be bound to remain on that survey and see the actual work and survey to completion. It would then tie the surveyor and give him

no chance to enlarge his practice or to go further than the actual work he does himself; so that I think the possibility is that the Chairman, with a committee of two others, if they would take that into consideration and leave it to the next meeting of the Council, or the next meeting of this Association, and report at the next meeting, that it would be satisfactory. We all have our different views on this matter, and I suppose there are some of them who are very conscientious and some not so conscientious in regard to what is necessary. My own views are, if any surveyor goes on to the ground, sees his survey properly begun, sees the method of survey, and that his assistant's work is being properly commenced, then the personal supervision is being carried out.

Mr. Sankey—I would say, in answer to Mr. Morris, the difficulty the Council has had is this: It is objectionable to define in every point what "personal supervision" means for this reason. If you are going to put a hard and fast rule down for the meaning of that expression, then each surveyor will be judged by how far he has or has not carried out that rule.

I suppose there are no two surveys of exactly the same character, and if a surveyor is acting up to his duty, he should be the judge, I think, as to how much actual assisting in a particular survey is necessary.

But the Council is decidedly of opinion that personal supervision does not mean the sending of a pupil or any paid assistant away from headquarters, or the dwelling of that surveyor where he may happen to be working, with instructions to go out with a prospector who wants to have a claim surveyed. How can a surveyor honestly sign a certificate if he never was on the ground, or saw the starting point? He cannot swear the post was planted; he never saw it marked.

I don't think it is advisable that we should have hard and fast rules that way, but if the definition the Council has already given is too severe, or not severe enough, then this Association is just as well able to give their decision now as to wait for another year. The trouble we have is there is only one meeting in a year. Our difficulties arise, are brought before the Association this year, and we have to wait a whole year for some definite settlement of them. I hope the Association will give a definite decision one way or the other. If the meaning put to these words by the Council is not strong enough, then say so, and say what it ought to be; and if too strong, say so.

The President—This is the copy of the letter which was sent, under the direction of the Chairman of Council, to the surveyors practising in the mining districts:

TORONTO, 26th May, 1897.

Dear Sir,—The Council has been asked for an opinion as to what constitutes “personal supervision” of surveys as intended by the certificate required by the Crown Lands Department.

The conclusion arrived at is, that the surveyor making such certificate should be personally present and direct the survey at the time of its performance, as in the case of any other survey regarding which he may be called upon to give evidence in court.

This seems to be the only way in which a surveyor can place himself in a position to honestly make such certificate.

Irregularities of practice having been reported to the Council, Mr. W. J. Keating, barrister, Fort Frances, has been appointed as representative, and it is expected that existing abuses will be terminated.

Yours truly,

A. J. VAN NOSTRAND,
Secretary-Treasurer.

Mr. James, sen.—There seems to be a difficulty as to what might be considered “personal supervision” in this way. For instance, take a surveyor having a survey to make at a long distance. If he had to take his pupil along and go himself it would increase very much the costs to the client, and, of course, I suppose each surveyor is desirous of keeping down the expense of a survey.

I think, of course, “personal supervision” would mean for the surveyor to be on the ground; there is no doubt about that. That I quite agree with.

The President—That is what the Council has stated.

Mr. James—I think he should see some part of the work and be with the assistant a portion of the time at any rate; I certainly think that.

The President—It is a wide question. “Personal supervision” may meet it. As you say, I think the surveyor should be on the ground. He may have an assistant a practical surveyor who has had great experience. It will be not necessary for the surveyor to remain with him to personally supervise that matter, and will not require his being on the ground nearly to the same extent as if he had a pupil who had had comparatively little experience.

Mr. James—It might be as well to discriminate between the years of service of the pupil.

The President—I don't think we could go further.

Mr. Morris—I might state a case in my own work. I went to one of the upper lakes and laid out a mining claim of 80

acres. I marked all the posts myself and had my assistant with me, a man I always take with me, no matter what work I do. Then, being in the same locality and wishing to mark off a point of land for another claim, consisting of 50 acres or thereabouts of broken front, I sent my assistant to start from one of those posts I had planted when he was with me. He traversed around the river front to the other post I planted without my presence on the ground at all. He brings me his notes. I find that his traverse round the river front checks with my former survey, and the marks which he shows and the notes and returns agree. I consider in this case that the evidence is sufficient to satisfy the surveyor that the work has been carried out as faithfully as if he had been on the ground.

Mr. Sankey—Of course, I might state to the Association, in bringing the matter in the shape it is now, a surveyor infringing or making a mistake in his duty is not going to be tried before a technical Court of Law, but will be tried before a Council of Surveyors. Each case will govern itself. And, take the position Mr. Morris has just put before us. I question very much if any three or four surveyors you could pick out by chance out of our Association would say he had done wrong if he had signed a personal certificate in that particular case.

For that reason, if, as I said before, our definition of personal supervision is general enough and severe enough, let it stand. If it is not severe enough, explain it more fully; but I do not think it would be right to say a surveyor should go on the ground to see the first post planted, or that he must see all posts planted, or that he must take an observation to get his meridian.

The President—Is the Association prepared to take action on this?

Mr. Gaviller—I don't think there is any other construction to be put on it, Mr. President. It simply, as Mr. Sankey says, lies in the hands of the Council, if a man is brought before them; they are practical men. And how to word it in any other manner I don't know.

Mr. Niven—I don't think that personal supervision can mean anything less than you have stated. Of course, as to this matter, most of you are aware how it originated. Certain surveyors got a lot of apprentices during the boom in the gold country, sent them all over the district, and charged full fees for their work, though they did not know anything about the work done by the apprentices, and then they certified to the plans. This state of things has not yet ceased.

I could mention an instance where a surveyor at the present

time has apprentices working in that district, and he is not within 600 miles of them, and yet plans are coming into the Department signed by himself. Is that in accordance with the spirit of the circular issued from the Crown Lands Department?

Mr. James, Sen.—That there is a good deal of difficulty in the way I see, but there is no doubt there ought to be something done. I know one instance myself in which a party suggested that an unqualified man should make a survey and they could easily get it certified to.

The President—The Council desires a resolution passed approving of this circular. Will the Association take action in the matter? If so, a resolution will be in order. It can be voted down if it is not the feeling of the Association, but the discussion is, perhaps, a little irregular now.

Mr. Sankey—Mr. President, with all due respect, I would suggest, if this is going to have an effect with the public, that this resolution should not come from a member of the Council.

Moved by Mr. Gaviller, seconded by Mr. M. J. Butler, That this Association hereby endorses the opinion of the Council of Management, expressed in the circular letter of 26th May, 1897, with regard to the meaning of "personal supervision" in the certificate required on plans of mining locations. Carried.

The motion for the adoption of the Report of Council of Management was then carried.

End of discussion on Report of Council.

REPORT OF AUDITORS.

We hereby certify that we have examined the accounts of the Secretary-Treasurer and vouchers therefor, also Financial Statement, and have found them correct.

March 9th, 1898.

GEO. ROSS,
H. L. ESTEN,
Auditors.

REPORT OF COMMITTEE ON LAND SURVEYING.

MR. PRESIDENT,—Your Committee have great pleasure in congratulating the members of our Association upon the great increase in the demand for their services and the constant addition of territory requiring their professional attention.

The large demand for mining location surveys and supplying information as to the development of the same has afforded a promising opening to those who, before qualifying as land surveyors proper, have taken the technical course now so well supplied by several of our colleges.

We are happy to announce that the great majority of the candidates for the final O. L. S. examination have availed themselves of this privilege.

In connection with the survey of mining locations, two important circulars have been issued during the past year by the Commissioner of Crown Lands. One, dated 27th August, refers to Amended Mines Act, Sec. 27, and suggests "instead of keeping the plans till paid for, or handing them to parties whom they cannot trust, inasmuch as they are strangers, immediately on conclusion of survey, to file the plan, field notes and description in the Department of Crown Lands for the discoverer, filing at the same time, if it has not already been done, an application in the name of the discoverer, together with the necessary affidavit by the discoverer, of the discovery of mineral; then if the discoverer fails to get a backer, and by the operations of the Mines Act loses all interest in the land, any other person making another discovery could pay the cost of survey into the Department at the rate of 50 cents per acre, to be refunded to the surveyor."

In the case of small islands that there should be a minimum cost for such survey of \$20.

The second circular, dated April 1st, directs that "all plans and field notes accompanying applications to this Department must be certified to by the surveyor making the survey in the following form:—

"I hereby certify that the foregoing plan and field notes are correct, and are prepared from actual survey made under my personal supervision.

"

" Ontario Land Surveyor.

" Dated this day of, 18..."

We would also draw attention to the addition of Botany and the Forest Flora of Canada to the list of subjects for final O. L. S. examination.

The investigation commenced by the Royal Commission on Forestry in Ontario we consider of the greatest importance, and also that a continuation of the same will undoubtedly prove most beneficial to this Province. The almost universal ignorance as to the growth and protection of the timber in our forests has been

a source of loss to the country, the amount of which it would be difficult to estimate.

We have also to congratulate the Association as to the Act respecting the Surveys of Lands, chapter 181 R. S. O. 1897. By the amendments in this Act municipal surveys are placed in a more satisfactory position, and the survey lines in a number of townships much simplified.

In concluding, your Committee would press upon the Association the necessity of giving the proposed Bill of Incorporation of the Ontario Civil Engineers a most careful consideration as to those clauses affecting the employment and standing of an Ontario Land Surveyor, and trust that an amicable arrangement will be arrived at that will prove beneficial to all parties concerned.

A number of questions in surveying have been sent in. These and replies to same are appended.

All of which is respectfully submitted.

M. GAVILLER,
Chairman.

QUESTION DRAWER.

Question 1.—Is an affidavit required to verify the surveyor's signature to a plan for registration?

Answer.—No.

Question 2.—Can a plan of sub-division be registered when more than three months have elapsed after the date upon it?

Answer.—Yes.

Question 3.—Must all parties signing a plan for registration as owners show proof of ownership?

Answer.—Yes, by deed or otherwise.

Question 4.—Can a Registrar refuse to register a plan if he considers that a line shown on the plan has been improperly described?

Answer.—He may call attention to what he considers an error before registering the plan, but the surveyor is, in most cases, the best judge as to the correctness of lines shown on his plan.

Note.—Answers to questions 1, 2, 3 and 4 are rulings of Inspector of Registry Offices on the several points.

Question 5.—In making a survey of the last four lots of a concession containing 30 lots, I find no post between lots 26 and the town line. The original notes give 26.46 chains as the width of each lot. A portion of the north half of lot 30 has been since granted as 100 acres, more or less. I find on the ground that the four lots occupy a width of 108.60 chains. What width ought I to give to lot 30 ?

Answer.—27.15 chains—one-fourth of distance on ground.

Question 6.—In making a Government survey, I encounter a lake on my line that I cannot get a sight across with the telescope on my transit. How am I to proceed ?

Answer.—Traverse round the lake and find by “latitude and departure” the point where your line produced would intersect the further shore.

Question 7.—In a township in the District of Muskoka the line between lots 21 and 22, in the fourth concession, was run prior to July 1st, 1897, on the astronomic course N. 19 deg. 50 min. W., being the course of the straight line A B joining the front and rear ends of the governing line. Since July 1st, 1897, this line has been disputed, on the ground that it is not run truly parallel to the line A B. A second surveyor is called upon to run the said line. Should such surveyor run the line on the same course as the line A B, or on the astronomic course N. 20 deg. 51 min. 40 sec. W., as shown in the plan and field notes of the original survey ?

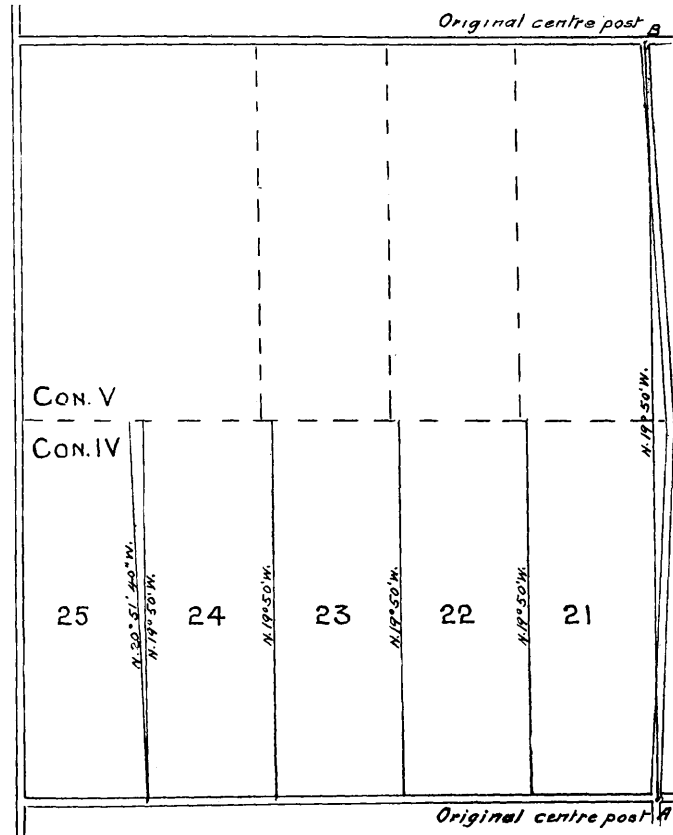
Answer.—The line between lots 21 and 22 was run in accordance with the statute in force at the time, and if re-run should be parallel to A B. R. S. O. 1897, c. 181, sec. 28 (2) latter part.

Question 8.—The lines between lots 21 and 22, 22 and 23, and 23 and 24, concession four, were run prior to July 1st, 1897, on the astronomical course of the line A B, viz.: N. 19 deg. 50 min. W. Since July 1st, 1897, a surveyor has been called on to run the line between lots 24 and 25, concession four. Should he run such line on the course stated in the plan and field notes, viz.: N. 20 deg. 51 min. 40 sec. W., or should he run the line on the course N. 19 deg. 50 min. W., so as to conform with the lines already run in the block ?

Answer.—Lines in the block in question having been run previous to July 1st, 1897, the new method in section 17, amending section 52, 1887 Act, cannot be adopted. See R. S. O. 1897, c. 181, sec. 28 (2) latter part.

Question 9.—How do you establish the “blind line” between concessions in those townships where only each alternate concession line has been run with double fronts.

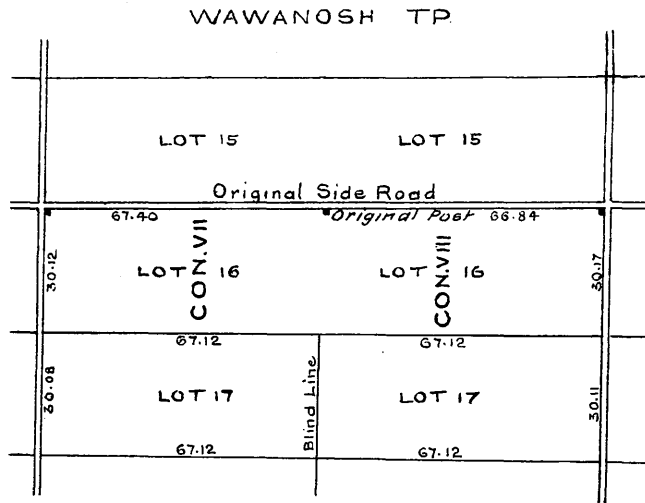
Answer.—Each lot line must be run from the posts on each side of such alternate concession to the centre of the space between



such alternate concessions, or to the proportionate depth intended in the original survey, and the lines joining the points so found will form the blind line. R. S. O. 1897, c. 181, sec. 14 (2).

R. S. O. 1887, c. 152, sec. 57, or R. S. O. 1877, c. 146, sec. 62.

To join the extreme points in a case where the concession lines were crooked would be an unfair division of some lots.



Question 10.—How would you run the line between lots 16 in the 7th and 8th concessions, the measurements being as shown on accompanying sketch. Lots all deeded as 200 acres?

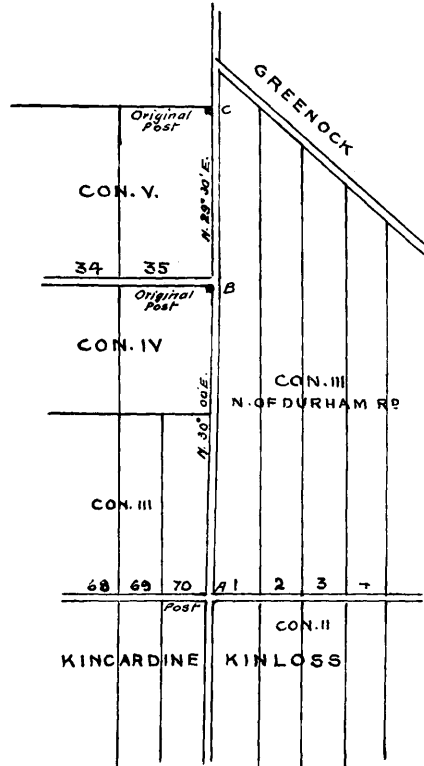
Answer.—Join the original post on the side road and the centre point of line between lots 16 and 17. See R. S. O. 1897, c. 181, sec. 14 (2).

Question 11.—How would you run the line between lots 1 and 2, concession 3, north of Durham Road, in the Township of Kinloss, the town line opposite lot 1 having a bend of 30 min., as shown in diagram?

Answer.—From information given in the question, the line between lots 1 and 2 should be run on the course of a straight line between the original posts at A and C, R. S. O. 1897, c. 181, sec. 36. But instructions for survey of that part of Township of Kinloss and Kincardine referred to should be examined.

Question 12.—The Township of Clarence was resurveyed about thirty-five years ago and posts defining the lots were planted down the centre line of the concession roads and also at 50 links

on each side of said centre line. Each set of three posts are planted in line, but not on the bearing of the governing line, so that if the outside posts are taken for running lot lines from a lot in one con-



cession will sometimes be five or six feet wider than the lot in the opposite concession. How should the lot lines be run ?

Answer.—If re-survey last mentioned was performed under proper authority, the post in centre or on opposite side would govern, being best evidence. R. S. O. 1897, c. 181, sec. 37 (2).

Question 13.—When a surveyor lays out the “chain reserve” along the margin of a lake or river, where does he begin ?

I find, on consultation with many surveyors, that the custom is to begin at ordinary high-water mark, or where the land vegetation begins or ends, but I can neither find any rule for taking such high-water mark or edge of vegetation, nor that the surveyors have any instructions to take such point.

I respectfully ask that you investigate this, and if you find that the custom is as stated take such action as will establish the position.

(See discussion on communication from E. S. Jenison.)

DISCUSSION.

Mr. Gaviller—In concluding this report I might say I only heard the report read by Mr. Campbell this morning, and had I had the opportunity of hearing what he has done, that is in connection with the engineering work performed in the Province, I would have made an endeavor to mention here all the surveys of any large extent that have been made; and I think in future it would be a good idea to include that in the report, but as far as we have gone we had very little opportunity of ascertaining what those works were. I move, Mr. President, that the report of the Land Surveying Committee just read be adopted. Seconded by Mr. Niven. Carried.

Land Surveying Committee Question Drawer, by Mr. Gaviller. (Reads question as to shore line.) Now, this has reference to the Association at large, and as such we did not take it up in the Land Surveying Committee in particular, and I think it is a position open to discussion before the members of the Association, but I may state this in connection with it, Mr. Jenison has made searches through the instructions given to surveyors for Government surveys, and most of us are aware there is nothing definitely laid down in those instructions except that there shall be four rods left for a road allowance around everything that is considered a permanent lake, not around beaver meadows, nor anything of that kind.

He says his experience is that when you get on the ground one surveyor has been there when the water is low in the lake, and he has put his post in at four rods from the edge of the water. Another one has gone there in the spring and made a survey of another township, in which part of this lake might be situated, in time of high water, and plants his post some ten or fifteen rods back, in what would be in the bush when the water was low.

He wants to know where this four rods ought to be, as there is nothing really definite in the instructions given by the

Government as to how a surveyor shall determine where his four rods is to commence, next the water.

Of course the only ground we have to go upon is the general ruling of Courts as to what high water means, and the common sense of the thing is that this four rods should commence at what is usually called high-water mark. This is a question that has been discussed in the Courts and elsewhere a great many times, but I think it has come down now simply to determine what has been taken as high-water mark in rulings, and from the Courts in the United States, and in our own country, and opinions, all show that high-water mark should be defined as "that point at which the water arrests vegetation, where vegetation ceases," and that should be the point of commencement. Now, I leave it before the Association to express their opinion. If Mr. Jenison wishes for the opinion of this Association, it lies in the hands of the members to put it in such shape that we can give it in our next annual report. I have no doubt if this is done in a satisfactory manner that in the future, where such road allowance is considered necessary, instructions will be issued by the Commissioner to define the matter in some way. In many cases the posts are lost, they invariably are when in a swamp or lake. It is often very rocky land, and the posts do not stand long, and then where is a man to commence the four rods?

Chairman—Now, gentlemen, I would ask for an expression of opinion and discussion upon the question referred to us in reference to the high-water mark.

Mr. Niven—Mr. President, in regard to the high-water mark, I agree with what Mr. Gaviller says. It has always been my practice to take the line of vegetation—that is, where trees commence to grow—not the highest water mark, not the flood mark, because in the spring of the year you will find that the water has been away up in the bush in many places. The high-water mark is generally conceded to be "that point where vegetation begins and where trees and bushes begin to grow." I think this is the opinion of the majority of surveyors.

Sometimes this line is very well defined, and there is no trouble. At other times there is a little difficulty in defining it, but in such cases I think the surveyor simply has to use his judgment.

It would be a good thing if this Association arrive at a decision on this point, so that the Commissioner of Crown Lands in his instructions to surveyors may locate definitely the position of the road allowances in question.

Regarding the other matter Mr. Gaviller spoke of (Question 12), as to posts being planted in the original survey, it often hap-

pens that posts are not on the line, if the line is intended to be at right angles.

For instance the surveyor in the original survey, or rather his chain bearers, have not taken sufficient pains to put these posts at right angles to the line which is being run. I have known the posts to be three or four feet out of position, and sometimes the farmers get very much out by taking these posts and running a line themselves.

If these posts were planted in the Municipal Survey I think that you would have to adhere to the posts where they were put.

Mr. Butler—Mr. President, in reference to the point raised as to posts on the water front, I have a resolution I would like to move. Where the post is found you must follow it, of course. If the post is gone, then it should be, I think, upon the whole, more likely that the line of vegetation, or very near that, would have to be taken as the high-water mark, and a line run parallel to this line at four rods distance.

I move, seconded by Mr. Bowman, "That the Secretary be instructed to communicate with the Commissioner of Crown Lands, placing before him the necessity for accurate instructions to surveyors with respect to planting posts on the shores of inland lakes and navigable rivers."

I think if the Commissioner gives such instructions in the future, it will overcome difficulties.

Chairman—The only question is whether the Director of Surveys would wish to take upon himself the responsibility without knowing the wish of the Association. It would strengthen his hands if the Association can agree upon a definition such as Mr. Gaviller has given. Would you add that to the resolution?

Mr. Butler—Yes.

Mr. James, Sen.—In reference to this matter, I think it would be a good thing in that resolution to ask the Commissioner of Crown Lands to have a stake planted in the centre of road allowance, that would be, say, two rods from the high-water mark, and one at four rods, then there would be two chances of finding the original mark.

Mr. Walker—Mr. Chairman, if I understand this motion of Mr. Butler's aright, it is to the effect that he wishes the Commissioner to issue instructions to the surveyors to fix the boundary of the lake. A difficulty arises in this connection—that is, with regard to the law of accretion. The boundaries of our lakes are continually changing, and although it may do very well to fix the boundary of a lake where the slopes are very precipitous, on

the sandy shores of a lake it would hardly do, they are continually changing. The owner of a lot that goes to the edge of the lake is entitled to the accretion which falls in front of his lot, and if he is only to be held to this post we are interfering with the law of the land when we say that the accretion which forms in the front of his lot shall not belong to him.

Mr. Butler—The question we want to decide is, where is the road. The object of the resolution is that the instructions shall be so given that they could be used in Court for information as to what was the actual intention of the Government in laying out that road. With the discovery of minerals, and one thing and another around the shores of the lakes, it will become a live question, and when it is I think the lawyers will get most of the valuable property in the future.

Now, if there is any increase of level, and the land rises, it might be a movable line, provided the definition is accurately given in the instructions that the chain widths shall be taken from that point where vegetation ceases parallel with the shore of the lake. That would provide for any increase or decrease of shore line.

What we want is that in the instructions a definite meaning should be attached to what is meant by the road allowance round the lake. At present it is so loose it may be anywhere.

Mr. Sankey—Mr. President, on this matter I hold that once a post is planted that post should govern, and the instructions should be definite as to the planting of that post. On the other hand, if the posts are not planted where the lot lines come to the water's edge then the definition of what is the water's edge becomes most important. I don't think the man owning a lot if he gets the acreage the patent calls for has much to find fault with. He pays for the acreage and he gets it.

The question seems to me more to define what the water's edge is to be in the future rather than actually giving instructions to plant the post, because if the post is planted and can be found I think that is final.

A Member—Have the Courts not already decided what is the high-water mark?

Mr. Walker—I think it is pretty well decided by the Courts already what high-water mark is. It is a matter that has come before them very often and has been pretty well discussed. In some cases the limit of the vegetation would be a very good mark, but not always—for instance on our own Toronto Island. I should like to hear Mr. Sankey speak as to the boundaries there.

The limits are continually changing. Even in my own recollection the shore line has changed as much as 100 feet, and I don't know whether that would be considered as part of the road, or entirely new land belonging to the Government.

Mr. Sankey—In answer to the question Mr. Walker has propounded with regard to the Toronto Island, I do not think there is much difficulty.

The city of Toronto somewhere about the year 1867 got a patent from the Crown of the island or peninsula lying to the west of the Gap, saving and excepting thereout the right of way and free access to and from the shores of the island, one chain in width, now used for fishing purposes, that is the exception on the island. Whether that particular clause in the patent was carefully considered at that time or not I cannot say.

The city of Toronto assumed they owned the island; they issued instructions to a land surveyor to make a survey and a proposed subdivision. That was done. That subdivision was accepted, and he was instructed to stake it out. He did so, and he took what he has since told me was a generous allowance of a chain from the water's edge, as he found it the day he made the survey. I am sorry to say he did not refer to the standard gauge at the Queen's Wharf, the Harbor Commissioner's Gauge of the level of Lake Ontario.

If he had done that I would have no trouble in now defining the shore line, but he planted stakes and marked them. A plan was registered. The lots have been leased to various parties according to that plan, and the question that Mr. Walker has propounded has very often come up, What are the rights, the respective rights of the parties with regard to that road allowance that was laid out by a registered plan?

This free access to a strip of land 66 feet wide is in the patent, the city possibly considering they enjoyed a road allowance around the island. They planted stakes and marked them, and then leased their lots. Now comes the question how far is that road binding on the city and on the parties who have leased the lots?

In one law case which has been already decided, an accretion occurred, and a tenant on the island admitted he occupied what he considered was an accretion coming to him on the land side of the road. In that case I proved I had found the original stake. It had been pointed out to me by the surveyor who made the survey; it was marked with the letter R on the west side, and Judge McMahon held that stake bound him, no matter what happened.

And on the south shore of the island the road allowance is cut away and also parts of the lots are cut away.

If the leases from the city to the tenants create a liability on the part of the city to keep up a road allowance, I suppose these tenants will have a very good civil action, for the road is gone. That road belongs to the city and the land under the water belongs to the tenant. He is the lessee of it, and if that land should come up out of the water they could go on and occupy the land, the old survey could be re-established, the old posts replanted and we would be just where we were, and whether the tenants have a good civil action against the city for not keeping up a road allowance in front of them, is something I cannot answer. I do not think there has been really a definite decision by our Courts in Canada as to high-water mark. They generally take an English decision, and that goes to tide water. They haven't the great lakes of Canada, they haven't the River St. Lawrence, where these matters become of very great importance. If our great lakes in Ontario and our River St. Lawrence are going to be governed by the same law as in England where there is tide-water, then possibly any man owning a piece of land along Lake Ontario where there is no road allowance, and where there are very few reservations, owns to the middle of that lake. But I think you will agree with me there is no definite decision on that matter with regard to the riparian rights on our large lakes and rivers.

Of course where the road has been reserved under the authority of the Crown there is a road allowance, and that will stand or fall according to the law on that point; but regarding the riparian rights on our big lakes and rivers, it is a matter I cannot decide, and questions are more likely to come up in the future than they were in the past.

Mr. James, Sen.—This high-water mark seems to me a very uncertain thing. I will give you an instance which came under my own personal observation. The beavers had dammed the outlet of a lake and the water consequently rose around the banks considerably. We removed the dam and went on with our work. We had to cross the lake and leave the chain for the road allowance. Well, we simply tore away the dam and lowered the lake to natural level and took the high-water mark as the direct point from which to lay off our chain. When we returned after being absent some time, we found it dammed up again.

Mr. Gaviller—The question was asked whether the Courts have decided what high-water mark means. Now, here are some decisions given in the Courts of the United States, and I think that they correspond with what have been given in our Courts. (Reads from Hodgman's Manual.)

Chairman—Gentlemen, I will put this resolution, which is

still open for discussion; it will be then properly before the meeting.

Moved by Mr. M. J. Butler, seconded by Mr. H. J. Bowman, "That the Secretary be instructed to communicate with the Commissioner of Crown Lands, placing before him the necessity for accurate instructions to surveyors with respect to planting posts on the shores of inland lakes and navigable rivers, and it is the opinion of this Association that high-water mark ends at the line of vegetation."

The Commissioner is asked to issue instructions, and I think unless he differs very strongly from us he will follow the opinion of the Association. Then he can state in reference to details whether it would be advisable to put the stake at the two rods or four rods in those instructions which he is to issue. Are you ready for the question?

Captain Gamble—Suppose the shore of a lake is worn away, and on resurvey of a registered plan you find twenty feet less than there was originally, where is the shore line?

Mr. Gaviller—I don't think in the case Captain Gamble mentions any Government or anybody else could give a title covering a lot that had been already conveyed by registered plan.

Chairman—Are you ready for the question, gentlemen?
Motion carried.

REPORT OF COMMITTEE ON DRAINAGE.

[NO REPORT PRESENTED TO THE MEETING.]

REPORT OF COMMITTEE ON ENGINEERING.

MR. PRESIDENT,—The past year has brought forth a considerable number of important engineering works and numerous developments in the science of the profession. Possibly one of the most striking works, and one with which all the members of the Association are in a measure familiar, is the projection of a railway from Glenora, on the Stikene River, to Lake Teslin, designed to assist in opening up the region of the Klondike. This railway is

to be the most rapidly constructed of any railway yet built, the contract requiring that about 150 miles be completed in about seven months, the work necessarily including even the preliminary survey of the proposed route. Other routes into the Klondike are being discussed, and some will no doubt materialize in the near future. In Ontario the building of a railway from a point on the Canadian Pacific Railway northward to James' Bay is being actively agitated. These works will undoubtedly open up additional engineering work in developing the mines and other resources of the country traversed.

Since the last Annual Meeting of this Association, the outlook in mining has developed to a considerable extent, and with the success of several mines in Northern Ontario assured, together with a promising outlook in Central Ontario, the demand for engineering skill is certain to increase.

The water power of Canada is being exploited to a considerable extent, and the possibilities of utilizing this power by converting it into electricity and transmitting it long distances, are very great. Notable works of this description are the power plants at Chambly and Lachine, which are among the most important engineering works of the year. The general design of the Lachine work is a dam thrown into the river about a mile from the foot of the rapids; and a dike parallel with the shore, extending up the river nearly a mile, thus forming a head race with a fall of eleven feet. The power thus obtained is converted into electricity and transmitted a distance of six miles to Montreal. The Chambly plant is located on the Richelieu River, about 25 miles from Montreal, is one of the finest hydraulic works on the continent, and consists of a dam 2,000 feet long and a power house of 20,000 h. p. capacity, the greater portion of which will, it is expected, be transmitted to Montreal.

In mining, water-power and electricity promise to play exceedingly important parts, since the former is everywhere available in our mining districts.

Municipal engineering appears to record no special departures in actual construction, although our knowledge of numerous departments, water supply, sewage disposal, lighting, and paving has been largely increased, and municipalities are making distinct progress toward an era when the absolute necessity of the best experience and skill in these matters will be acknowledged.

In bridge construction, Canada has produced another of the notable works of the year in replacing the old Victoria tubular structure at Montreal with a modern design. Other interesting features of bridge work on the Canadian Pacific have been stated in the following interesting letter from A. P. Walker, a member of the Engineering Committee of this Association.

“The past year has been an exceedingly busy one with the engineering staff of this railway. No less than sixteen large, new iron or masonry structures having been put in in place of old wooden spans or temporary trestles on this Division (Ontario and Quebec) alone. These include spans varying from 50 to 100 feet, and the general design is a plate deck girder on masonry abutments or piers. This has been varied in the case of the crossing of the Upper Lachine Road, near Montreal, when three graceful semi-elliptical masonry arches, two of 40 feet and one of 60 feet span, and 20 feet high, have been erected. As regards appearance, there can be no question that these arches are a step in advance of the rather prosaic looking plate girder, and the continued scraping and painting required with these girders in order to keep them from rusting tends towards making the ultimate cost not very much greater. The low prices of iron and steel during the past few years has developed a change in the designs of iron bridges. Formerly it was considered good practice to make the iron span as short as possible consistent with the size of the stream and hold the earth embankment back with large abutments or retaining walls. Now the tendency is to increase the span, reduce the quantity of masonry to a minimum, and allow the earth embankment to run out beyond the masonry. This is quite noticeable in the case of three bridges built last year, when spans of 50 feet, 47 feet and 78 feet would have been ample to have carried the water, yet spans of 80 feet, 60 feet and 100 feet have been put in, respectively, and money saved thereby.

There is also the continual tendency towards increased weight in rolling stock, necessitating continual increase in the strength of bridges and heavier rails. In 1884 an average passenger engine weighed about 141,000 lbs., of which about 48,000 lbs. would be on the drivers. Now a first-class passenger engine weighs about 218,000 lbs., of which 103,890 is on the drivers, and this company propose to build this year a freight engine weighing 140,000 lbs., with 125,000 lbs. on the drivers.

“Three large bridges have been finished in Toronto, during the past year, viz.: Queen Street Subway, John Street and York Street Overhead bridges. With regard to the latter, the writer is engaged in compiling a description of it, and may be able to present a paper on the subject to the Association at its coming meeting.”

The use of cement concrete in engineering works is every year attaining great prominence. In response to an inquiry, Mr. M. J. Butler, Engineer of the Bay of Quinte Railway and Navigation Company, writes:—

“I have built the following bridge abutments and piers of concrete, viz.: At Gananoque, on Thousand Islands Railway, 5

piers 5 feet by 22 feet by 12 feet high. On Bay of Quinte Railway, 1 arch culvert, 10 feet opening, 9 feet high under crown; 12 abutments under short span bridge, size average about 5 feet by 16 feet by 12 feet high; also a number of smaller culverts. I have also put in 4 abutments at Oshawa on the railway and built the engine and chimney foundations. At Deseronto we have put in a number of engine foundations, and I also used it in the foundation blocks under the water tower and in the pumping station engine foundry at Deseronto. Usual proportion, 1 part Star cement, 3 parts clean, sharp sand; 5 parts field gravel, screened so that largest piece will pass through 2 inch ring and the smallest piece over 1-4 inch. A varying size in the grains of sand and of gravel will give a denser and more economical concrete."

All of which is respectfully submitted,

A. W. CAMPBELL,
Chairman.

DISCUSSION.

Mr. Campbell—I might say, Mr. Chairman, in connection with this report that I do not imagine that the report covers or deals with all the important works which have been undertaken in the country during the past year, but I think we have dealt with all the important works which are going on at the present time, or which have been completed during the past year.

I might say that it is a matter of considerable importance to prepare a report giving a review of all the works which have been undertaken and constructed during the year and for this purpose it is necessary that we should have, or the Committee should have, the assistance not only of its own members, but also the entire membership of this Association.

In the preparation of this report I certainly have had the hearty co-operation of all the members of the Committee. We have held several meetings. We held meetings in my office, and then I presume we each of us held individual meetings outside of that, and I feel very grateful to the members of the Engineering Committee for the assistance rendered in connection with the preparation of this report, and trust that you will advise the Engineering Committee of next year to at least assist the Chairman as ably as the Committee of 1897 have assisted me, and the report will no doubt be of very great value to the Association.

Chairman—I thought perhaps the report would have referred to the progress made in road-making throughout the Province, but

of course we receive very full reports in reference to that in the reports published by the Government of the work done by the Provincial Instructor in road building.

REPORT OF ENTERTAINMENT COMMITTEE.

MR. PRESIDENT.—Your Entertainment Committee for 1897-98 beg to report as follows :

The Annual Meeting of the Association for 1898 was opened in the Association's Repository in the Parliament Buildings, and was afterwards continued in the Private Bills Committee Room, for the use of which the thanks of this Committee are hereby tendered to the members of the Ontario Government.

Your Committee's chief care has been the annual dinner, held at McConkey's on the evening of 9th March. We are glad to be able to report that it was one of the best attended and enjoyable of these annual social functions. The guest list was unusually large, and included Mr. Aubrey White, Assistant Commissioner Crown Lands; Prof. C. H. McLeod, of McGill University, Montreal; Mr. C. H. Rust, City Engineer, Toronto; Mr. Blue, of Bureau of Mines; Mr. Kivas Tully, of Department of Public Works, Ontario; Mr. Weeks, representing the Engineering Society of the School of Practical Science, Toronto; Messrs. Jarvis and Skeats, and Messrs. Robertson, Greenwood, Boulton and Johnson, representing the "Canadian Engineer," "World," "Globe" and "Mail," respectively.

The chair and vice-chair were occupied by the President and Vice-President, and the diagram shows the names of those present.

Due justice was done to the good things provided, and the following programme was carried out :

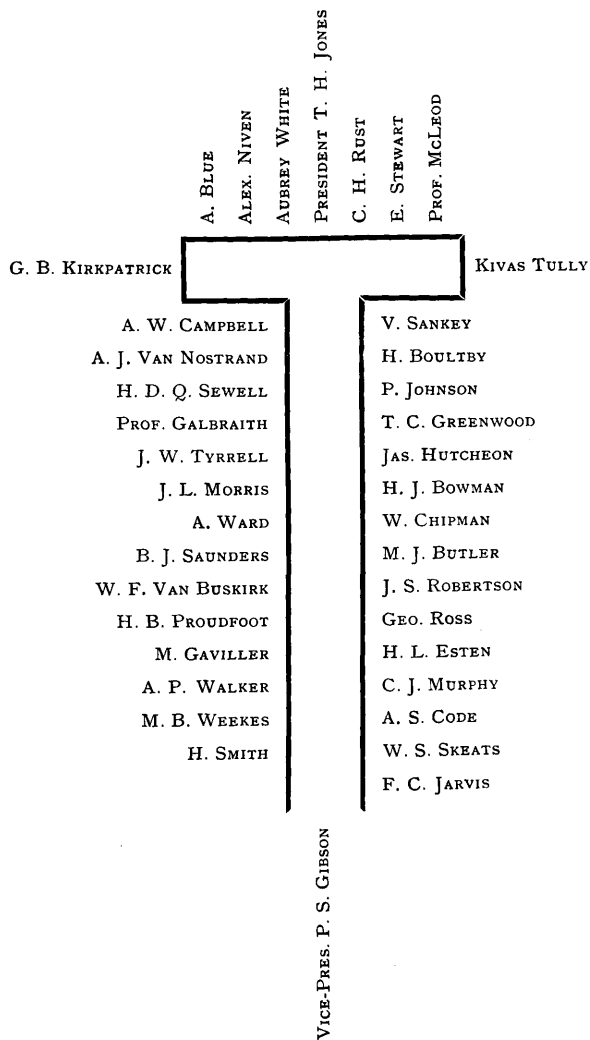
Toast, "The Queen," proposed by the President and right loyally received.

Toast, "Canada," proposed by the President, responded to by Messrs. Aubrey White and Kivas Tully.

Selections on the graphophone by Mr. Ward.

Toast, "Sister Societies," proposed by the President, responded to by Prof. McLeod and Messrs. C. H. Rust and M. J. Weeks.

Recitation, "Our Wilfrid," by Mr. Butler.



Toast, "Our Northern Heritage," proposed by the Vice-President, responded to by Messrs. A. Blue, E. Stewart and J. W. Tyrrell.

Recitation, Mr. Greenwood.

Toast, "Our Guests," proposed by the Vice-President, responded to by Mr. Jarvis.

Toast, "The Association of Ontario Land Surveyors," proposed by Mr. White, responded to by the President.

Song, "Bonnie Dundee," Mr. Niven.

Toast, "The North Pole," responded to by Mr. Chipman.

Song, "The Extension of the Railway," Mr. Sewell.

Toast, "The Entertainment Committee," responded to by Mr. Walker.

Toast, "The Ladies," responded to by Mr. Code.

An enjoyable evening was then brought to a close with the singing of the National Anthem.

A statement of the receipts and disbursements has been filed in the office of the Secretary-Treasurer.

All of which is respectfully submitted,

A. P. WALKER,
Chairman.

REPORT OF PUBLICATION COMMITTEE.

MR. PRESIDENT,—The Committee trust that after their pleasing labors, through the industry and zeal of those who were good enough to furnish "papers" for publication, they have this year been enabled to present a Report of our Proceedings which will meet the approval both of the profession and of our general readers.

We hope that those contributing papers for our next Report will kindly see that the accompanying diagrams are neatly executed and small enough for insertion.

The thanks of the Association are due to Mrs. Broughall for her kindness in sending us a portrait of her father the late Hon. Samuel Proudfoot Hurd, Surveyor-General, and also some details of his life.

A "tender" was received for the publishing of our Report, but as it was considerably higher than the price paid in former years, we again employed C. Blackett Robinson, by whom the work has been carefully executed. Twelve hundred and fifty copies were printed at a cost of \$275.95.

The interests of those advertising with us should not be overlooked by the members of the Association.

We have exchanged Reports with other societies, as follows:—

EXCHANGES SENT TO

School of Practical Science Engineering Society....	200
Michigan Engineering Society.....	130
Ohio Society of Surveyors and Civil Engineers.....	130
Illinois Society of Engineers and Surveyors.....	125
Indiana Engineering Society.....	90
Iowa Civil Engineers' and Surveyors' Society.....	60
Wisconsin Engineering Society.....	20

Respectfully submitted,

KILLALY GAMBLE,
Chairman.

REPORT OF THE COMMITTEE ON TOPOGRAPHICAL SURVEY.

Your Committee on Topographical Survey begs to report as follows:—

There is apparently some misconception regarding this survey, judging from the opening remarks in the discussion of last year's report. The inauguration of a topographic survey is a matter of great moment and should not be begun without a well-matured plan—a scheme not expedient, but devised so that its work will be permanent and lasting.

As a topographical survey must be based on geodetic survey, the latter should be first instituted, and this properly falls within the scope of the Federal Government, while the former is the work of the Province.

The functions of your Committee (and the Association) are directed primarily to a topographic survey, and through our efforts it is hoped to induce the Provincial Government to ask the Federal authorities to begin the geodetic survey, so that no surprise need be expected that in the past year no "actual work" was done.

It is with regret your Committee has to report that the Provincial Government has not yet taken any "active steps" in the matter, but the prosperous condition of the Province and the country at large will certainly hasten the consummation of our aim.

Some most valuable letters have been received from the eminent director, Dr. D. Gill, of the Cape Observatory, that it is desired to put the pertinent points thereof on record here:—

“I rejoice to hear that you have been urging the undertaking of a geodetic survey of Canada. It is strange that such a survey has not yet been undertaken, and there are few objects to which a man having the best interests of the progress of the country at heart could devote himself to with more advantage both for the benefit of the country itself and for the cause of science, than to initiate and carry out such a work.

If I can advise or assist you in this endeavor I shall be only too happy to do so.

I am glad to tell you that I have succeeded in persuading the Chartered Company to undertake a geodetic survey of Rhodesia, and I have just started the work.” . . . “I am deeply interested to find that you have a Surveyors’ Association, and that one of your objects is to urge the commencement of a geodetic survey in the Dominion. Surely something ought now to be done. The experience of all civilized nations goes to show the waste and extravagance of postponing principal triangulation. It means survey after survey without finality—the fatal mistake of attempting in survey to proceed from small to great instead of from great to small.

Here, as you know, I have at last got the geodetic survey of the Cape Colony and Natal completed, and now I have just started that of Rhodesia. I think also there is a proposal of getting the geodetic survey of Egypt started, so we are on the way to a great triangulation, which I hope will one day extend from the North-Cape to Cape Town.

But we come back to Canadian survey. Apart entirely from the immense practical importance of a geodetic survey in Canada, you have the scientific inducement that you can connect with the Coast and Geodetic Survey of the United States, and as the scientific value of a geodetic arc increases as the square of its length, your work would be of peculiar scientific importance. I should be deeply interested to hear what progress you are making in showing Government its duty in the matter. May I suggest that I think you could get much aid from the Intelligence Department of the War Office, London, in pushing the question on the attention of Government.”

Respectfully submitted,

OTTO J. KLOTZ,
Chairman.

Ottawa, March 5, 1898.

DISCUSSION.

Chairman—The Association is glad to feel, while Mr. Klotz is not able to be present with us this time, that he still has a deep interest in our welfare, and on this occasion, as on many others, has helped us.

REPORT OF COMMITTEE ON POLAR RESEARCH.

MR. PRESIDENT,—Your Committee regrets to have to report that, notwithstanding its efforts, the North Pole still remains undiscovered.

The failure of its discovery can in no way reflect discredit upon your Committee, since its members are quite prepared and anxious to discover the Pole as soon as the means of getting there are provided, i.e., those most contemptible and mercenary means, the love of which is at the root of all evil.

Last spring an effort was made by your Committee to secure, under the auspices of this Association, during the holding of our Annual Meeting, a lecture from Dr. Nansen, but it was found impossible to arrange the lecture for any time other than November last, and since the conditions asked were that we should guarantee fifteen hundred dollars (\$1,500), this enterprise was dropped; but those of us who were in or near Toronto had the pleasure of hearing the distinguished Arctic explorer, without putting up the fifteen hundred dollars guarantee.

Coming nearer home. We are all familiar with the work of that most distinguished member of our Association, William Ogilvie, whose statements, or supposed statements, have been so extensively quoted by every newspaper in the land.

The Council of this Association, wisely thinking that it would be well to secure Mr. Ogilvie for Massey Hall, one evening of this week, deputed the Chairman of your Committee to try and arrange the matter with Mr. Ogilvie, and this he endeavored to do; but, though all available influence was brought to bear, the great explorer's modesty was too great to be overcome, and, without even giving a definite reply, he settled the matter by sailing away to England.

Before concluding its brief report, your Committee desires to express its sincere hope that ere long such Canadian patriotism may be found as will in the prosecution of Polar research and Arctic exploration place the Beaver side by side with the Lion, the Pine and the Eagle.

J. W. TYRRELL,
Chairman Committee.

REPORT OF COMMITTEE ON REPOSITORY AND BIOGRAPHY.

MR. PRESIDENT,—The Committee on Repository and Biography has to report as follows:—

A considerable number of reports, pamphlets, etc., have been added to our collection during the year. A copy of Jackson's "Aid to Survey Practice," by Mr. Butler, and a copy of Tyrrell's "Through the Barren Lands," by Mr. Tyrrell; several volumes have been presented by Mr. Chipman, and Nansen's "Farthest North" has been purchased by the Association; a catalogue of all such additions will be printed in the next annual report. Several absolutely necessary articles of furniture have been ordered for the "Repository," and arrangements have been made with one of the caretakers to have it looked after and kept clean. Hitherto, unless the Committee took it upon itself to dust, etc., it was very likely to remain dirty. As the position of the Association with regard to the possession of the second room seems to be somewhat uncertain, the Committee would suggest that steps be taken by the Council to have it placed on a more decided footing or that some other room or rooms in the building be applied for before it is too late, as already considerable difficulty is felt in providing accommodation for our increasing collection of maps, charts, etc. A small sum will have to be paid yearly for the cleaning before mentioned, which the Committee requests the Council to grant.

An album has been purchased, as directed at last year's meeting, to contain the photos already received. Several have been added to the collection during the year. Biographical sketches of Hugh Black, P.L.S., and Chas. Kennedy, D.P.S., have been sent in by James Warren, O.L.S., of Walkerton, also a sketch of the late J. M. O. Cromwell, O.L.S., by his son, J. M. Cromwell, Esq., and an autobiography of M. C. Schofield, O.L.S., written on the day he entered his 80th year. The Committee desire to express their thanks to these gentlemen for the considerable trouble they have taken. Chas. Unwin, O.L.S., of this city, has kindly expressed his intention of contributing a number of photos of members of the profession, collected by himself during his term as Secretary to the Board of Examiners. In conclusion, the Committee asks the assistance of every member of the Association in its efforts to keep a record of their appearance, lives and work.

All of which is respectfully submitted.

H. I. ESTEN,
Chairman.

REPORT OF COMMITTEE ON EXPLORATION.

MR. PRESIDENT,—Your Committee on Exploration beg to emphasize much of what was expressed in last year's report on the advisability of greater attention being bestowed by our Government on the exploration and examination of our new territory.

The early history of Canada is replete with the adventures and discoveries of the early French settlers, so much so that even now our wilderness region to the north bears in the names of its lakes and rivers the reminder that they have shown an enterprise in this regard which we have been exceedingly slow in emulating.

We would respectfully urge on the Government the great gain that would accrue to the public if there was any authoritative source from which they could obtain reliable information as to the character of that vast region which extends from the settled fringe on our southern border up to James Bay on the north. It is only necessary to look into the newspapers of the day to see the difference of opinion which exists with respect to that region.

What we would suggest is that a thorough system of inspection should be undertaken, not to supersede, but to precede, the regular work of the surveyor—some such work as was done by Mr. Ogilvie along the Yukon and Mackenzie rivers. Each exploring party should have, in addition to the surveyor and his assistants, a practical mineralogist and a man capable of examining the timber and soil of the region passed over. A few parties thus employed would in a very few years supply us with a general knowledge of the country and its resources and capabilities that would be of great value to the Government in determining what districts should be subdivided and opened for settlement, which should be reserved for timber, and which would be valuable for minerals.

This information could annually be condensed in the Department, and on a large map, kept for the purpose, each year's work could be laid down so that at a glance the character of any particular region could be ascertained.

All of which is respectfully submitted.

E. STEWART,
Chairman.

DISCUSSION.

Mr. Stewart—I have thought for a good many years that we were working very much in the dark. For instance, a surveyor goes out to survey a township before the character of the country is really

known. Then again, as I have mentioned in the report, the public are at a loss to know what districts would be suitable for agriculture, what districts would be worth building a railway through; in fact, you find the greatest ignorance on the part of the public regarding the northern country. There are no authentic records anywhere to which they could refer to give them such information as is necessary. I hope that this will lead to some discussion; I think it is worthy of it. I believe it would be greatly in the interest of the Government if such explorations were undertaken not only for their own purposes, but for the benefit of the public generally.

PAPERS.

[*This Association is not responsible as a body for the opinions expressed in its Papers by Authors.*]

FIELD EQUIPMENT FOR PROSPECTORS.

By W. HAMILTON MERRITT, M.E.

Toronto.

Mr. Chairman and gentlemen, it is very good of you to allow me to appear before you to-day.

My reasons for so doing are, in the first instance, because it happens that the first time I tried to get together a little field-testing outfit was for a meeting of this Association; and another reason, my principal reason, is because I feel that of any body of men in this Province the Ontario Land Surveyors par excellence are the body that can use any species of field-testing outfit to the best advantage, and can most effectually assist the prospector. I thought you might, therefore, be interested to see a somewhat more complete outfit than the one which I endeavored to get together for a meeting of this Association a couple of years ago. I have been working at prospectors' classes occasionally for the last three years, and I have found by taking into the field an outfit such as I now show you that the ordinary tests, especially for the precious metals, can be made with a degree of accuracy which is not short of surprising.

You know that gold, and, indeed, silver, occurs in what we call the free milling and the refractory states. To extract it from the first you can use mercury, and to get it from ore belonging to the second class we must resort to smelting or some other process, such as cyanide or chlorination. You can always work out your gold or silver by smelting. For our testing the smelting process is carried out with the assistance of the blowpipe, the free milling is done by quicksilver. I shall merely show you the outfit which will do both of these things, without taking up any more of your time.

In the first place, the most important thing of all is getting a fair sample. You have read, no doubt, many of those prospectuses giving magnificent assays and that sort of thing, but, especially in

gold, you can get almost any assay you like, as all of you well know.

If a man has got such a rubber cloth as this and has this wide brush in the field, besides his mortar and pestle to hammer up and break the material, with his sieve, he can get a fair average sample, either to treat himself on the spot or to take afterwards to an assayer. He can thereby bring in his pockets the average of half a ton or more. Without this he would have difficulty in getting a fair average. As you can see, these are very cheap, simple little things.

Then, of course, for making the panning test, one requires a pan. Such a pan as this one is not quite so liable to rust as some are, being made of Russian iron sheet. All of these things are made very cheap, so that prospectors can afford to buy them.

That is the simplest sort of an outfit that a prospector should take into the field for panning, namely, the sampling cloth and brush, the mortar and pestle, sieve and pan.

This panning is rather uncertain. If gold ore runs 50c. a ton, it will "pan." When you go through all the trouble of pulverizing rock (first of all supposing you do get a fair sample), you might as well get a definite result as to find that it "pans." Of course, some prospectors, perhaps, do not want to get a definite result. If you wish to obtain definite results, it is advisable to have a couple of other pans, or one other pan and a bottle in which you can shake up the pulp and mercury. Many prospectors have bottles, but sometimes they break them, and the three pans are, on the whole, better for the field, as they nest together and the extra weight is not serious.

Then we have some nitric acid, which is the only liquid necessary to carry. It is carried in this "lightest weight mailing case," which only costs a trifle.

The mercury is also better carried in the same sort of case.

We have a little sodium in a similar case. These mailing cases have corrugated paper or cork paper inside as a lining, so that they can be thrown about with impunity, and the bottle in them will not break.

Here is a little hand scale that will weigh from 1-4 oz. up to 12 oz. It only costs about 50 cents.

Then we have a mercury retort. There are several sorts. A very cheap sort, made out of Russian iron, something like this, is put on a sheet of iron, and you can build a little bonfire under it. Here is another form, which has been made by a prospector. Its cover has been ground down to fit tight and it does not need heating. The tube from it is made of iron and it collects the mercury. This clamp holds on the cover. The sheet of iron that holds the mercury retort is very convenient for doing the work of quartering on the sheet of rubber cloth.

A little porcelain dish can be provided, or you can use a granite-ware cup and saucer for all purposes, and they are not so liable to break.

In case you get fine gold, there is a sieve 60 mesh, besides the one of 40 mesh.

Here is a wooden pestle, which anyone can make for himself at a moment's notice.

Then a little sheet lead is necessary (two ounces), and some sheet silver (25 cents' worth) is very convenient sometimes.

Finally, there are different ingredients, such as borax-glass, bone-ash, a little sodium-carbonate, a paraffine blow-pipe lamp (candles will do), and clay pipes for cupelling; a little pair of pincers, corrugated on the inside to hold things; a little steel anvil can be made readily by cutting off a piece of steel bar; a small hammer; asbestos paper to keep the mercury from spurring when you are retorting; a horseshoe magnet; a smooth iron bolt for cupel-making in a clay pipe; and with these things you have got all that is necessary for free milling determination, together with the scales, which I omitted to show you. These scales are remarkably accurate. They weigh from 5 grains to a tenth of a grain, and if you treat 2 lbs. of rock you can readily distinguish between an ore that would vary 80 cents in gold, and establish with the greatest of ease if it carries even as small an amount as \$1.50 per ton.

With that portion of the outfit just exhibited, you see that the free milling properties can be determined, and at the same time you determine the proportionate yield of concentrates by weighing out the concentrates you have panned out in the process, and then weighing them with the little scales first exhibited, so that you can tell whether your ore is one, two, three or four per cent. concentrates; that is to say, whether it takes 100 tons of ore to make a ton of concentrates or whether it will take 50 or 20 tons; and then all you can do with this section of the outfit, just described, is to see whether these concentrates contain gold or whether they do not. That is almost all most people want to know.

Mr. Lyman, of Montreal, who sent up this outfit to be shown, charges \$13 for everything you have seen so far, complete.

If you want to determine the value of the concentrates per ton, or if you want to estimate a refractory ore such as the one from Rossland, B.C., or to concentrate any ore and determine its value, without taking out the free milling parts, you proceed as follows: Pan it down until you get, say one ounce, without taking out the free gold. Of course you do not need all the pan amalgamation outfit for making this assay, but you require a little furnace. One sort of furnace is called Fletcher's furnace, and you will find the procedure in "Fletcher's Blowpipe," an excellent little manual, one recommendation being that it is cheap. Here is the

little furnace, and you use small crucibles of this size. Or you can use this larger furnace, which one of my pupils of a few years ago made for himself. He also made this little crucible, too. With them you can use a larger amount of ore, up to 25 grains, instead of the very small quantity Fletcher uses. You can, therefore, get a more satisfactory result. This larger furnace needs a good deal of blowing, therefore you should have a little blowpipe bulb like this, which does not weigh anything, and which is very cheap. You see by working it with your hand you can keep up a steady blast all the time, so that you have a blast furnace with you as well as a smelter, and for field work it is a great convenience. You will see the advantage in being able to make an assay of concentrated ore, refractory ore, or of concentrates with an outfit such as this, and the whole thing won't cost more than \$25. With it you can really get results which are better than an assayer ordinarily gives you with a \$200 plant, because in assaying he does not usually discriminate between the free milling part and the smelting or refractory portion. And of course the value of an ore may vary tremendously, whether it is of a free milling or smelting quality.

For this latter outfit Mr. Lyman charges \$6 more. In it there is a platinum ivory scale, on which you measure the beads instead of weighing them. You note two divergent lines run up the scale. At stated distances there are numbers, and opposite each it shows in decimals of a milligramme the weight of the button. If it is silver it means so much to the ton and, if gold, another amount to the ton. There are a number of these little crucibles, some little capsules, one of these little furnaces (that costs 45 cents), a small amount of flour in these little tin boxes, methylated spirits if desirable (although you can do it with grease), a little camel's hair brush, some nitre and a tin spirit lamp, which costs \$6, as above mentioned, or \$19 for complete outfits of both sorts.

This box I have here is more compact, made for the quantitative set.

Very good and accurate results can be obtained from this outfit with a small amount of practice. In a few hours any intelligent man can learn to do the whole business.

DISCUSSION.

Mr. Gibson—What does the whole outfit weigh ?

Mr. Merritt—A great deal depends on the mortar and pestle, but one has to have that. I think it is 27 pounds for the qualitative and quantitative sets. The quantitative part is only a few ounces.

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ACETYLENE GAS AND ITS USES.

By V. M. ROBERTS, O.L.S.

St. Catharines.

Acetylene is a colorless gas, having a pungent and very unpleasant odor, it burns in the open air with a luminous and smoky flame, and is formed by the contact of water with sodium, potassium, magnesium or calcium carbide, which are unions of a base with carbon, made in an electrical furnace.

The first reference to this group of carbides was observed by Davy in 1822. Jacob Johan Berzelius being the first to discover Acetylene, experiments were afterwards made by Frederick Wohler, a pupil of Berzelius, in 1862, and by Pierre Eugene Marcellin Berthelot, a noted French chemist, in 1866, and by several others, until Mr. Thomas L. Willson, in 1888, experimenting with his electric furnace with some of the compounds of calcium, accidentally discovered his present process of manufacturing calcium carbide. A mixture of lime and powdered anthracite was subjected to the heat of the electric furnace, and reduced to a heavy, semi-metallic mass. Upon examination it was found not to be the substance sought for, and thrown into a bucket of water which stood close by, on which a violent effervescing immediately took place in the water, and fumes were thrown off that it was impossible to ignore the presence of a gas proclaiming itself in such a marked manner. A match was applied, and the result was a luminous and smoky flame, accompanied by several sharp reports, as the bubbles burst and the gas contained in them was ignited.

The calcium carbide of commerce is manufactured by mixing nearly equal weights of coke and lime, ground to a fine powder, and subjecting to a heat of 3,000 deg. F. in an electrical furnace for about six hours. The intense heat separates the atoms of lime which enter into union with the carbon, and the whole is fused into a semi-metallic mass, or pig, which weighs from two hundred to three hundred pounds. When this is removed from the furnace, it is allowed about twelve hours to cool and is then broken or crushed into small pieces and packed in air-tight cases ready for shipment.

Calcium carbide is a very heavy, dark semi-metallic mass, having a crystalline metallic fracture of almost black or dark brown

appearance, very pungent in odor and susceptible to the moisture of the atmosphere, which causes it to slack like common lime.

In order to obtain Acetylene Gas from the calcium carbide of commerce, and to overcome the smoky flame of the gas when burnt in the open, it is necessary to confine the gas in a chamber under a small or large pressure. For this purpose generators have been made, in which water is brought into contact with the calcium carbide in a sealed chamber, from which it passes into a gas holder, which is weighted to regulate the pressure, and is conveyed from there through the pipes to the burners.

These generators are of two kinds: (a) Wet generators.
(b) Dry generators.

In the wet generator the carbide is placed in a pan or deep tray in the generator chamber. In the top of the chamber is a spray through which the water is discharged on to the carbide, the flow or discharge being regulated by the rise and fall of the gas holder, the carbide, or rather residue, becoming saturated and remaining in the pan in the form of a stiff mud.

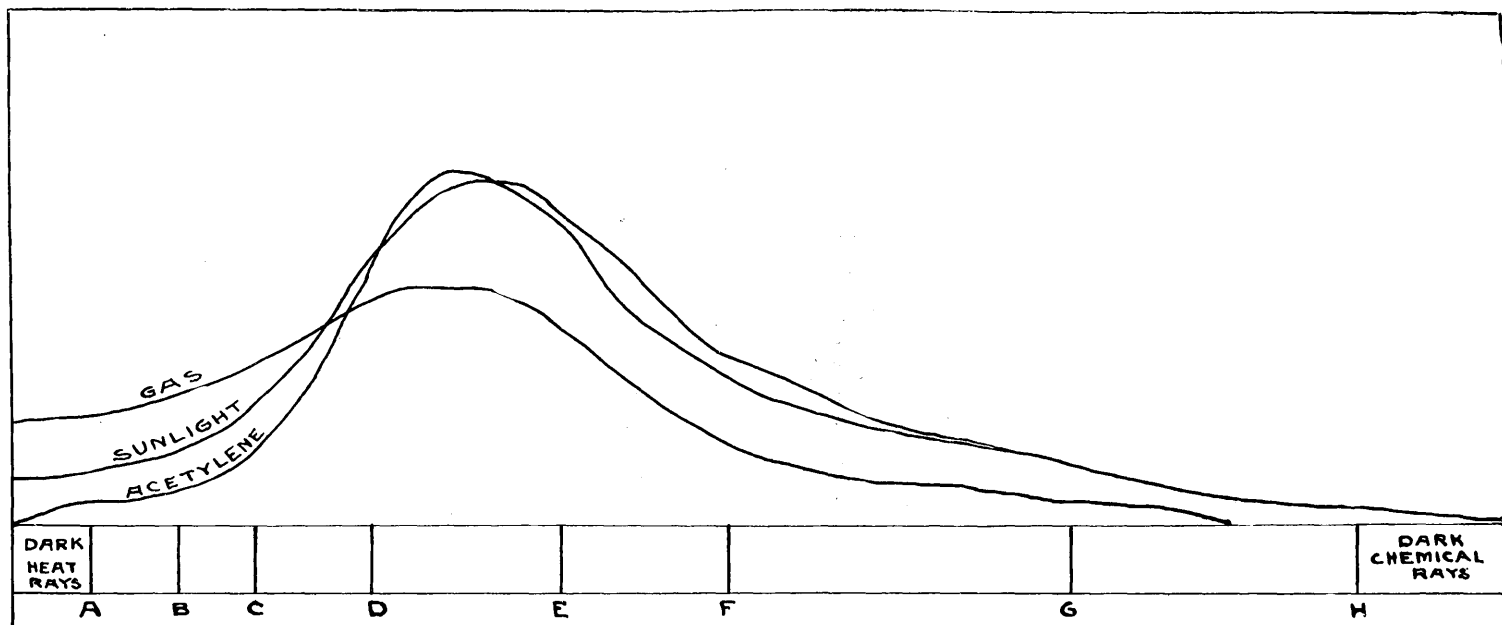
In the dry generator the carbide chamber is divided into an upper and lower half by means of a grating having a slight shaking motion, and on which the carbide is placed. The water supply is so regulated that when the gas holder is down a limited amount of water only, from four ounces upwards, according to the capacity of the generator, is discharged on the carbide. The heat caused by the slacking process dries the slacked lime, which coats the carbide, and it drops into the lower half of the generator chamber and is removed from there in the form of a very fine dry powder, which is perfectly odorless. One of the greatest difficulties which has had to be contended with and has in reality kept Acetylene Gas in the background has been the want of a burner which will not smoke or throw fine grains of soot—in other words, a burner with perfect combustion, or nearly so.

The burners on the market up to the present time are the Bray, the Milne, the Naphey and the Star or Chattanooga.

The Bray burner, I should judge, gives the best light, but although rated as a half foot and foot burner, it burns considerably more gas, as do all burners. It has a lava tip, which, after being burnt for a short time fills with soot and smokes horribly. This nuisance can be to a certain extent overcome by brushing the tip before lighting each day. There is a good demand for this burner on account of its cheapness and the light it gives, and it is well suited for factories or places where the smoke and soot will do no damage.

The Milne burner was made of iron, and was soon rusted by the moisture of the gas and rendered unfit for use.

The Naphey burner has two lava tips opposite one another.



CURVES OF LIGHT VALUES OF SUNLIGHT, ACETYLENE, AND COMMON GAS IN VARIOUS PARTS OF THE SPECTRUM

Through each of these, from the outside to the gas passage in the centre, four holes are drilled to admit the air. These burners when lit throw their flame at right angles to and midway between the tips, and burn without smoking.

The Star or Chattanooga burners are made on the same principle as the Naphey burner, differing somewhat in form, and may be considered with the Naphey burner as being the most satisfactory burners which have so far been placed upon the market.

In 1895 the light of Acetylene Gas was studied with a spectrum photometer, the curve of which may be seen in the accompanying diagram, and which shows it has the spectrum nearest to that of the sun, with the exception perhaps of the arc light. In the matter of cost, candle power for candle power, it is far cheaper than any other illuminant. As an illustration, one pound of calcium carbide will produce five cubic feet of Acetylene Gas. This, burnt through a burner rated as a half foot burner, but which under tests has been found to burn from 5-8 cubic foot to 3-4 cubic foot per hour, according to the pressure. Assuming, therefore, 3-4 cubic foot per hour, one pound will last approximately 7 hours, and will give 175 candle power hours, at a cost of 3 1-2 cents.

The following table gives a very fair comparison of the different illuminants:—

Acetylene Gas is estimated at.....	\$7 00 per 1000 cubic feet.
Coal and Water Gas is estimated at	1 00 per 1000 cubic feet.
Electricity is estimated at.....	20 per 1000 watts.
Coal Oil (American)	25 per gallon.

ILLUMINANT.	C.P.	Consumption per hour.	C.P.H. for \$1.00	C.P. per 1000 c. ft.	Cost per 1000 c. ft.
Acetylene Gas, without Chimney	25	$\frac{3}{4}$ c. ft.	5,000	35,000	\$7 00
Coal or Water Gas, using Argand burner..	16	5 c. ft.	3,200	3,200	1 00
Gasolene Gas, using Argand burner	12	5 c. ft.	3,200	2,400	75
Incandescent Electric Light.....	16	50 watts	1,600	1,600	20
Coal Oil, using circular burner.....	25	5 oz.	2,550	5,100	2 00

In Canada Acetylene Gas is still unknown to the majority of people, and is looked upon as being very dangerous and highly explosive, whereas it is really no more explosive or dangerous than any other illuminating gas. Experimental attempts to liquify this gas in order to get it into the smallest possible state have been the cause of the most serious accidents, where the parties experimenting have used a crude apparatus. To liquify the gas it is necessary to bring it under a very heavy pressure, and under conditions of this kind air, water and gas are equally dangerous, if the necessary conditions for safety are not complied with and if the gas is impro-

perly or carelessly handled. The accidents which have occurred, it is my firm belief, can one and all be traced to carelessness and ignorance on the part of the parties experimenting.

The gas is now used extensively in the States for lighting towns and villages. In addition to isolated dwellings, lamps of all kinds are in use, from the student's lamp to the bicycle lamp. It is fast taking the place of lime light in stereopticon views, and has a future before it the possibilities of which are hard to foretell.

For draughtsmen I should say it would be of inestimable value.

I have now been using it in my office for about eight or nine months. With its light the most delicate shades of color can be distinguished, and, although a most intense light, it is very soft and steady, and is not so trying to the eyes as coal oil, coal gas or electric light. I am now getting a cluster and reflector made, in order to attempt blue printing, being induced to do this by the great success of the St. Catharines Camera Club in photographing by Acetylene.

The superiority of Acetylene Gas in point of purity of light and its hygienic advantages (*viz.*, it consumes less oxygen than any other gas, gives off less carbonic acid and no carbonic oxide, the temperature is about 35 per cent. less than ordinary gas, the flame is perfectly regular and steady), demands that it should have a first place among all gaseous illuminants.

DISCUSSION.

The President—I went through the Riordan Paper Works in St. Catharines, which is illuminated by this gas. They have been using the gas for quite a long time and they seem to be perfectly satisfied with it. Of course a paper mill is a very bright place, and although you can see very distinctly, it did not seem to impress one that the place was very well lighted. That is the impression it gave me while going through it; the light did not strike me as being very bright, although you can see very well.

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PROGRESS ON LAKE OF THE WOODS.

By HENRY DEQ. SEWELL, Asso. M. INST. C.E., O.L.S., D.L.S.

Rat Portage.

When in 1894 I had the pleasure of reading a paper before this Association on the subject of "The Lake of the Woods as a Mining Camp," there was nothing there beyond a few promising prospects. The deepest proposition at that time was the Pine Portage. A shaft had been sunk on it to a depth of 120 feet with very promising results, assays made by the Geological Department at Ottawa running as high as 20 oz. of gold. Dissensions, however, occurred amongst the owners, resulting in the closing down of this promising property, but I am pleased to note that work on it has lately been resumed.

The Sultana, situated on the same vein, or reef, was then working at a depth of 105 feet, and had just got three air drills and a compressor plant, the work having so far been done by hand power.

There were then some other promising properties on the lake, but on none of them had shafts been sunk to as great a depth.

I shall endeavor to lay before you a brief outline of the progress that has since taken place in gold mining within the past four years, and to point out what I believe will be the ultimate destiny of that interesting mining camp.

Referring to the gold statistics for the past year, the world's output shows that the United States contributed 25 per cent. of the entire production, Australia 24 per cent., Transvaal 23 per cent., Russia 14 per cent., and the rest of the world, including Canada, contributed only 14 per cent. It is thus self-evident that it is useless to look for any large influx of capital from the United States, as they have more gold in their own country than they can extract without the assistance of foreign capital. It is, therefore, gratifying to read in an article in the English London Mining Journal of a recent date "that the tendency of English capital will hereafter be more and more towards investments in mining enterprises in preference to stocks and other securities." The Journal winds up by speaking with favor of mining enterprises in British Columbia and the Northwest Territories of Canada, where the exploitation of gold mining properties seems about to bring about splendid results.

At the present time there are only three properties on the Lake of the Woods that can fairly be classified as dividend paying mines, viz., the Sultana, the Regina and the Mikado, but there are others that will probably become dividend payers in the near future, which mining men will recognize as a splendid showing for so short a time.

The Sultana belongs to private parties (Canadians), the other two are owned by Englishmen and are working under English charters, distributing their dividends in England. We have plenty of Americans on the Lake of the Woods who own some properties of undoubted merit, but none of them have, or are likely to have, sufficient pluck or energy to develop a property into a dividend paying mine, their sole aim being to develop and sell their properties at an advance, and thus it is to English capital, and to English capital alone, that we should look for the practical development of the Lake of the Woods. Thus we should endeavor by all the means in our power to develop our mining properties and put them into a practical shape, to attract the investment of English capital, and thus secure for ourselves large profits, and greater profits for the capitalists who can develop them into dividend payers.

The principal advantages the Lake of the Woods possesses over all other parts of the Rainy River District, to say nothing of other parts of Canada, is the easy means of access to all parts of the lake by steamer from the station on the C. P. R. at Rat Portage, thus reducing the cost of transportation to a minimum, also the free milling nature of the ore, and the continuity and depth of the veins, to which may be added that there never has been a single case of failure where a depth of 300 feet has been reached to get plenty of good paying ore. It will thus be observed that the Lake of the Woods possesses advantages and attractions peculiar to itself, which will always enable the miner to carry on his operations at much less expense than in any other part of Canada.

There are many other mining camps in Ontario; these are chiefly in the Rainy River District, such as the Lower Seine, the Sawbill, the Manitou, the New Klondike and Minnitonka, whilst in other districts are Hastings, Wahnapiatae, Michipicoten, Jack Fish Bay, Shebandowan, etc., but the greatest progress and development will undoubtedly fall to the lot of the Lake of the Woods, as its special advantages, everything else being equal, will always give it the preference over other mining camps, even in the same district where the cost of transporting provisions, stamp mills, etc., is necessarily much more expensive.

The three dividend paying mines before mentioned are situated as follows: The Sultana, on the north shore of the lake, about 8 miles east from Rat Portage; the Regina, in Whitefish

Bay, about 50 miles south-east of Rat Portage; and the Mikado, in Shoal Lake, about 35 miles west of Rat Portage. These properties, it will be thus seen, are fairly scattered over the northern half of the Lake of the Woods, affording a considerable mineral area, which is more than likely to increase with future discoveries as it has in the past.

It is somewhat difficult to find out the amount of work done on these mines, as the owners keep these matters very much to themselves, and the Government reports are always carefully published about a year old, so that when issued they are somewhat stale. It is, however, known that the Sultana is down over 400 feet, with a 30-stamp mill; the Regina over 370 feet down, with a 20-stamp mill; and the Mikado over 300 feet, with a 20-stamp mill, and they have all plenty of pay ore in sight. The Sultana and Regina ores are claimed to average about 15 dwt. of gold and the Mikado 1 oz. to 1 oz. 10 dwt. of gold per ton of 2,000 lbs. The ore is all free milling, with some concentrates from which the gold can be easily extracted by the chlorination or cyanide processes. Comparing this with the ore of the Le Roi mine at Rossland, B.C., which averages 1 oz. of gold per ton, and smelting ore at that, the assured future of the Lake of the Woods becomes intelligible. There is a peculiar feature about these three mines, viz., that they are all contact veins, lying alongside of intrusive granite bosses. So far as my experience goes in Western Ontario, veins at or near the contact of any change of formation are generally preferable.

Besides these mines, there are many prospects more or less developed, on some of which considerable work has been done. Commencing from the north of the Lake of the Woods, in Jaffray township, there are a number of highly mineralized diorite dykes (locally called Fahlbands). They have great widths, but no well-defined walls. They appear to be similar to the diorite dykes which are being mined at Rossland, B.C. Probably, if these dykes are sunk on deep enough, large bodies of low-grade ore will be found, and, if so, it would be a bonanza, for a constant ore body from 15 to 30 feet wide carrying 6 dwt. of gold per ton of 2,000 lbs. would present considerable attraction for British capital.

The Scramble has been sunk on these dykes 75 feet, the Black Sturgeon 35 feet, the Princess 50 feet, and the Grey Eagle 50 feet. These dykes are all more or less gold-bearing, but whether they succeed or not in producing dividend payers, they present an exceedingly interesting geological problem.

In Haycock township, near the Pine Portage mine, there are some good prospects with considerable development work done, viz., the Royal, the Triumph (sold last fall for \$30,000), the Treasurer and the Bad mine. These are all good gold quartz propositions of considerable promise.

South-east of the Pine Portage mine on the mainland are the Master Jack, the Black Jack and the Golden Gate; the latter was sold for \$20,000 cash last summer. On Hay Island, near by, are situated two very promising gold propositions, viz., the Keewatin and the George Heenan. Some development work has been done on all these properties. A little further south, in Bottle, Witch and Andrew Bays, to which may be added Gibi Lake, there are a large number of very promising gold locations; they have had but little development work done, owing to their being comparatively recent discoveries. Still further south is Bath Island, an interesting proposition in the clay slates and mica schists, with some fine-grained gneiss, a formation in which no previous mining for gold has been done. There are a number of strong parallel veins on it, and should gold be found in paying quantities, it will be a desirable proposition. We next come to the vicinity of the Regina mine, which so far may be considered the south-eastern limit of the Lake of the Woods gold belt; this consists of Crow Lake and Whitefish Bay. Here we have the Bully Boy and the Trojan, both reported sold, the latter for \$40,000 cash. There are other promising properties in this vicinity, and some of them that have had considerable development work done are under option at good prices.

Last, but not least, is the west side of the Lake of the Woods, in the immediate vicinity of the Mikado mine on Shoal Lake. Here we have a number of promising properties, such as the Gold Coin, the Li-Hung-Chang, the Cornucopia, the Yen-ti-hi, the Yum-Yum, the Nan-ki-poo, and Cameron's Island, that sold last fall for \$10,000. Close by, in Echo Bay, is the Golden group (four properties), of which the Golden Horn was recently sold for \$35,000. Lying east of the Mikado mine and adjoining it is a large tract of mineral lands, about 6,500 acres, that I surveyed for a Buffalo syndicate. It extends northward to Echo Bay and contains some valuable claims. Little or no development work has been done on it, owing, I believe, to a lack of funds on the part of the promoters. The lower part of Shoal Lake, from Ash Rapids south and westwards, contains a number of promising properties, on which but little development work has been done. This takes us to Carl Bay, or Dead Man's Portage, the commencement of the Ontario Government Gold Concessions Co., that covers a large tract of land on the western peninsular down to Monument Bay on the Lake of the Woods. This company is credited with having discovered some valuable claims, and should it result in a large investment of English capital, it will materially assist in advertising the Lake of the Woods in the only market from which any financial investments of any magnitude can come.

The Keewatin Power Co., which for years has been nothing but a valuable franchise, now proposes reaping a rich harvest out of the mining companies by transmitting electricity to the mines on Shoal Lake, which will enable those companies to work their properties to a greater advantage than heretofore.

In conclusion, what is most needed at the present time in the interests of Canada is the adoption of such measures as may be calculated to demonstrate to the world at large the possibilities of this country becoming one of the chief producers of gold in the near future, and it behoves everyone who is trying to interest English or foreign capital in the purchase and development of our mines to keep well within the mark when making any representations, to adhere closely to the truth, so that we may merit the confidence of investors and ultimately secure an abundance of capital from England and other countries to develop the latent, but rich, resources of this great country. The Government can, if so disposed, aid and assist by the establishment of a mint in Canada, and by requiring that all gold taken from our mines shall bear the imprint of Canada, either as coin or bars of bullion, instead of as at present allowing a large portion of our gold to pass through the United States mints, thereby giving credit to that country as the producer of a large amount of gold which rightfully belongs to Canada. Thus each coin bearing the imprint of a Canadian mint would be a bona-fide advertisement of the gold resources of this country. Australia adopted this principal many years ago, with the result that it is now the second greatest gold producer in the world.

DISCUSSION.

Mr. Gibson—Are any of these minerals found in the Laurentian formation in any quantities ?

Mr. Sewell—Yes, it is one of the best formations; but generally on the Lake of the Woods you have to look for the contacts of the different formations.

Following any of these formation lines, it may be seen there has been some lateral impression and the result has been more breakage in the rocks through the deposits of the different formations lying one on top of the other, and consequently, in the cavities, the veins have been deposited, and they appear to be far more lasting under those circumstances than under any other.

Mr. Gibson—It is not really in the Laurentian formation; it is in some of the dikes or veins in this formation ?

Mr. Sewell—Yes, the Laurentian is as much a producer as any of the others, but it has to leach out of the formations in the shape of water—mineral water—and come in a deposit.

Mr. Gibson—I am not a practical miner, but the idea has come to me that these minerals have all come up from the lower regions of the earth and have been scattered over the surface of it, and during the glacial period the surface rock has been scoured off and thus left these veins below.

Mr. Sewell—I do not think so. The formations have been broken up by strong volcanic or other action, and the cavities are leached out of the surrounding rock; quartz containing gold has leached out.

Mr. James—As one having some little experience in mining, I may say a few words on that score with reference to that line Mr. Sewell speaks of, that it is very wide as a matter of fact, because the broken up part of the two formations will naturally leave room for veins, a good deal on either side.

Mr. Sewell—Yes.

Mr. James—Has Mr. Sewell, in his experience, met with placer mines ?

Mr. Sewell—No, nothing in the nature of placer mines at all; but I do not see any reason why they should not be found if you went north of the Lake of the Woods, but scarcely in the Lake of the Woods district. It is all lake—very few rivers.

Mr. James—Has there been any great attempt to find placer mines ?

Mr. Sewell—No; some think they found placer mines, but they really were the tops of the other mines.

Mr. James—In gullies where there have been creeks running did they attempt to sink down ?

Mr. Sewell—There are hardly any creeks there. It is all lakes and wherever there is a connection between lakes it is generally a muddy, still channel. It has been pulled down a great deal by glacial action and levelled considerably. There is nothing sedimentary. I think if you went further north you would find a great deal of change in the Laurentian formation.

Mr. James—They will find placer mines more in the rapidly running creeks.

Mr. Gaviller—You say there are no signs of placer mines but you see no reason why they should not be found extensively; but how do you account for the disposal of the material which was caused by this glacial action?

Mr. Sewell—I think it is probably down at the bottom of the Lake of the Woods.

Mr. Stewart—You do not mean to say it is common to find good quartz veins away a distance for the contact, that is, in the Laurentian the same as in the Huronian?

Mr. Sewell—I do not see why there should not be. Very little of any value has ever been found, except that which is near contact. There are numerous contacts of different changes of formation all over the lake, and it is almost invariably in connection with these contacts that anything of any value has been found, otherwise you generally find a bedded vein which may be of an uncertain depth.

Mr. Stewart—I understand the question was whether quartz carrying gold was frequently found in the Laurentian formation.

Mr. Sewell—If I were looking and came upon the Huronian and there was no change of formation, I should pass over it until I came to a change of formation. I should not look in any peculiar formation; I should just look for a contact, and if I did not find it, I should pass on until I did.

Mr. Gaviller—Is it your experience that the quartz veins in the Laurentian formation are vitreous quartz, not milky quartz? Do you find any really good milky looking quartz in the Laurentian formation at all? I do not mean the junction.

Mr. Sewell—Well, the junctions are where the veins are found, and you do not find them anywhere else.

Mr. James—I think the experienced authorities say that you can.

Mr. Sewell—You can within the area of filtration.

Mr. James—But the instant you go too far from that line you would not be likely to find anything?

Mr. Sewell—I think the Laurentian and Huronian and the Clay Slates all contain more or less gold. The problem is, in Nature's laboratory how and where one is most likely to find it has been leached out or dissolved out of those rocks. You must have a cavity in order to deposit mineral water or water of any sort. If you have not got any general breaking up of a formation or some cause or other, you cannot have a large cavity, and where you have

a large cavity there the leaching process takes place, and the subterranean water flowing through the cavities of the rocks runs into these cavities or veins and constitutes the vein. In fact, you might call it, properly speaking, a stone creek. That is what a vein is; it is a quartz creek. It has been water, and the water, owing to the excess of mineral, has deposited through the rise and fall of temperature.

Mr. Tyrrell—I think Mr. Sewell missed one point in his valuable paper. When I was at Rat Portage during the past summer, I always understood, and I believe it is generally understood in Rat Portage, that the richest gold mine on the Lake of the Woods is the Hilliard House. I did not hear him say anything about that.

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WATER POWER FROM THE NIAGARA RIVER.

By VAUGHAN M. ROBERTS, O.L.S.

St. Catharines.

At a meeting of the American Association for the Advancement of Science held in 1894, Prof. Spencer, in describing the evolution of Niagara Falls, stated that their age was 28,000 years, for the first 11,000 years of which the fall was only 200 feet, draining the Erie Basin by the present route, the waters of Lake Huron, Lake Michigan and Lake Superior then emptying through the Huron Basin by way of the Ottawa River. The second stage came in with the increase of height from 200 feet to 400 feet and the final drainage of the upper lakes through the Erie Basin, the present conditions being brought about in 17,000 years more. The age of the Falls was estimated at 55,000 years by Andrew Ellicott in 1790, and at about 35,000 years by Lyall in 1841.

For thousands of years the immense power of Niagara Falls, estimated by some to be upwards of 6,000,000 horse-power, has been lying idle and practically going to waste, firstly, for lack of the need for power, and secondly, for lack of enterprise and capital. In or about 1891 the Niagara Falls Power Co. of Niagara Falls, N.Y., was formed, and a charter was procured for developing a large portion of this power, and a few years later the great Niagara Falls Electric Power Plant was completed and electric power successfully transmitted to Buffalo, a distance of 26 miles. This project and its successful issue acted as a stimulant on men's minds, and fresh projects were in consequence being continually brought before the public.

The development of a power at Queenston, Ont., taking water from the Montrose Creek, a tributary of the Welland River, and conveying it to the escarpment at Queenston by means of a tunnel four miles long, with an open canal of one and one-half miles long at each end of it.

The Mather bridge scheme consisted of the building of a bridge across the Niagara River where it leaves Lake Erie; below the spans where the current was strongest immense wheels, forty feet in diameter and about 200 feet long, were to be placed, sub-

merged about 20 feet; these wheels were to be connected with the power house on the shore by a system of shafting.

Love's Model City scheme involved the building of a canal and the erection of power houses, to be supplied with machinery. "Free power for forty years and free factory sites" was Mr. Love's lever, the revenue being derived from the sale of land to the persons who would flock to the city in the wake of manufacturing concerns.

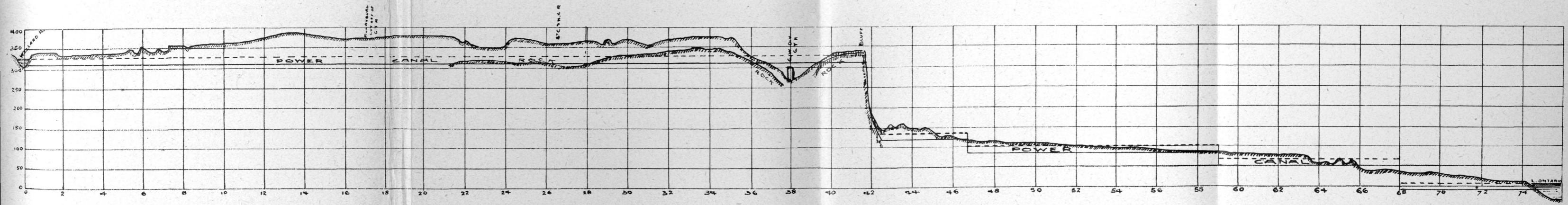
These and several other schemes have been projected for the development of the enormous power of the Niagara River, the majority of which are for the most part so wild and visionary that few of them will ever get beyond the chrysalis state and can be passed over for a Canadian project, viz., that of the Welland Power and Supply Canal Company to construct a power canal from the Welland River to Lake Ontario. This project is the more interesting as it originated with Canadians, is in Canadian territory, and the company now holding the charter is formed of Canadians, and lastly, our American neighbors consider it a steal of the Niagara River, mention of which will be made later on.

Clause 2 of the company's Act of Incorporation defines their proposed work as follows :

"The Company may construct, equip, maintain and operate a canal and hydraulic raceway from some point in the Welland River, within five miles from its junction with the Niagara River, to a point or points on or under the Niagara escarpment at or near the township line between the Townships of Stamford and Thorold, in the County of Welland, or in the Township of Grantham, in the County of Lincoln, with such raceways or extensions of the said canal and hydraulic raceway through the said Township of Grantham or the Township of Niagara as are necessary to carry off the surplus water from the said canal and hydraulic raceway to Lake Ontario, with all such works, dams and wing dams, docks, sluices, conduits, accessories and buildings as are necessary to give full effect to the intent of this Act; with power to dredge, widen or deepen the Welland River from its mouth to the point of intersection of the said canal with the Welland River, if so found expedient for the purpose of the Company."

The canal will be 15 feet deep, 100 feet wide on the bottom, and 160 feet wide on the water line, and the slope of its sides and banks 2 to 1, having its intake on the Welland River near the Village of Montrose, and will flow through the Townships of Stamford, Niagara and Grantham to Lake Ontario, being fed by the Niagara and Welland Rivers.

The Welland River rises in the County of Wentworth a few miles south of the city of Hamilton, and flowing through a comparatively level country, empties into the Niagara River about two



PROFILE OF PROPOSED POWER CANAL

SCALES [HOR. 4000 FT.] TO 1"]
 [VERT. 200 FT.]

miles above the Falls, and is navigable for some thirty miles above its mouth. A canal or cut was made some years ago by the Dominion Government from Chippewa, a small village at the mouth of the Welland River, southerly across the north-east corner of the Township of Willoughby into the Niagara River, to allow vessels bound for Welland to enter the river without risk, connecting with the Welland Canal at Port Robinson. The current of the Niagara River forces its waters through this cut, and its influence is felt some twelve miles up the Welland River.

Seven miles north of the Welland River the canal reaches what may be termed the "Bluff" to distinguish it from the Niagara escarpment, of which it forms a prominent and isolated portion; seven miles north of this point is Lake Ontario.

Between the point of intake and Lake Ontario there is a difference in elevation of 316 feet, of which 184 feet is available at the Bluff, 66 feet in the vicinity of the Queenston and Grimsby stone road, 33 feet in the vicinity of the Niagara stone road, and 33 feet at or near the mouth of the Eight Mile Creek, every foot of which can easily and with advantage be utilized for the development of power.

In applying for and securing their charter, the Welland Power and Supply Canal Company had the following objects in view :

(a) The construction of a power canal between the Welland River and Lake Ontario, with the ultimate development of 300,000 horse-powers or more.

(b) The construction of a shipping basin at or near the development of the power at the Bluff, upon permission being obtained from the Dominion Government to connect such basin with the New Welland Canal by means of a guard lock or such other construction as the Government might require.

(c) The construction of a good and safe harbor at the mouth of the Eight Mile Creek, together with a branch railway connecting it with the Great Western Division of the Grand Trunk Railway.

(d) The irrigation of the country through which the canal passes.

The engineering features in connection with this immense undertaking are, for the most part, of an extremely simple nature; difficulties similar in all respects to those which will have to be surmounted, having already been successfully overcome in the construction and maintenance of the New Welland Canal, which lies about two miles to the west and is a standing proof of the feasibility of the power canal.

In the spring of the year, when the disruption of the ice which has formed in the Welland River during the winter months takes place, the extremely swift current of the Niagara River above the Falls keeps the mouth of the Welland River open and carries the

ice away immediately, preventing ice-jams. The intake of the canal will leave the Welland River about three-quarters of a mile above Montrose bridge, at such an angle with the River as will afford protection from ice coming down stream, and crossing a small knoll, enters the bed of a creek flowing into the Welland River about half a mile lower down, and follows its course for about one mile and a quarter, thence almost due north across the height of land to the Bluff, crossing under the Allanburg cut off of the Grand Trunk Railway and the St. Catharines and Niagara Central Railway, and over the Great Western Division of the Grand Trunk Railway; thence following the general course of the Eight Mile Creek to Lake Ontario.

The deep cut on the canal will be about 65 feet; the slope of sides of cut and canal will be two to one in earth, and have a batter of one in twelve in rock. A short distance south of the crossing, or aqueduct, over the Great Western Division of the Grand Trunk Railway, a regulating weir will be constructed of first-class masonry. The aqueduct will be similar in all respects to that on the New Welland Canal where it crosses the same railway about one mile to the west, being composed of a masonry tunnel, covered with puddle clay properly tamped and rammed to form the bed and banks of the canal. A storage basin or reservoir and head race will be constructed at the bluff, which presents about six thousand feet of almost perpendicular sides, in the form of a semicircle, down which the water will be conveyed through steel tubes to the turbines. From the bluff to Lake Ontario the cutting will not be heavy, the canal being formed alternately in cut and fill, masonry, dams and sluiceways being built at the points of power development.

The general formation and topographical features of this section are well adapted for successful irrigation.

During the last ten or fifteen years the development of power from the fall of water, and especially in large quantities, has received a great deal of thought and attention. Manufacturing has increased to such an enormous extent that large powers, which can only be obtained economically by the use of water, are in constant demand. The development of powers on the numerous rivers in Canada possessing waterfalls have certain drawbacks which become a nuisance and a constant source of annoyance. Heavy rainfalls on the drainage area are closely followed by the volume of flow, causing a great variation in the flow of streams. Such streams lack the principal requirement of effective water-power, viz., regularity of flow to the maximum amount needed for the machinery.

The Niagara River carries the overflow from the upper lakes, which act as storage basins or reservoirs, and regulate the flow, keeping it even throughout the year. This water backing up the Welland River will naturally have its outlet through the proposed

canal, which will practically divert part of the waters of the Niagara River. This is a fact which is, or at least appears to be, fully recognized by our American neighbours, if we may judge from the following newspaper articles:—

The Niagara Falls (N.Y.) Journal, 30th June, 1894:—"For the consideration of those who are trying to make a corner on Niagara River water, it will be well to inform them that neither the State of New York or any of its chartered companies are masters of the situation, but that a company recently formed in Canada can dry up the Niagara River and make the great cataract and Niagara gorge a dry and dreary waste any time they see fit. A water company has been chartered in Canada to build a power canal from Lake Erie to Lake Ontario. Through this route all the water that now flows through the Niagara River channel can be diverted if this company sees fit, and much easier than enough water to interfere with the beauty of Niagara Falls can be diverted, by all the projects now under way or talk of in this State."

The Buffalo Courier, under heading "Stealing the Niagara River," says:—"Certain newspapers in the States are exercised over what they term a scheme to 'steal the Niagara River,' by which reference is made to the project of one of the Canadian companies that have been organized for the purpose of utilizing the Niagara water power, namely, The Welland Power and Supply Canal Company, which was incorporated at the last session of the Dominion Parliament, and whose aim is not only the utilization of power, but also to supply water to irrigate the peninsular fruit belt. The charter of the company, The Philadelphia Record observes, permits it to draw unlimited water from the Niagara River. The company is empowered to deepen or widen the Chippawa Creek (Welland River) from its mouth to the point of intersection of the proposed canal, four and one-half miles west, and it is said there is nothing in the charter to prevent the company from diverting the course of the Niagara River to Thorold, Ontario."

These criticisms are satisfactory, in that they practically acknowledge the feasibility and superiority of the project of the Welland Power and Supply Canal Company over any of the other projected schemes for the development of the power of the Niagara River. That steam cannot compete with water power in the development of cheap electrical power is a well known fact, which makes the development of cheap power of the greatest importance to the manufacturing industries of this country, and one of the greatest factors in the growth of cities and towns. To use the words of Mr. Ferris, engineer of the Ferris wheel, "The condition which will determine the relative expansion of towns and cities in the next decade is the presence of water power. The whole problem of electricity is one of cheap generation."

The total cost of this work would be in the neighbourhood of \$5,000,000. This does not include the harbor or shipping basin, but is merely for the power canal and necessary machinery for developing 300,000 horse-powers in water, 100,000 horse of which are developed electrically.

DISCUSSION.

Mr. Butler—What are you going to do with all the power ? is the question. Some few years ago, when Niagara projects were first started, it was contemplated in the future to send electric power to New York and all the large cities between Niagara and New York. As far as I am able to learn up to the present date, a very small fraction, indeed, has been sent even to Buffalo, and at what cost no one could find out. I know that in Canada one of the largest schemes that has been worked out, so far as I know, in the world, has been by the Royal Electric Company at ——— Lake, about fourteen miles from Montreal, and some time ago I received figures from them to supply 125 horse-power per 24 hours, and I found I could do better by putting in compound engines and water tube boilers in competition with electricity there. From investigation at Chambly (I do not know the distance from this point to any city in Canada), it seems to me they are going to build up an immense water power without requiring to use it. There is another scheme on the St. Lawrence River, known as the Messina Springs, part of the St. Lawrence River taken by a cross canal, with a head of about 80 feet, power to the extent of some 100,000 horse-power, I think, they are figuring on. So that all these tremendous schemes for utilizing of water powers seem to me to be largely speculative for the reason that the power is not wanted. I do not believe 100,000 horse-power would be used by the City of Toronto. They have 28 feet head at Chambly.

[*This Association is not responsible as a body for any opinions expressed in its Papers by Members.*]

LAND SURVEYORS AND THE FORESTRY PROBLEM.

By THOMAS SOUTHWORTH, CLERK OF FORESTRY
FOR ONTARIO.

Toronto.

I am deeply grateful for the opportunity afforded me to address the members of this Association, for various reasons. In the first place, I only escaped becoming an ornament to your profession through an overdose of study of the diary of the very methodical surveyor to whom I was once apprenticed. The multiplicity of detail, the incidents of daily life, domestic and otherwise, with which that diary was filled, convinced me that my lack of method and extreme modesty would militate against my success in a similar production, and I went back to the farm. Since then, however, I have learned that all surveyors are not so particular as to their daily journals; in fact, I have known of incidents in the lives of some surveyors to go utterly unrecorded, at least so far as their own private journals were concerned.

Aside from my abortive attempt to become a surveyor, I have been interested in the success of your Association for, having had the honor to be the friend of Mr. Willis Chipman and his printer as well, when he successfully attempted its organization, I was in at the birth, as it were, and have always followed your proceedings with much pleasure.

I believe I am expected to say something regarding the relation of land surveyors to the forestry problem, now receiving so much attention in Ontario. In extending your curriculum of studies to include "Botany and the Forest Flora of Canada," a very wide scope was given in the terms used, and I do not know what ground the author or authors of it intended to cover. In what I have to say on this subject I desire to be understood as speaking, not as the Provincial Clerk of Forestry, but simply as an individual interested in the welfare of our common country and of your Association, and will briefly outline my ideas of the proper relation of land surveyors to the Crown Lands Department and to their other clients in the Province in connection with Forestry.

POLICY OF THE DEPARTMENT.

We have not an autocratic government in this country, and it is difficult to forecast what the policy of the Administration may be ten or twenty years hence. With us the people rule. Sometimes the will of the people is changed and with it the government. A change of government may mean a change of policy, and I have heard of a change of government entailing a change of officials—but that was in the United States. For these reasons there can be no absolute certainty as to the system of exploiting our present and future forest reserves that may be adopted by other generations than ours, or by other administrations than the present one.

I think we may be reasonably certain, however, that public opinion is now sufficiently awake to the vastness of the interests involved and the wastefulness of past methods to prevent any retrograde step from the forward movement now begun in forestry development.

EVOLUTION OF THE SYSTEM.

As you all know, the pioneers in this tree-covered province found it necessary to clear the ground of its tree crop in order to raise crops of another kind, but just as essential for their existence. The trees were felled, rolled into log heaps and burned, a laborious and expensive business. When we think of the endless toil of the early settlers in getting the ground ready for crops of grain and for pasture amid the dense forest that once covered this part of Ontario, with no market for any forest product, we are filled with wonder at the courage of the men and the women who undertook it.

It was not long, however, before the lumberman began to prepare the way for the pioneer farmer. A market was found in England for much of our most valuable timber, and the labor of the farmer was lessened by the work of the lumberman.

The method of exploiting our great coniferous forests adopted by us in the past has been, in some respects, the wisest available. Nature has provided us with a splendid crop of valuable timber trees, and it was the duty of the government to see that in preparing the land for grain and pasture this crop should be harvested with as much revenue to the state as possible. The timber had to be removed to make way for grain crops where clearings had to be made; what the lumberman left the farmer burned, and it did not matter, so far as the provincial revenue was concerned, if the timber was cut faster or of a smaller size than was advisable for the most profitable working. From time to time areas of timber have been sold at the highest price obtainable in open competition. So long as it was designed that the lumberman should act as the precursor

of the farmer in clearing the land for grain growing, and at the same time contribute to the revenues of the state, I doubt if a much better plan could have been adopted. The lumberman only bought the standing timber, the fee simple of the land remained in the Crown to be disposed of to the actual settler, and the manner in which the lumber was cut, or, as some would say, was slaughtered, was of more concern to the lumberman himself than to anyone else.

It so happened, however, that as settlement which, begun on the shores of the St. Lawrence and the Great Lakes, extended northward, considerable areas of timber land were found which were not at all suitable for general agriculture. The soil on these areas, although frequently bearing a heavy crop of trees, would not grow anything else with profit. When the trees were removed by the lumberman and the forest fires which generally followed him, it was discovered that the land was unfit for settlement, and as it had been taken from the only purpose for which it was suitable, it became valueless and waste. The young forest growth that sprang up only furnished food for the next fire that swept over it.

Thus it will be seen that the system followed, while all right for the tillable areas, was not suitable for these tracts of thin, rocky or sandy soil. Forest fires were of such common occurrence it was for a long time thought impossible to prevent them; and, besides, it was generally believed that when the original white pine forest was cut away it was succeeded by Banksian pine, poplar, or other less valuable trees. Erroneous as this view was, it was firmly held by most woodmen. At the suggestion of Mr. Aubrey White, now Assistant Commissioner of Crown Lands, a system of fire ranging was adopted in 1886, much in the way of experiment. It was found to be quite possible to check or prevent forest fires, and the question of the reclamation of these waste areas became a live issue.

NATURAL REPRODUCTION.

Planting young trees on these lands was out of the question because of the great expense. A more correct knowledge of the laws of natural regeneration of forests after forest fires, in the past few years, has led to the discovery that wherever fire has been kept out for any length of time, and where the trees of the original forest, old enough to bear seed, have not been completely exterminated, which rarely happens, a new crop of the valuable varieties, such as pine, spruce and others, is found to be growing in large quantities. It is found that, in the case of white pine particularly, the quick growth of poplar or other trees is necessary for the propagation of the pines that need the shade thus afforded during their early life. With the knowledge of actual conditions, the problem of reclaiming these waste lands became less difficult of solution. It was seen that

time and protection from fire was, in most cases, all that was needed to secure another crop of timber where nothing else would grow. For this purpose the Act of last session of the Legislature for the establishment of forest reserves was introduced by the Commissioner of Crown Lands and passed. The Bill is very brief. It gives the Lieutenant Governor-in-Council power "to set apart from time to time such portions of the public domain as may be deemed advisable for the purposes of future timber supplies." It further provides that "no lands within the boundaries of such reserves shall be sold, leased or otherwise disposed of, and no person shall locate, settle upon, use or occupy any such lands." It is also provided that "the Lieutenant Governor-in-Council shall have power to frame regulations for the protection, care and management of the said Crown Forest Reserves."

FORESTERS AND LAND SURVEYORS.

It is designed that these reserves shall be created out of areas that have been lumbered over and found to be unfit for settlement, and also from tracts that investigation prior to the removal of the timber shall prove to possess the same character of soil. None of these reserves have yet been created, unless we except our million-acre Algonquin Park, and in establishing their boundaries it is more than likely the services of the gentlemen of this Association will be required.

It is impossible at this time to state what the regulations for the care and management of these reserves will include. It is the intention to have them managed and protected with some approach to modern scientific forestry methods, such as will be suitable to the conditions existing here. In any systematic attempt to manage these reserves for future profit, working plans for each reserve will have to be prepared, and for such working plans some sort of topographic survey and timber plan will be required. In countries where scientific forestry has been practiced for a long time a forester is necessarily a land surveyor; surveying is part of his studies in his four years' course.

As we have no trained foresters in Ontario, much of the technical work of the future treatment of the forest reserves will need to be performed by surveyors until such time as we have a trained staff of foresters

FORESTS AND CLIMATE.

It would be presumptive on my part, before this audience, to go into the question of the effect of forests on climate and water supply. The necessity of forest growth to the health, nay, the existence of humanity, is well known. The absorption by the leaves of trees

of the carbonic acid gas expired by animals purifies the atmosphere, that otherwise would become so foul that we could not live in it.

As to the effect of forests on rainfall, a great deal has been said and written that was perhaps not warranted. I believe that, though forests may have little or no effect on the total rainfall, they exercise a great deal of influence on the local distribution of that rainfall. I give this as my firm opinion, but must confess frankly that I cannot prove it as yet. Experiments are now being conducted in Germany, France and Switzerland to determine this point, but as yet it is a case of "not proven."

There can be less question, however, as to the effect of forests on stream flow and the subterranean drainage of the water gradually filtered from the forest floor.

The effect of forests in checking evaporation from the soil by breaking the force of the drying winds is well known to you all, and there are few of you who have not personally observed the failure of streams that were once perennial owing, apparently, to the removal of the forests from their sources and banks.

THE CROWN LANDS.

Much territory has been opened for settlement in Ontario that should have been held exempt from location if the character of the soil and the timber growth had been fully known. I am far from placing the blame for this entirely upon the surveyors who laid out and reported on these areas. They no doubt carried out their instructions, but in examining many of these reports I have been disappointed in the information they contained. So far as the timber was concerned, there seems to have been a disposition to regard the white pine as the only tree worth reporting upon. While this is undoubtedly the most valuable tree in our, or perhaps any other, forests, there are others of great and increasing value.

I think a surveyor should be able to distinguish and report upon all our commercial timber trees, and to state the proportions in which they are found in the township surveyed. It is not unusual to find in a surveyor's report, "No timber of any value, mostly spruce." If spruce is not now as valuable as pine, it will be in the near future, for no business in this country is advancing with such rapid strides as that of paper-making, for which spruce is mainly used. There are few trees growing in our forests that may be considered as of no value. The cheapening of steel has caused its substitution for wood in many ways, but, on the other hand, new uses are found for wood, and the changes in this direction are so rapid that a tree having little, if any, value this year may be eagerly sought after next. Even the despised Banksian, or jack pine, makes very

good paper, and the white or canoe birch is being extensively used in the manufacture of spools. The common aspen poplar is being made into flour barrels at Keewatin, and a very good barrel it makes. I have slept this winter under a blanket made entirely from wood, and the same vegetable fibre is spun into silk threads that, when woven into cloth, cannot be distinguished from the product of the silk worm.

In estimating the value of our various timber trees, regard must be had not altogether to the value of the wood alone, but to its occurrence in our forests. For instance, the wood of the black walnut, *Juglans nigra*, is very valuable, but as its habitat was confined to a very limited section of the province, and as it is now practically all gone, it need not be considered. It would also be well in reporting on forest trees to give the botanical names as well as the common ones. The same tree goes under various names in different localities, and this is sometimes very confusing. In looking over some reports I found the term cypress used quite often, and was for some time unable to make out what tree was meant until one of your members informed me it was the *pinus Banksiana*, or jack pine.

Another point that I think should be borne in mind by the surveyor in new territory is the general age of the forest, which may be easily determined by cutting down a few trees of average diameter and counting the annual rings of growth.

Aside from the surveyor's usefulness to the Department of Crown Lands in connection with forestry, he may be equally useful to the individual members of the farming community who may be his clients. Rightly or wrongly, the land surveyor is regarded in most communities as a general all-round, well-posted individual, whose advice on a great many matters is eagerly sought for. There are few farms in the more densely settled parts of the province that have not some hilly, unproductive acres that could be profitably planted with trees, and I know of few men who would have more influence in restoring a proper proportion of woodland where over-clearance has been detrimental to the general well-being of the community than surveyors.

Subject to correction, I submit a list of what I consider to be our most important timber trees, arranged in the order of their importance, with their common and botanical names.

Among the coniferous trees the *pinus strobus*, or white pine, is easily first, and has no equal on this continent. Next are *picea alba* and *picea nigra*, the white and black spruce. These two trees are so much alike it is not easy to distinguish them, but when growing in masses the foliage of one is much darker than the other. The cone of the white spruce is thicker and shorter than that of the other, while the cones fall off before next flowering time, and the cones of

the black spruce are still on the tree at next flowering time in the spring. The spruce is the tree most used for paper-making, and the largest spruce forest in the world is probably in Ontario and Quebec.

Next in order is probably *Tsuga canadensis*, or hemlock, with *pinus resinosa*, or red pine, and *larix Americana*, or tamarac, in the same class. The market value of these three trees varies considerably.

Next to these I would place *thuya occidentalis*, or arbor vitae, which we generally, but some say erroneously, call white cedar. This tree, where found in quantities, is more valuable than the three last mentioned. In addition we have *abies balsamea*, or balsam fir; *juniperus virginiana*, or red cedar, a scarce, but very valuable tree, and *pinus Banksiana*, or jack pine, sometimes called pitch pine and cypress.

Among the deciduous trees that are found in our northern forests are *quercus macrocarpa*, or bur oak; *quercus rubra*, or red oak; *betula lenta*, or black birch, or sweet birch; *betula lutea*, or yellow birch; *acer saccharinum*, or sugar maple; *tilia Americana*, basswood or linden; *ulmus Americana*, or white elm; *fraxinus viridis*, or green ash; *fraxinus sambucifolia*, or black ash; *betula papyrifera*, or canoe birch, white birch, or paper birch; *fagus ferruginea*, or beech; *juglans cinerea*, or butternut; *carya amara*, or bitter hickory; *populus balsamifera*, or balsam poplar, or balm of gilead. Other trees valuable, but less important because of their scarcity, such as *fraxinus Americana*, or white ash, might be mentioned, but these I regard as the most important from a commercial point of view.

DISCUSSION.

Mr. Southworth—I have tried in the very brief time at my disposal to give an idea of the development that has taken place in the protection of our Crown Lands in regard to forestry, and to direct the attention of this Association to it.

Mr. Gaviller—I think we all ought to be glad that this most interesting paper has been written and we have had the pleasure of hearing it, and that the gentleman overcame his bashfulness, and I hope on a future occasion we shall hear from him again; because in my own experience and the experience of young men I have had out with me at work—and I think it is the general experience of surveyors who have been at work a few years—there is much ignorance on the subject of the timber in the country. In fact, you find a great many persons do not know the names of the trees, and most

of us in our youth were under the impression a pine tree was the only tree worth looking at; and I daresay numbers of us are old enough to remember the first thing considered necessary to be done on the farm was to girdle the pine tree, get the bark off, and sell the miserable remains that happened to be standing in the fall after the hardwood was gone, to some sawmill to stoke up where they could not get water power to supply the power to run the mill.

I have not read my report on the Committee of Land Surveying yet, but I think when we do read it you will see I have emphasized as strongly as possible the great necessity there is for carrying on this work now as much as possible, and there is no doubt in a case like this, where the ignorance has been so great, that the remedy should be applied in a manner that will make it most effectual.

Mr. Niven—I will just say, Mr. Chairman, that I was very much interested in the paper that Mr. Southworth has just read.

It is not very long since people believed that we would never have a second crop of pine. Now, I am not an awfully old man yet, but it is nearly thirty years since I went to Haliburton, and I remember about the first thing I noticed up there was a nice little grove of white pine some distance out of the village, along the road that I was building, and they were just nice little trees, such as you see when driving about, about four or five inches in diameter, and perhaps twenty feet high, growing nicely. Now those trees form a very fine grove of valuable pine. Unfortunately, a few years ago fire got in and destroyed the greater part of them, but not longer ago than the day before the election I drove through that place again, and I had a practical lumberman alongside of me in the cutter, and he said that he had made an offer to the company for that grove of pine. There is some very good timber there to-day, some excellent little saw-logs, and it is really surprising how quickly it has grown.

Regarding the Cypress, I was not aware before now that Bankian pine, or pitch pine, was ever called cypress. I remember, when I was an apprentice, the field notes of P. L. S. Willmot, who, I think, surveyed the Gore of Toronto. He planted his tamarac posts in a swamp. Those posts were sixty years old, and his field notes state they were planted in a cypress swamp; well, that swamp was a tamarac swamp. Whether Brother Willmot was astray in his timber or not I do not know. But I have always considered cypress meant tamarac. Of course I have always called tamarac, tamarac.

I am very much pleased with Mr. Southworth's paper, and I think it will be very useful to us, and I hope we shall hear from him again.

Mr. Gaviller—I don't think that Jack pine has any possible resemblance to cypress.

Mr. Southworth—We have no cypress in Ontario at all, but in some of the reports, I think principally along the Ottawa, as someone remarked, the Banksian pine is generally called cypress, and I did not know for a long time what it was; but I would just like to say in regard to the remarks that have been made by Mr. Niven and Mr. Gaviller, that I shall be extremely delighted if I am privileged to give a paper to this Association at your Convention next year, and I will endeavor in it to give the results of the latest scientific forestry up to date so far as I can, something that is of practical use to the members of the Association. This paper has been prepared hastily and was intended simply to direct attention to the subject as it exists in our own Province.

Mr. Chipman—Mr. Chairman, I think the Association has lost a valuable member in not having Mr. Southworth. If he had continued his studies, we would have had a surveyor acting as Clerk of Forestry. It was very fortunate, no doubt, for himself, that he changed his mind, but it is our misfortune. However, he is with us and has promised to be with us again, and no doubt he will keep his promise.

As to that term cypress, I had quite a different impression as to its meaning. I also have seen it in surveyors' notes and made enquiries as to what it meant. I was told it meant white cedar; that is quite a different tree from either Banksian pine or tamarac.

Now to come to Mr. Southworth's work, which he has been at for the last few years in the Department of Crown Lands, to make his work of value to the surveyors and to the country at large, I think that the Association should secure two or three hundred copies of his report and distribute one to each member of the Association with our own Annual Reports. That would give his work a practical value to the members of the Association.

Mr. Ross—I like this paper of Mr. Southworth's very much. I think it is a very timely one. What he says with regard to the ignorance as to the names of certain woods and trees is quite true with regard to the general public, and I am afraid it is true with regard to quite a few of our own members, too. I think it would be a good idea to have botany put in our subjects for examination.

Mr. Chipman.—I might state, Mr. Ross, that has been added to the list of subjects for examination, and I think I was the one who suggested it last year.

Mr. Butler—Mr. President, I am partly responsible for telling Mr. Southworth that the word cypress was used in lieu of Jack pine. A French-Canadian halfbreed, north of Lake Nipissing, named the Jack pine to me the first time I saw it as "cypree," which was the nearest he could get to cypress in English.

and all the men in the vicinity called it cypress without any mistake. I think I told Mr. Southworth of that fact, and I put it down in my notes as cypress until I found it was Jack pine.

As I was out with Mr. Southworth on the Forestry Commission some time last summer. I might tell you something in addition to what he said as to what happens in the growth of the reforestation of the pine forests.

After the lumbermen have cut over the forest, or the fire has destroyed it, as a rule the poplar springs up first. There seems to be an absolute necessity for the poplar or some other quick-growing deciduous tree, for unless that shelter is afforded by the deciduous trees, the young pine saplings will die from the heat of the sun.

Now, the poplar grows rapidly for from 15 to 20 years, shading the pine by making a dense covering overhead. The pines strike up higher for sunlight and you get a limbless tree, which crowds the poplar; the poplar keeps ahead of it, and the evergreen keeps shooting up; and I think if you examine any tree that grows in a dense forest, it grows without any limbs at all near its base.

Then the next thing was that, after about 25 to 30 years, the poplar began to be of somewhat slower growth, up to 50 or 60 years. At that time, looking at a forest, the deciduous and evergreen trees are almost on a line, and it would be difficult at a distance to tell which it was, whether an evergreen or deciduous forest.

At 75 years there is no mistake about it at all; the pine tree is over the top and the poplars are beginning to fall. They rot quickly and form some nourishment for the pine tree. After that it is a case of the survival of the fittest among the pines themselves.

Among other things, we found that state of affairs occurring up in the Collins Inlet District, and to show you how little the men who are all their lives in the woods see of what is going on under their very noses and eyes, I was describing to Mr. Mickle, of the firm of Mickle, Dymont & Son, lumbermen, a forest owned by Mr. John Bertram, in which I told him that it came on from 5 years up to 50 years, and 75 years and 125 years. He said he wished he had a forest like that and he would take such great care of it, it would never get cut out. That is the principle. Just cut the annual growth and keep a perpetual forest there. It has been done in other parts of the world and can be done here. All we have to do is to educate our lumbermen up to act on it, and the firm with which I have been connected have been acting on it for 10 or 15 years. We have cut only our annual growth. Now, when passing along with Mr. Mickle, travelling through Hollow Lake, in the first old burn we came to, which he thought was nothing but poplar, we found a splendid young pine forest coming along beautifully. He was astonished. He said, "I did not think there was anything in that

but poplar, cherry trees and sumach." He realizes now he has there an asset which is rapidly increasing in value and is better than money in the bank at compound interest at 3 per cent. There is no question about it, a pine forest like that is worth 4 per cent. compound interest as an investment.

Now, another point we noticed was the conditions of crowded growth. If a tree is crowded in its environment, that is to say, if it has not sufficient room around it for air and light, that tree will take perhaps 15 years to add an inch in diameter; it may grow two feet in height.

Now, if it has normal forest surroundings and the soil good, it will add an inch in diameter in seven or eight years; but in favorable conditions, if weeded out as it should be, then the inch will be added on in about four years.

Mr. Southworth—I think that is a very moderate estimate.

Mr. Butler—And of course it will grow in height proportionately.

On twelve-inch trees that add on an inch in four years a man is making money hand over fist, and all he has got to do is to protect them and weed out the forest.

Now, the question in Canada here is, what are we going to do to weed out those forest trees to give the healthy trees a chance to grow? Those of you who take The Engineering News, look into the issue two weeks ago, and see what they are doing in Sweden in connection with the Charcoal and Smelting and Steel Works. There you will see the question solved. They have 730,000 acres of land all told owned by the Charcoal Iron Smelting Company, of Sweden. They also run a pulp mill in connection with it. They found that true economy consists in cutting down all trees that make pulp—the limbs, the shrubs, the leaves, every particle of the trees is gathered up. What will not make charcoal will make gas in refining the steel, but everything that will make charcoal is used in refining the iron, and if they can do it there surely we can do it here. That is all I have to say on forestry.

I think we owe a debt of gratitude to Mr. Southworth for preparing this paper. I can tell you that the action which the Government has taken in connection with forestry is largely due to the suggestions of Mr. Southworth.

[This Association is not responsible as a body for any opinions expressed in its Papers by Members.]

ECONOMIC RECOURCES OF THE HUDSON BAY DISTRICT.

By J. W. TYRRELL.

Hamilton.

Where is this district and what is its extent ?

The following may be taken as a simple but fair description of it, i.e., of Hudson Bay and the surrounding country which may be considered as tributary to it:—

All and singular that certain parcel of land and water (with-out the premises) situate, lying and being in the Dominion of Canada, in the Continent of North America. Being composed of that great undeveloped region, long monopolized as the most fruitful field of the Hudson Bay Company, and more particularly described as follows, that is to say: the entire area within a radius of seven hundred miles from a point situate in latitude 59 deg. north and longitude 85 deg. west, and containing by admeasurement nine hundred and eighty-five million six hundred thousand acres, be the same more or less.

Briefly, the circumference of the circle above described would be situate as follows: Commencing at its southern extremity, the line crosses the height of land north of the Canadian Pacific Railway, near Missonabie, thence proceeding westerly it takes in the north-eastern part of Manitoba, passing through Lake Winnipeg, thence just touching the eastern extremity of Lake Athabasca, thence would cut through the centre of the divide between the waters of Great Slave Lake and Chesterfield Inlet, thence crossing the Arctic Circle, and for its extreme northern boundary passing the north end of Melville Peninsula, and thence through Cumberland Sound, Cape Chidley, at the eastern extremity of Hudson Straits, and thence southerly and south-easterly through the Labrador Peninsula, following the border of the western water-shed to the place of beginning.

The area contained within this circumference, already given in acres, amounts to one million five hundred and forty thousand square miles, which represents almost one-half of the land area of the whole Dominion of Canada, which is commonly placed at three million two hundred thousand square miles. Now, astonishing though the statement may seem, it is, nevertheless, true,

that for the whole of this vast area we have absolutely no direct access, excepting by means of small boat or canoe navigation.

Of course there is for ships one most indirect route to the Bay by way of the St. Lawrence River, the Atlantic Ocean, and Hudson Straits, but this necessitates a voyage of from three to four thousand miles of difficult navigation.

We now come to the question—which is, by the way, one of the most burning now before the Canadian public, and particularly the citizens of Toronto—i.e., Is this part of the Dominion worth opening up by means of railway or improved shipping facilities, and if so what return may we count upon from its development in consideration of the public monies spent upon it.

If these million and a half square miles are worthless, let us not squander our none too abundant public funds upon them, but if it can be shown that there is very reasonable ground for expecting handsome returns from the opening and developing of the Hudson Bay District, surely it is time that a strong movement should be made in that direction.

From my personal knowledge and after a careful perusal of the reports of Dr. R. Bell, A. P. Low and J. B. Tyrrell, members of the Geological Survey, who have at various times carried on exploratory work in the district, I will endeavor to present a list of the various economic resources of the Bay, together with some notes as to their localities, qualities and abundance.

Commencing with the Animal, or highest of the three great kingdoms of Nature, let us see what resources the Hudson Bay District has to offer us.

MAMMALS.

Moose.—Not found to the east of Hudson Bay, but south and south-west they are commonly met with as far north as about latitude 57 degrees, valuable for flesh and hide.

Woodland Cariboo.—Common throughout the districts south and south-west of Hudson Bay. Reported to be about exterminated in Labrador. Valuable for flesh and hide.

Barren Ground Cariboo.—Very abundant in the barrens both east and west of Hudson Bay. The chief source of both food and clothing for the native population, and the great local source of food for future explorers and prospectors.

Musk Oxen.—Common north of Chesterfield Inlet, and along the valley of the Great Fish River. Flesh may be used as food, and hides form valuable robes.

Fox (red, cross, silver and black).—Common throughout the district. Furs of silver and black varieties very valuable.

Arctic Fox.—This species is abundant throughout the barren grounds. Furs not so valuable as other varieties.

Grey Wolf.—Becoming scarce in southern districts. More common in the semi-barrens.

Arctic Wolf.—Common, though not very numerous, throughout the barrens.

Wolverine or Carcajou.—Very common throughout the barrens. Skins are valuable as furs.

Canadian Lynx.—Abundant in some places in wooded country. Fur very fine and warm for rugs or clothing.

Sable or Pine Marten.—Common below north limit of semi-barrens. Fur valuable.

Fisher.—Abundant in some of more southern districts.

Mink.—Very common in southern portions.

Weasel.—Common throughout the wooded country.

Ermine.—Common in wooded as well as in barren lands.

Otter.—Common in more southern districts. Very abundant in parts of Labrador.

Beaver.—Common in more remote wooded districts. Very abundant along some of the rivers emptying into the east coast of James Bay.

Musk Rat.—Very common everywhere throughout southern wooded region.

Black Bear.—Not uncommon throughout wooded districts.

Barren Ground Bear.—Rare, but met with occasionally in the barrens. Skin valuable.

Polar Bear.—Abundant about the shores of Hudson Bay in some localities, and found for a considerable distance inland.

Walrus.—Very abundant in several localities in Hudson Bay and also found in James Bay. Valuable for hides and ivory tusks.

Bearded or Square-Flipper Seal.—A large species common in Hudson Straights and Bay. Valuable for hide and oil.

Gray Seal.—Not common.

Hooded Seal.—Not very abundant.

Harp Seal.—Common along the whole Labrador Coast. Valuable for oil and hide.

Ringed Seal.—Most common species in Hudson Bay and Straights, and quite numerous. Valuable for oil and hide.

Harbour or Fresh Water Seal.—Common about the coast of Bay and in some lakes, both in Labrador and the western barrens. The skin of the throat of this species, contrary to the usual rule, is black and glossy, and makes a beautiful soft, rich fur.

White Whale.—Very abundant in both Hudson and James Bay, and especially about the mouths of large rivers where they resort to feed upon the small fish. Valuable chiefly for oil.

Narwhale or Sea Unicorn.—Found in Hudson Straights and other waters to the west and north-west. This peculiar creature,

whose body is only 18 or 20 feet in length, possesses a single spiral ivory horn not uncommonly 8 feet in length and of great weight.

This horn, or tusk, which extends from the end of the nose in line with the body of the animal, is composed of a very fine grade of ivory, and is therefore very valuable.

Right Whale or Bow-Head.—This is the most valuable and one of the largest of the several species of whales, and furthermore is nowhere so common as in the water of the northern part of the Hudson Bay District. Although the value of an average Right Whale is in the neighborhood of fifteen thousand dollars (\$15,000,000), it is a most regrettable fact that, to the best of my knowledge, there has never been a Canadian whaler in the Bay, whilst our neighbors to the south have habitually for years had at least five or six vessels hunting and carrying away these prizes to the ports of New England.

Indeed, this foreign wholesale destruction has been carried on for so many years and to such an extent that the whales have become comparatively scarce to what they once were, and it is high time that our Canadian Government should step in and put a stop to the poaching practice entirely, and see that these most valuable of all animals are not ruthlessly exterminated, as without such intervention they certainly will be.

FISHES.

Sturgeon.—Common throughout southern portions of district. A small species, plentiful in many of the rivers of Labrador.

Salmon (common sea).—Found in abundance in Ungava Bay.

Cod.—Found in Ungava Bay.

Hearne's Salmon.—Common along coast of Hudson Bay.

Great Lake Trout.—Abundant throughout lakes and rivers. Twenty-five pounds is not an uncommon weight for this fish.

Brook Trout.—Abundant in many streams.

White Fish.—Very abundant in lakes and rivers. Ordinary size from six to ten pounds; fourteen pound whitefish caught in Lake Mistassini.

Herring White Fish.—Abundant about the mouths of most of the rivers flowing into Hudson Bay.

Halibut.—Reported to occur in Hudson Bay.

Pike or Jack Fish.—Very abundant throughout district in lakes and more sluggish streams.

Pickrel.—Reported common. Many other less important species may also be found, but the above list will be sufficient.

Without attempting to present a full list of the birds of the Hudson Bay District, I will merely call attention to the existence of great numbers of water and land fowls, such as geese, ducks, grouse and ptarmigan.

TIMBER.

The Hudson Bay District is not, as a whole, a great timber country. Indeed, the northern half of the district is entirely devoid of timber of any description, but the land of the southern half is covered by forests of more or less value, some of the river valleys and more favored localities being well wooded by valuable trees of good size.

The following is a list of the forest trees of the Hudson Bay District, arranged in the ascending order of their northern limits :

1st. White Elm.—Found only in the most southern parts of district, its extreme north limit, east of Lake Winnipeg, being about latitude 51 deg.; not very abundant.

2nd. White Pine.—Found only as far north as latitude 52 in the neighborhood of Lonely Lake. Common and of fair size, about the head waters of the branches of the Moose River.

3rd. Red Pine.—About same as white.

4th. Black Ash.—Found as far north as latitude 53 toward Lake Winnipeg, but only 50 deg. towards James Bay. Common on the various branches of the Moose River, but of small size.

5th. Cedar.—Found as far north as the mouth of the Rupert River on James Bay, along the Moose and Albany Rivers, around Lake St. Joseph, and Cedar Lake on the Saskatchewan River, being in about latitude 53 deg. 40 min. Many trees are of large size, though not very abundant.

6th. Banksian Pine or Jack Pine.—Extends as far north to the east of James Bay as latitude 55 deg., and trees of good size are abundant throughout this western part of the Labrador Peninsula. To the west of Hudson Bay the range of this tree extends much further to the north, having been discovered by me at the north end of Selwyn Lake in latitude about 60 deg. 30 min. Dr. Bell reports it as being abundant and of large size in the valley of the Albany River.

7th. Balsam Fir.—Northern limit on east side of James Bay at Great Whale River. To the west it crosses the Nelson River at about latitude 55 deg., and thence turns in a north-westerly direction towards the mouth of the Athabasca River. The tree is common below this limit, though not very abundant.

8th. Canoe Birch.—One of the most common and valuable forest trees of Northern Canada. In the Labrador Peninsula it extends as far north as Great Whale River, is very common south of this, but not of large size, commonly not over six inches in diameter.

West of the Bay the limit extends in a north-westerly direction, passing out of our district a little north of Selvyn Lake. When, in 1893, I passed through, a party of Chippewyan Indians were engaged in the manufacture of bark canoes from it.

9th. Aspen or Common Poplar.—Has about the same northern limit as the Birch, and is the most widely diffused tree of North America. It is very abundant within its range throughout the Hudson Bay District, and is one of the most valuable of the forest trees, being commonly as much as 10 or 12 inches in diameter. It is now much sought after for the manufacture of pulp, etc.

10th. Balsam Poplar or Balm of Gilhead.—Extends considerably further north than the white poplar, but is much less common.

East of Hudson Bay this tree is found as far north as Richmond Gulf. West of the Bay it disappears near Fort Churchill, and thence its limit extends in a north-westerly direction, about parallel with those of the other northern trees, although in latitude 64 deg. 41 min. at the forks of the Telzoa River, my brother and I found driftwood branches of this tree which had come from some place to the westward.

11th. American Larch or Tamarac.—This tree is the rival of the Spruce in the range to the northward, and, as regards abundance, it stands second only to the Black Spruce. It is usually the largest tree of its neighborhood.

It attains a fine growth throughout many parts of the country south and west of James Bay.

12th. Black Spruce.—Is by far the most abundant tree in the Hudson Bay District, forming, I should judge, 75 per cent. of the whole forest. It is much to be regretted that this tree does not attain a larger size, being, as a rule, too small for the manufacture of lumber.

13th. White Spruce.—Though much less abundant than black, is very common everywhere throughout the forests of the Hudson Bay District.

Its northern limit, which is about the same as the Black Spruce is, on the east side of James Bay, in about latitude 57 deg., a few miles north of Richmond Gulf.

On the west coast of the Bay the limit extends to latitude 59 deg. at the mouth of the Seal River; thence it extends in a north-westerly direction, passing close to the mouth of the Copper Mine River, and on to the mouth of the Mackenzie River.

In latitude 62 deg. 15 min. north, on the shore of Cary Lake, I have seen White Spruce trees the largest of which measured twenty-nine inches in diameter, two feet above the ground. This was, of course, very exceptional. Mr. Low reports 18 inches as no

uncommon size for the species in Labrador, and 20 inches at one locality near Lake Mistassini.

Dr. Bell reports cut Spruce logs on Lake St. Joseph 18 and 20 inches in diameter.

In connection with the forest resources of the District, it is very much to be regretted that disastrous bush fires are of such frequent occurrence, entirely destroying large areas of valuable timber from year to year, which may have been a century or more in attaining its growth.

MINERALS.

From the third and last great division of natural resources we may expect, in course of time, the greatest results.

There is every reason to believe that many parts of this great District will prove to be rich in the possession of minerals. As yet neither the prospector nor the miner has operated to any appreciable extent within the circumference of our vast district, but from what preliminary exploratory work has been carried on, it is abundantly proven that many large mineral areas exist, and only await means of access for development. The following is at least a partial list of those already reported :

1st. Iron(haematit and magnatit).—Extensive deposits in various localities in Labrador, on the Albany River, and near the east end of Lake Athabasca.

2nd. Copper.—Extensive deposits on west coast of Hudson Bay, also south-west of Lake Mistassini, on East Main River, and elsewhere.

3rd. Silver.—Found associated with lead in the limestone of Cambrian areas of east coast of Hudson Bay, where it occurs in quantities sufficient to be of economic value. It has been traced for a distance of twelve miles, and has given assays of from 5.104 to 12.3 ounces silver in the ton.

4th. Gold.—Discoveries of this most coveted metal have been reported from the Lonely Lake region, the west coast of Hudson Bay, and the shores of Repulse Bay.

5th. Mica.—Large specimens have been obtained from the north shore of Hudson Straits, also from near Lake Manouan in Labrador. From the Ison-Glass River, where a quarry was opened as long ago as 1685, from Lake Winokapaw, and elsewhere.

6th. Graphite.—Found on north shores of Hudson Straits, etc., etc.

7th. Asbestos.—Found on J. Gordon Island on east coast of Hudson Bay.

8th. Coal.—Lignite coal reported to exist on Coal River, a tributary joining the Moose River at about 114 miles from tide water.

9th. Anthraxolite.—This mineral has been found at Lake Mistassini, at Pet-it-sik-apaw and Men-i-hek Lakes in Labrador, and on Long Island in Hudson Bay, from which latter locality an analysis of some samples gave 94.91 per cent. of carbon.

10th. Jasper.—Is found in large masses in several places in Labrador, whence it is easily obtainable.

On the Koksoak River there is a thick band of apple-green jasper, brecciated with small angular fragments of the red variety, which might be used for pannels, etc.

11th. Agates.—Found on east coast of Hudson Bay.

12th. Labradorite.—Large and beautiful crystals of this mineral are found in great abundance on the north-east side of Lake Michikamau for a distance of ten miles or more, besides other places in Labrador.

The above lists might be greatly extended, but I think that I have already shown that the Hudson Bay District, vast in its extent of territory, is not likely to prove less vast in its natural resources, and I am convinced that the sooner we provide ourselves with some adequate means of access and egress to this great realm of isolation, the better it will be for the trade and commerce of our country, and for the thousands of those who may go up and possess themselves of "Our Great Northern Heritage."

DISCUSSION.

Mr. Southworth—You refer in your paper to the very serious losses in that district from fires. To what do you attribute the fact that so much of that territory has been burned over—the causes of the fires? I notice Dr. Bell attributes it nearly altogether to lightning. Do you think that is the cause, or is it due rather to the carelessness of the Indians and traders in that country?

Mr. Tyrrell—I think it is to a very great extent due to the carelessness of the Indians, but where prospectors have entered the field they are perhaps as bad or worse than the Indians, often being anxious to get rid of the growth, of whatever nature it may be, in order to lay bare the rocks. But where the country is not occupied by the prospectors, such as the great Barren of Labrador, I think that it is almost entirely due to the carelessness of Indians. They have a practice amongst them of signalling each other, such as

notifying an inland tribe of the crossing of the deer at a certain place in a river where they may be expecting them. In order to notify these neighboring tribes they will kindle a great fire, and that often results in the destruction of large quantities of timber. I think it is almost entirely due to the carelessness and wilful destruction of the Indian.

Mr. Southworth—I am glad to have your opinion about that, because I noticed Dr. Bell has given that as a natural phenomenon—forest fires—and he takes it as a sort of rotation of crops on the part of Mother Nature, and gives the Jack pine as a tree that will not shed its seeds under any other circumstances as an evidence of the fact that the tree has been provided for such a contingency. That is, of course, incorrect, because Jack pine will reproduce itself by its seeds in the same way as any other tree. But last summer in the north we put out a fire that was occasioned by an Indian who left his camp fire burning on the ground, and I have only heard of one or two authenticated instances where fires had been caused by lightning, and it seemed strange that that whole country should be entirely burned over by lightning, which is generally accompanied by rain to put out the fire.

Mr. Tyrrell—I know that last season, when I was travelling through the Lonely Lake District and the district around Lake Minnitakie, the whole country was burning. That was largely due to the work of prospectors. There had been a recent influx of prospectors, and almost everywhere where their camps had been they left a fire trail behind them.

Mr. Stewart—Are there any blueberries up there ?

Mr. Tyrrell—No, it was a wooded country; next year the blueberries may have a chance.

Mr. Stewart—Indians sometimes fire a country that berries may come up.

Mr. Niven—I have been in the bush more or less for thirty years, and I never knew an instance of lightning causing a fire yet. Most of the fires of recent years I think have been started by prospectors. I know that in the Rainy River District some five years ago we were almost smoked out and driven out, in fact had to run through the flames very often, as it was a dry season, and I am quite certain there were thousands and thousands of dollars' worth of pine destroyed that summer by prospectors simply burning the ground so that they might see the rock.

So far as my experience of the Indians goes, I do not think that in the parts of the country where I have been that very many fires could be attributed to them. They hunt, and they know that

the fire destroys the fur, and I have found them very careful, although in the tract of country Mr. Tyrrell mentions—Minnetakie Lake and from that to Lac Seul—the country has all been burned some few years ago. I don't know how that fire originated, but it was a very serious one.

Mr. Stewart—I would like to ask Mr. Tyrrell, in speaking of the whale fisheries, whether our Government should take some means to protect them. I am not clear whether Hudson Bay is regarded as an inland sea—whether the Canadian Government have power to prevent foreigners coming in. There is some talk now about a railway to James' Bay. But so far I have been unable to see how a railway from there to Toronto would be of use in bringing any of the fishery products here. Certainly the whales would not be brought to Toronto and then sent down to Montreal and shipped on a vessel for England.

And again, the other fisheries there are not of very great value at present, and as for carrying grain we would scarcely send the grain from here to James' Bay and thence to England. As I said before, there is a great amount of ignorance shown by those who write regarding the country between here and Hudson Bay. If preliminary explorations were made we would know whether the railway would be of any use to Toronto or not. It seems to me that at present, at least, such a railway would not have enough to do—I cannot see what it would do. I would be very glad if anyone here can give any reason to make me think otherwise.

Mr. Tyrrell—In replying to Mr. Stewart's remarks, I may say I have not undertaken to look at the question from a Torontonian standpoint at all; I have not undertaken to show whether it will be of any benefit to the city of Toronto, or whether it will not. I have merely made an effort to show what the resources of the district are, and then if financiers and business men think those resources are going to be of any benefit to Toronto, why let them act on their opinions.

I think that some such project as Mr. Stewart has called attention to on several occasions—that is, the making of preliminary explorations in advance of surveys, would be a decided step in the right direction.

The information which I have endeavored to present in this paper has been gleaned as best I could get it from official reports and from some personal knowledge, but the amount of information available is very meagre.

If the Government were to take the matter up and send out some of our intelligent surveyors to look into this matter and determine what we may count on getting, and what the district really is like, it would be, I think, a benefit to the country.

Mr. Stewart—What about the closed sea ?

Mr. Tyrrell—As to that, there is no doubt it is purely Canadian water. There was away back in 1670 something of a struggle maintained for some years between the British and the French for the supremacy of those waters, and it concluded by the Treaty of Utrecht, by means of which the French ceded all rights in Hudson Bay to the British.

Mr. Stewart—That might be, but that would be simply the French occupation there—they had some rights of occupation—but I mean as to whether it is really a closed sea.

Mr. Tyrrell—I think it is admitted to be such by the best information which I have been able to obtain; it is considered, I know, by members of the Senate who have spoken on the matter in Ottawa to be a Canadian sea exclusively.

Mr. Stewart—It is pretty well closed.

Chairman—Has not the City Council of Toronto appointed a Commission—three Commissioners—to enquire into this question as to the economic resources and the best route for a railway, and as to whether, from a financial standpoint, it would be a safe undertaking ?

Mr. Tyrrell—Yes, I believe they have appointed a Commission to do some work; I don't know what the programme is.

Chairman—I believe they have power to expend a certain sum of money ?

Mr. Tyrrell—There is an appropriation of \$5,000.

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SOME CAUSES OF LOSS IN GOLD MINING IN ONTARIO.

By CAPT. J. F. WILLIAMS.

Toronto.

The contention is that we have mines standing idle, which would yield more gold per ton than some that are working and paying dividends on lower grade ore, and if these mines can do it, why not others? It seems to me that since the conception of gold mining in Ontario it all has been uphill work and great loss of capital in some places. No doubt, ore that is very refractory and difficult to treat will account for some of the failures in the past, but, on the other hand, there are mines with free milling ores which at the present day ought to be working. There has been a large amount of work done on some of them, machinery erected, everything put up for the extraction of the precious metal, gold veins carrying gold in paying quantities, everything that is needed for the successful working of the mine, yet they have been failures in many instances when the mill has been put in operation on the ore. It has been found that it did not carry as much gold per ton, as the mill test showed that a reliable firm made for them, before the erection of their own mill; yet they cannot find the gold in the tailings. It is evident that a great loss is taking place, and unless the evil is cured the enterprise must be a failure. The mill man says he is attending to his duties, and catching all the gold possible, which shows by the tailings. Therefore, it is evident the loss is not in the mill.

It seems to be a chronic case when a mine shuts down; the cause is generally attributed to some fault or other with the mill; while, if the cause were found out, it would show it to be due to some other defects outside of the mill. Therefore, I will try and show where great loss occurs outside the mill. I will not go into the cause of losses to a great extent, but will try and show where losses do occur. In a mine just opened up and the mining is near the surface, say in starting to sink a shaft, or open work. In most of the mines there is generally a large amount of prospecting done. First, to show that there are veins on the property. Second, to determine what kind of mineral they bear. Third, to see if they

carry ore in a paying quantity. We will say the vein found contains gold; we notify the parties that we represent that we have found this vein. I am notified to send so many tons of ore to a certain firm for a mill test; the wish of the parties carried out, the ore is mined carefully for fear any gold might be wasted, carefully put in barrels and sent on. While that is in transit and being tested, the vein is being stripped on its course; after a while the returns are sent back showing good results, and gold in paying quantities and not refractory.

Suppose that the quartz is of a honey-comb nature; the cells carry a large amount of gold in the leaf form, which needs careful handling and mining near the surface; this has been strictly attended to so far. The parties come to the conclusion that they will erect a milling plant, for the circumstances warrant it. Now, word is sent to start mining operations on the lode and get out all the ore I can for the mill, which will be erected at once, so as to have a supply on hand. As you have noticed above, the ore that was sent away for a test was got very carefully so there should be no loss. But now mining has got to start; men are engaged; everything ready for the mining of the ore, but no provision made for the ore to be carefully put away till wanted. No thought of the loose gold in the cells. What was going to come of that while waiting till the mill was ready? No floor of any kind made to put the ore on, but simply to take it from the lode and throw it to one side on a pile of loose rock and underbrush. Ultimately the fine gold that was loose found its way into the crevices of the rock and other debris lying around, which, when wanted, could not be recovered and was lost.

Another way of loss in gold has come to my notice, namely, blasting. I have noticed men at work on a gold reef drilling; it was known that it carried gold in paying quantities, but after it was mined it would scarcely pay for milling. This might look strange, but nevertheless it's true; the loss occurs in this way. In the blasting operation the hole would be overcharged, and when the explosion occurred the ore could be seen cutting off the limbs of the trees. The hole that ought to be charged with judgment sufficient to break the ore and keep it in the workings was overcharged, the ore all blown away, and what gold there was in it was lost. From time to time an average sample would be taken from these workings in a very careful manner, sent to the assayer, the returns would be satisfactory, still carrying gold in paying quantities; that was all right, but when everything was ready at the mill the prospects for the company looked bright. The mill started on ore that ought to realize so much per ton, but when the clean-up came it was far short of that figure, then some one says this cannot be the right mill for this ore. The

mill is condemned when the fault is in the mining, and the loss occurred before it ever reached the mill.

It is a great drawback to any company either with a large or small capital which has spent a large amount of money to have its ore tested before putting in machinery to make sure, to find that the best part of their lode has been lost. It was on that pile of ore its hopes were centred. Other men were watching what the result would be; if satisfactory, they would take stock. There were so many tons put through, so much gold was recovered, the thing was not satisfactory, therefore they would not have anything to do with it. The lode had been worked deeper, it would cost more per ton now to mine it; in other words, it would cost twice as much to mine it now as what it did above, therefore the company's money has run out, making it impossible to carry on the work any longer. After a large, expensive operation the mine is shut down, being, in the opinion of some, no good, played out, when at the same time here is gold in the mine in paying quantities, but through mismanagement at the start the company was handicapped. If gold is worth mining at all, it is worth mining properly, and I firmly believe that if our mines were carried on with the proper mining system, and everything was done to the best interests of the company, and some things left undone that are being done till the mine gets on a good footing, and expenses kept down, and things only erected and put up when needed, and the demand called for it, there would be better times in mining. It is a very bad policy in mining to think a thing is needed. It is no use to work a mine on a thinking system, to think a thing is required, and when it is there and costs a large amount to get it there, and then see it is no use. The thing is to be sure it is needed, and not to spend your employer's money on a thing that is not required. Another thing is to make a success. If you have some piece of work to do, know what you are going to do before you start. Be certain on that point, carefully weigh the matter over in all its details. Is it feasible? Will it answer the purpose it is intended for? Will it meet all the requirements which it will be called on to do? But do not have a half-a-dozen men working at a thing for three or four days, then find out that it is wrong, and that some other method would have to be introduced in place of the one that has been worked on. But be sure that you have it down right before starting it, in all its minute details, and when completed that it will be not merely an ornament, but a useful factor in the working of a mine. Mining as a rule does not call for frills and tassels in its different branches: it's these kinds of things cost money to get. What is wanted most in the erection of things pertaining to the working of the mine is strength and durability to stand all pressure that is brought to bear on it from

all points, for the safety of the miners and the successful working of the mine.

In starting a mine, if these things were considered at first, and a little less hewing and planning done, not so much of a surface showing made. That is not what makes a mine. It is a poor policy to make a little town on the surface first, and then look around to find the mine, after all the available cash has been spent in building up the town. That is not what the company wanted, or what it intended the money for. It was to open up the veins and prove them, first develop them in depth, open them out on their strike, prove their value, and ascertain first if it will make a paying investment. This to be done at a cost which the company will be able to meet.

But the company meets with a drawback. It finds that the money it had is gone. The shareholders visit the mine to see what the prospects are, to find that the mine is having a building boom on the surface. But down in the mine things are very quiet, as it was necessary to get some of the miners up on the surface to help to get things in shape, as it would not be wise to have anything out of order at the surface. This I maintain is wrong both to the Company and to the mine, for they are handicapped in this way. Money has been spent too freely on the wrong part of the mine, and instead of having their mine opened up with about two years' supply in sight, the company finds itself with about enough to make a mill run with. At the clean-up it finds it has a vein producing gold in paying quantities, but it cannot work the mine, for the simple reason that it has no money to pay the expenses to get out ore and enlarge the underground workings, and to get out ore enough to meet the capacity of the mill. Therefore, after spending a large amount of money, it is compelled to close down the mine. Then comes the question: Why did not such and such a mine pay? They could not have found anything there, and the mine gets a reputation as being no good, played out, when such is not the case, and this makes it uphill work for any company to fight against. Therefore, if a mine shows a good vein as far as it has been worked, and in a mill test produced gold in paying quantities, the fault cannot be in the mine. When things like this occur with a mine, it not only injures the reputation of that mine, but the district which it is in suffers to a certain extent with it. I know of one mine in particular that is closed down to-day, that in the mill run that was made on the mine produced gold in paying quantities, as I put through the run for the company in its mill erected on the mine. So that is conclusive proof that there are mines that would pay to work that the to-day lying idle on account of the way that work was done on them, in an unbusi-

ness-like manner in the start. But if the mines had been worked according to the means of the company, and only things erected that were absolutely necessary to put them on a working and paying footing, some of them could have been put there with the capital the company had in hand. But when so much unnecessary work is done, causing an expenditure which in most cases is an unredeemable loss, it puts a company with a small working capital to the wall. Practical mining involves more than some may think; it is not merely to drill a hole and then launch out as a practical miner and take on in some mine as one who knows all, but in fact would not know when the brass holes in the wind bore were choked, or the pumps going in fork, or a goose neck shackle from a squatter. A practical miner, from his boyhood to manhood, has to learn a lot to be a success in life, or a success to those that employ him. These are some of the different things he learns practically: Trimming, filling, mining in all its different methods, shaft man, pit man, timber man, to understand the working of a mine in all its details, to know what is required for the different workings, to be able when in charge of a mine to be not only able to give an order for a piece of work to be done, but to have an experience that if there is no one else in the mine can do it, to be able to turn in and do it himself, and when there is a dangerous piece of work to be done, to be there and take your place with the rest, and to never ask a man to go where you are afraid to go yourself. It looks bad when there is danger ahead, when the mining captain is waiting with his miners for his superior officer to come to help to carry it through, to have word sent saying that he has had a bad night or has a headache, but to go on with the work, it's all right. A practical miner in charge of a mine will stand by his men and share danger with them.

DISCUSSION.

Mr. James, Jun.—I don't understand how there can be a loss in blasting?

Captain Williams—My meaning is this, suppose you work an open cut, and you drill a hole in a certain place in the vein, and you overcharge that hole, when the explosion occurs the ore is driven about, and when you get back to the workings there is a vacant space and the ore is all gone. I have seen them going round with a basket picking it up afterwards.

[This Association is not responsible as a body for any opinions expressed in its Papers by Members.]

THE SEWAGE PURIFICATION WORKS OF WORCESTER, MASS.

BY CAPT. W. F. VAN BUSKIRK, O.L.S., A.M. CAN. SOC. C.E.
City Engineer, Stratford, Ont.

Engineers, as a rule, have little time or money to expend in travelling and making examinations of works such as those at Worcester, and it is difficult to get descriptions of engineering works, as the college professor and the mechanic fill the pages of the various Canadian engineering publications with mathematical problems and trade advertisements.

It occurs to the writer, therefore, that a short description of the works and of the experience of the city of Worcester in dealing with what is recognized to be one of the most difficult problems with which towns have to deal, may prove of interest, and may possibly be of some value to members of the association in considering problems of like character.

The plant at Worcester, Mass., for the chemical treatment of sewage has been for many years the largest and most interesting purification works in America. The plant was well built and has been well managed, so that we may take it for granted that no better results can be obtained by any similar plant operated under similar conditions.

The city of Worcester is situated upon the Blackstone River, has a population of about 98,000, and has in the neighborhood of 80 miles of sewers, which receive large quantities of manufacturing wastes, as well as the ordinary domestic sewage and surface water. The quantity of sewage was largely augmented by the flow of a small masonry enclosed stream. This water is now being separated from the sewage proper, and all additions to the sewerage system are being made on the separate plan, as it is not possible to properly treat the very large quantity of sewage now flowing into the river.

The Blackstone River is not used as a source of public water supply, but has, below Worcester, many dams for the storage of water for power, etc., for the numerous mills situated on its banks. Large quantities of organic matter from the sewage were formerly deposited in these ponds and in the bed of the river, and became exposed to the atmosphere during periods of low water. The

foul odors given off by these deposits were considered dangerous to health and were declared a nuisance; so that in the year 1886 the State Board of Health ordered the city to purify its sewage in some manner before discharging it into the river. Mr. Charles A. Allan, M.A., Soc. C. E., City Engineer, was sent to Europe to examine the most important sewage purification works, and upon his return reported that the sewage of Worcester could be most economically purified by chemical treatment, and that the effluent would be sufficiently pure to prevent the serious pollution of the river.

Acting upon Mr. Allan's recommendation, the city, in 1889, constructed six precipitation tanks, each being 66 2-3 x 100 feet x 7 feet deep, and these were put in operation as soon as completed.

Since that time there have been added ten new tanks, each 40 feet by 166 2-3 by 7 feet.

The capacity of the works is now upwards of 15,000,000 gallons per day, providing for the entire dry weather flow of the sewers.

The lime used for precipitation is slaked and mixed with water in two tanks, 8 x 6 feet each, the mixture being agitated by compressed air delivered by perforated wrought iron pipes placed in the bottom of the tanks.

The milk of lime is delivered to the main outfall sewer by an iron pipe entering at a point about 100 feet above the screen chamber. Sulphate of alumina was formerly used with the lime, but was discontinued. The quantity of lime used is about 900 lbs. per million gallons of sewage, or 40 tons per week, at a cost of \$6 per ton. This quantity is much less than is generally used, owing to the fact that the sewage of Worcester contains at times large quantities of iron salt from wire works, which is run into separate tanks and used gradually in connection with the lime.

After receiving its charge of lime, the sewage passes through a screen chamber, where all large substances are removed; thence flows down a mixing channel, with rather a rapid fall, to the channels between the settling tanks, whence it is directed, along with a small amount of the sewage containing the iron salts, into the various tanks, by means of movable flash boards. The sewage passes slowly from one tank to another, the solids in suspension gradually sinking to the bottom, until it reaches the last one in operation, whence it flows out over a weir to a channel which conducts it to the river. The effluent looks bright and transparent, but appears to contain a considerable quantity of lime in solution at times, as the stones with which the outlet channel is paved were coated with lime.

From one to three tanks are "cut out" each day, and after

being allowed to stand quiet for a short time, the clear liquid is drawn off by means of hinged floating arms from pipes provided with valves passing through the walls of tanks.

The sludge deposited in the bottom of tank is then run off to the sludge well through masonry channels located under the sewage channels between the tanks.

It is then pumped from the well by a Shone ejector, the air for which is compressed by power from a water wheel driven by the effluent from the tanks at the main outlet. After leaving the well the sludge is deposited on beds where the water is gradually drained off. The sludge has not been utilized to any great extent, but it is reported to be growing in favor, and presses are being put in which will leave the material in a form that will permit of economical handling or disposal.

The force of men generally employed on the works consists of four day men and two night men, occupied in cleaning tanks, etc., and one day man and one night man employed in making tests of sewage, in order to ascertain the quantity of lime to be applied.

An idea of the efficiency of the process may be gathered from the fact that 54 per cent. of all the organic matter and about 92 per cent. of the suspended matter contained in the sewage is being removed.

Notwithstanding the fact that nearly all of the suspended matter is removed, the town of Millbury entered action a short time ago to compel the city of Worcester to further purify its sewage, and in consequence of such action the city employed Mr. Samuel M. Gray and Dr. Drown to make a report on the plant. They have recommended that the effluent from the works be further purified before being discharged into the river, and for this purpose an area of ten acres is being prepared for sand filtration. There is a little doubt, however, whether this will abate the nuisance or not, as the river bed and mill ponds are still covered with the organic matter deposited before the works were put in operation and during heavy storms since that time when the whole of the sewage was not passed through the tanks.

The report above mentioned affords further evidence of the fact that purification by chemicals is an incomplete process, and the lime and organic matter remaining in the effluent may give trouble when discharged into streams and small bodies of water.

The experience of Worcester is particularly interesting, as being in all respects similar to the experience of England, where it is found that notwithstanding the many improvements in settling tanks and in the methods of applying chemicals, it is not possible to produce effluents of sufficient purity to be discharged into the smaller rivers without causing complaints, and, as a

consequence, the effluents are generally subjected to further treatment by rapid filtration through gravel, coke, or some such material.

Chemical precipitation, it is true, may in some cases give a degree of purification sufficient for the conditions which obtain, but the writer is of opinion that it will in most cases prove less expensive to treat sewage by rapid filtration through gravel, aided by a current of air; and when the conditions demand complete purification, the effluents can be filtered in the ordinary way at a very high rate per acre.

It has been shown by experiments conducted by Board of Health of the State of Massachusetts that Rapid Filtration through gravel or coke gives an effluent comparable in all respects with that obtained by Chemical Precipitation under the most favorable circumstances and has the advantage that the sludge is disposed of, as it is consumed in the pores of the filter.

Recent experiments in England confirm the conclusions of the Massachusetts Board of Health, and we may expect in the near future to find many of the chemical plants supplanted by more scientific and less costly methods.

DISCUSSION.

Chairman—Did you mention, Mr. VanBuskirk, what the total discharge of the river itself was into which the effluent was emptying?

Mr. VanBuskirk—No, I did not.

Chairman—Have you estimated the cost per head of population that this process involves?

Mr. VanBuskirk—About three cents, I think.

Mr. Butler—Per day?

Mr. VanBuskirk—For a year.

I might say, Mr. Chairman, I have been there four or five times, but I thought I would make a short description of it, and if anybody would like to find anything more about it they can find it in the files of The New York Engineering News. There was a complete technical description of it about a year ago. I don't know that it gives the cost anywhere, but the cost of running that works is somewhere about \$25,000 a year.

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“THE PRINCIPLES OF EVIDENCE.”

By M. J. BUTLER.

Napanee.

The subject matter of this paper is prescribed for the examination of candidates for admission as Ontario Land Surveyors. Hitherto, fortunately for the most of us, a very mild interpretation has been given to the phrase by the Board of Examiners. An interpretation more in keeping with the intention of the Act will likely be adopted for the future. Let us seek to analyze the phrase “The Principles of Evidence,” in the hope that we may clearly apprehend what is intended. By the word “Principles” we understand the elemental fundamental truths of a science. By the word “Evidence” “That which tends to prove or disprove any matter in question, or to influence the belief respecting it. Belief is produced by the consideration of something presented to the mind. The matter thus presented, in whatever shape it may come, and through whatever material organ it is derived, is evidence.”—Prof. Parker, Lectures on Medical Jurisprudence in Dartmouth College, N.H.

Greenleaf, vol. 1, chap. 1, defines Evidence as “That which in legal acceptance includes all the means by which any alleged matter of fact, the truth of which is submitted to investigation, is established or disproved.”

Evidence may be considered with reference to its *instruments*, its *nature*, its *legal character*, its *effects*, its *objects* and the *modes of its introduction*.

The instruments of evidence, in the legal acceptance of the term, are:—

- (1) Judicial notice or recognition.
- (2) Public records.
- (3) Judicial writings.
- (4) Public documents.
- (5) Private writings, as deeds, writings, contracts, wills.
- (6) Testimony of witnesses.
- (7) Personal inspection by the jury or tribunal.

In its nature evidence is direct or presumptive, or circumstantial. Direct evidence is that means of proof which tends to show the existence of a fact in issue, and does not arise from any presumption. Evidence is direct and positive when the very facts in dispute are communicated by those who have the actual knowledge of them by means of their senses. In one sense, there is but

little direct or positive proof, or such proof as is acquired by means of one's own senses; all other evidence is presumptive, but in common acceptation direct and positive evidence is that which is communicated by one who has actual knowledge of the fact.

Presumptive evidence is that which shows the existence of one fact by proof of the existence of another or others, from which the first may be inferred, because the fact or facts shown have a legitimate tendency to lead the mind to the conclusion that the fact exists which is sought to be proved.

Circumstantial evidence is sometimes used as synonymous with presumptive evidence; but presumptive evidence is not necessarily and in all cases what is usually understood by circumstantial evidence. The latter is that evidence which tends to prove a disputed fact by proof of other facts which have a legitimate tendency, from the laws of nature, the usual connection of things, the ordinary transactions of business, etc., to lead the mind to a conclusion that the fact exists which is sought to be established. (See 1 Starke's Ev., 478.)

In its legal character, evidence is primary or secondary and prima facie or conclusive.

Primary Evidence: The best evidence, or that proof which most certainly exhibits the true state of facts to which it relates. The law requires this, and rejects secondary or inferior evidence when it is attempted to be substituted for evidence of a higher or superior nature. For example, when a written contract has been entered into, and the object is to prove what it was, it is requisite to produce the original writing, if it is to be had; and in that case no copy or other inferior evidence will be received. So, too, when the question is as to whether a post is an original one—the evidence of one who knows it to be such must be had if obtainable.

This is a rule of public policy, grounded upon a reasonable suspicion that the substitution of inferior for better evidence arises from sinister motives and an apprehension that the best evidence, if produced, would alter the case to the prejudice of the party. This rule relates to the quality of evidence, not to the quantity of it.

Secondary Evidence: That species of proof which is admissible when the primary evidence cannot be produced, and which becomes by that event the best evidence.

But before such evidence can be allowed it must be clearly made to appear that the superior evidence is not to be had. The rule requires that the party or person who possesses it be applied to whether he be a stranger or the opposite party; in the case of a stranger he must be served with a subpoena duces tecum, if the opposite party it is sufficient to serve him with a formal notice demanding the documents or thing, and in all cases proof must

me made of the facts of such service. There is a difficulty when a stranger, after having been served with a subpoena duces tecum, refuses to supply the evidence. No secondary evidence can be given, but he is liable for contempt of Court, and may be made to respond in damages for such refusal. A party to the cause after service of the notice to produce, who refuses to obey the demand, cannot afterwards contradict the secondary evidence, even though it be inaccurate.

It has been decided, at least in England, that there are no degrees in secondary evidence; and when a party has laid the foundation for such evidence he may prove the contents of a deed by parol, although it appear that an attested copy is in existence.

Prima Facie Evidence is that which appears to be sufficient proof respecting the matter in question, until something appears to controvert it, but which may be contradicted or controlled.

Conclusive Evidence is that which establishes the fact: as in the instance of conclusive presumptions, etc.

Admissibility of Evidence: In considering the legal character of evidence, we are naturally led to the rules which regulate its competency and admissibility, although it is not precisely accurate to say that evidence is in its legal character competent or incompetent; because what is incompetent for the consideration of the tribunal which is to pronounce the decision, is not, strictly speaking, evidence. But the terms incompetent evidence and inadmissible evidence are often used to designate what is not to be heard as evidence, as witnesses are spoken of as competent or incompetent.

As the common law excludes certain classes of persons from giving testimony in particular cases, because it deems their exclusion conducive in general to the discovery of the truth, so it excludes certain materials and statements from being introduced as testimony in a cause, for a similar reason. Thus, as a general rule, it requires witnesses to speak to facts within their own knowledge, and excludes hearsay evidence.

Hearsay is the evidence, not of what the witness knows himself, but of what he has heard from others. Such mere recitals or assertions cannot be received in evidence, for many reasons, but principally for the following—first, that the party making such declaration is not on oath; and, secondly, because the party against whom it operates has no opportunity of cross-examination. 1 Phillips Ev., 185. The general rule excluding hearsay evidence does not apply to those declarations to which the party is privy, or to admissions which he himself has made.

Admissions are the declarations which a party by himself, or those who act under his authority, make of the existence of certain facts. A statement of all the distinctions between what is to be regarded as hearsay and what is to be deemed original evidence

would lead us too far on this occasion. The general principle is that the mere declaration, oral or written, of a third person, as to a fact, standing alone is inadmissible.

Res Gestae. But when evidence of an act done by a party is admissible, his declarations, made at the time, having a tendency to elucidate or give a character to the Act, and which may derive a degree of credit from the Act itself, are also admissible, as part of the *res gestae*.

The Effect of Evidence: As a general rule a judgment rendered by a Court of competent jurisdiction directly upon a point in issue is a bar between the same parties and their privies in blood or in law.

The object of evidence is to ascertain the truth between the parties to the cause.

Necessarily in preparing a legal paper there is no room for originality of matter. All one can do is to consult the legal authorities and quote verbatim, the difficulty being to know where to stop, hence in what precedes little more has been done than to abstract the excellent article in Bouvier's Law Dictionary. The writer is well aware of the imperfect and fragmentary character of this paper, and can only advise those desirous of pursuing the subject to read Reynold's edition of Stephen's Digest of the Law of Evidence. The recent work by Mr. R. E. Kingsford, Barrister, of Osgoode Hall, will probably be more in conformity with the Evidence Act of Ontario, but as the writer has not had an opportunity of reading it he is unable to judge its merits.

DISCUSSION.

Mr. Gaviller—I suppose Mr. Butler's object, especially as he is a member of the Board of Examiners, would be to frighten all future candidates into the idea they had to get several very large and expensive volumes and read up this subject, but I think it is an excellent thing having a paper upon it, and especially the paper we have just heard; because, as far as the examinations have gone at the present, if any candidate was to simply get hold of our next year's report and read this paper when printed, it would go a very long way to help him to get through his examination.

But, as Mr. Butler suggested, and it no doubt will be done in the future, the subject of Evidence will be paid a great deal more attention to as a subject of examination in the finals, and the more experience we have as examiners and have had, we find it the more necessary from the very extraordinary answers we get to the very

simple papers that have been given, and the candidates are not to blame for this, because all of us know how difficult it is in a great many cases to take an affidavit of the very extraordinary evidence that we have submitted to us, which makes the subject still more important, knowing, as long as human nature is human nature, that the tendency of all parties, especially out in the country, will be—the tendency, I say, I don't say the deliberate intention—to make their evidence coincide with what will most benefit their own property.

That is pretty well understood by all surveyors who have taken evidence as to lines and points, and the more we are safeguarded as to what real proper evidence is, and what the witness should know, and that he should give his knowledge in his evidence, the better able we shall be to draw up a decent affidavit and to get evidence upon the subject, and reject what is not evidence.

Because, as Judge Hagarty once remarked on a case in Court, in speaking to a celebrated Q.C., who was examining a witness, "Mr. So-and-so, you must remember that a surveyor is sent out in a semi-official manner. He holds a position in which he has to take the evidence before he can make up his mind what the result will be."

The question asked the surveyor on that occasion was, "What is your opinion on this case from what you heard?"

Well, now, the answer that he got was, "I knew that the case was coming into Court, I knew that the parties who were those who understood the case the best, would be examined in Court. There was a great deal of hurry in making the survey, consequently the evidence was not taken from those parties. They are here about to be examined in the Court. I have not heard their evidence, so I simply have not made up my mind what opinion to form on it."

Then, when he was constantly pressed to give an answer as to his opinion, the foregoing remark was made by Justice Hagarty.

I think we are very much obliged to Mr. Butler for the paper he has read, and I hope it is only the commencement of much information on this subject.

Chairman—When the surveyor takes evidence in the field in reference to a corner stake from a farmer who points out the stake as one which had been pointed out to him by his father as being kept up under the original survey, would that come under the definition of hearsay evidence?

Mr. Butler—I think it is hearsay evidence, and I think it is a weak point very often in the surveyor who takes it down, and I know I have done it myself, but it is not primary evidence, but it may be the best evidence obtainable under all the circumstances.

Mr. Campbell—Mr. Chairman. I think we have dealt with a

very important point this morning in this matter of taking evidence, and how to take evidence. I know something about taking evidence, and there is a heap I don't know about it, and I do not think I ever will become posted on what evidence should be admitted in trying to establish a lost point, and what evidence should be ruled out, and judging from the paper read by Mr. Butler this morning it looks to me as if volumes might be written on this subject, and Mr. Butler is the very man who could write these volumes.

It is an unfortunate thing for us as an Association that we should confine ourselves to meeting once a year, or if meeting only once a year that we should confine our meetings to two or three days, because our papers are of the greatest importance as educators, and I think many subjects have been very ably dealt with.

Now, the question of sewage purification, dealt with by Mr. VanBuskirk this morning, is a question of very great importance in this country. Nearly every city and town to-day is interested in the question of disposal of sewage and information on this subject is very much needed.

Mr. VanBuskirk is well acquainted with the system of sewage disposal dealt with in his paper, and he comes here to-day giving us personal information, or information from personal experience.

Mr. Butler has had experience in connection with the taking of evidence, and he comes here also prepared to give us the result of personal experience, and for that reason I think that these papers should be taken up and discussed more fully than they have been; or, better still, if this cannot be done, we should try to induce these gentlemen to write text-books on these different subjects for those of us who have not, owing to our multifarious and arduous duties, sufficient time to devote to a consideration of these problems.

I do think it would be of great benefit to the Association if Mr. Butler should take up the question of evidence and write a text-book, not for the use of students only, that is, those who intend entering the profession, but for all the members of the profession. I am very much pleased with this paper on Evidence.

Chairman—I think Mr. Campbell's remarks are very pertinent. I think one reason why a fuller discussion does not take place is the fact that there are a great number of papers written and the time is limited.

Another reason is, too, that in a discussion of a paper, particularly a technical paper, the paper not having been printed before the meeting, the members are not sufficiently conversant with the subject and are not in a proper position to discuss the subject.

Now, I know for two years at least the papers were printed before the meetings. I don't know whether they were printed at such an early date that they were distributed among the members,

but if the members could be induced to have all their papers sent in long enough before the annual meeting to have them printed and distributed to each member of the Association, as is done in other societies, then a better discussion would take place upon the papers, and in the case of absent members they could send in their written opinions on the papers.

[*This Association is not responsible as a body for any opinions expressed in its Papers by Members.*]

SUDBURY WATERWORKS.

By L. V. RORKE.

Sudbury.

So many papers have been read by different members of the profession on this available subject, "Waterworks," the writer feels that it may be only trespassing on your time to attempt another, but when we consider that no two systems are identical and that each plant will have one or more particular points of interest in its construction or maintenance peculiar to itself, I am encouraged to proceed. In view, however, of this, I shall only give a general outline of the system, going into details of construction only, where I may hope to attract your interest.

Sudbury assumed the dignity of a town some five years ago, and at present has a population of about 2,000. Mining, lumbering and railway operations are what engage the attention of its people, commercially or otherwise, situated as it is at the junction of the main line of the Canadian Pacific Railway with what is known as the "Soo Branch," and in the centre of the great nickel mining belt of the Province, and also being the chief distributing point for supplies to the lumbering camps of Northern Nipissing and Eastern Algoma.

In 1894 the question of a Waterworks and Sewerage System was discussed, and a By-law to raise the necessary funds was submitted to the ratepayers and carried, only a very small vote to the contrary, and the writer, together with J. R. Gordon, Civil and Mining Engineer, were engaged as Designing and Constructing Engineers by the Corporation.

That the passing of By-law met with little or no opposition (which is not generally the case) was due to the following reasons :

1st. Wells were scarce, it being necessary, to obtain good water, to bore through from 60 to 80 feet of "running sand" into the rock below, in the central part of town, and the cost of this was too great.

2nd. The water in the small river flowing through the town was totally unfit for drinking purposes.

3rd. Those who had not wells were obliged to buy water purchased from a small spring within the limits of the Corporation, from water carts, at 25c. per barrel, and the poorer classes did not obtain a fresh supply as often as health demanded.

4th. The cost of water so obtained was greater than the water rates which the Corporation could supply householders for.

5th. In the business portion of the town people were compelled to water the streets by a volunteer tax during the summer months, which would be much reduced when water was more easily obtained.

6th. The hope that insurance rates, which are exceptionally high in those northern places, would be greatly reduced.

In designing the system we were handicapped in one particular. It was necessary to keep the expenditure down to the lowest possible notch and give the ratepayers water. The Corporation was enterprising, but not wealthy, and the engineers, being residents, were fully aware that the "town fathers" were compelled to finance carefully, as well as supply necessary demands, and were willing to co-operate with them and keep down expense; but not, however, with a "penny wise-pound foolish" motto, but only in such cases where the town would not materially suffer and where changes and extensions can be made in future with little additional expense. The principal clippings were all ornamental designing, extension of mains to outlying portions, extension of conduit, and filtration.

While, therefore, not being able to present to the engineering profession a perfect system, we do at least present the foundation for such, as well as fulfilling the requirements, and meeting the wishes of even an enterprising and ambitious town.

While reading the paper on "Waterworks" by T. H. Wiggins, C.E., as published in last year's proceedings of the Association, wherein he cites cases of the earlier development of water power, I was reminded of an instance which occurred here previous to the construction of the system.

There was keen competition amongst a few men for the contract of street watering, and those who had the matter in hand were surprised to receive a tender for the work much below the other figures. They, however, accepted the lowest tender, and were curious to know how he would be able to do the work for the price. The ingenuity of the man came to his help, and being aware that the filling of his water tank was where his time and labor were lost, he constructed a large paddle-wheel about 12 feet in diameter, with an open tin-can attached to the edge of each paddle. These buckets were of different sizes and shapes, however, as old oyster cans, camp tea pails, tobacco caddies, etc., were used. The wheel was placed over a small creek in town and propelled by the force of the stream; as the laden bucket passed the apex of the wheel the water was spilled on its downward course into a wooden trough which conveyed it to his tank, standing on a low bridge some 25 feet away. True, a considerable portion of the water never reached

the tank, but he saved time and made his contract pay, much to the surprise of his rival competitors.

The only available source of supply was Lake Ramsey, which is situated about three-quarters of a mile from the central part of town and is 25 feet below the level of same, rendering a pumping system necessary. Lake Ramsey, which is so named after the late W. A. Ramsey, Chief Engineer of the C. P. R. construction, is five miles long and from one-half to one mile wide, and is fed by small streams and springs from its immediate vicinity. Its position on the height of land separating the watershed of the Walmapitae River from that of the Whitefish River excludes it from being the receiver of any great extent of surface drainage, and while the water is not rated as first-class, there is nothing injurious or obnoxious in its constituents.

The pumping station is built upon the shore of the lake and consists of pump and boiler room 26 x 30 feet, electric light room 26 x 34 feet, with a one a half storey commodious dwelling above electric light part for the electrician and engineer. Just outside of station is built a well, into which the water from lake gravitates by means of 500 feet of steel conduit 11 inches in diameter. The walls of well are built from 18-inch brickwork at bottom to 9-inch at top, laid and lined with cement. The intake at end of conduit is a steel funnel placed upright to pipe, with a perforated lid 30 inches in diameter.

About one-third of a mile from the lake, and towards the town, a rocky hill stands out as though nature had placed it there purposely, on which to erect the water tank. The top of hill is 100 feet above the lake surface, or 75 feet above the town; upon this is built a steel tower 80 feet high and supporting the steel water tank, 24 feet in diameter and 24 feet high.

The tower, built by the Canadian Bridge and Iron Co. of Montreal, consists of six columns of 6-inch T iron set on bases 3 feet square, of cut stone from the Longford quarries, set in cement and bolted to the solid rock below. These columns are braced by three sets of horizontal girders of same dimensions and with wrought iron inch tie rods. The columns are placed with 50-foot spread at base and converge to 25 feet at top.

Water is pumped into this elevated tank through a 10-inch main, and from thence gravitates through 10, 8, 6 and 4-inch mains throughout the system.

The pumping plant consists of two direct-acting duplex Northey pumps, each guaranteed to pump at a safe and reliable fire speed 30,000 gallons per hour, with steam pressure of 80 lbs. per square inch. These are connected to delivery main with proper valves, to allow single or double action. The surface of water in well at low water mark is 9 feet below the pump valves.

The system comprises, approximately, 500 feet steel conduit, 11 inches diameter; 1,800 feet 10-inch main, 3,500 feet 8-inch main, 7,000 feet 6-inch main, 4,000 4-inch main, 26 fire hydrants with double hose connection, and 14 valves.

The principal portion of mains in the town are connected in circuit, there being only two dead ends upon the entire system. The distributing main to town branches from the main leading to tower is about 400 feet from the latter, at foot of hill, thus enabling the tank to be shut off at any time by means of a gate valve, and allowing direct pressure from pumps over the system in case of repairs at any time to tank, or in case of large fires, but owing to the high pressure obtained from the tower, the latter may never be required. Indeed, some householders grumbled that the pressure at tap was too great (a good fault); but to insure sufficient pressure at higher points within the town, it was necessary to give 80 lbs. in the lowest portion. The water mains throughout are laid to give a 5-foot covering.

The upright pipe to tank was protected from frost as follows: A boxing of 2-inch plank, 24 inches square, was built over the 10-inch main, and the interior space around pipe thoroughly packed with mineral wool. A second boxing of 2-inch plank, 36 inches square, was placed over all, thus leaving an air space. The outer box was covered on all sides with a coating of hot coal tar.

Water tank was enclosed, both roof and sides, with inch lumber, tar paper and shingles, coated with mineral paint outside of studding, and dressed and matched lumber on inside. A space of two feet was allowed between tank and covering, and a 3-foot walk outside, with iron railing.

The connection of delivery pipe with tank is made with a special cast-iron slip-joint, to relieve the strain caused by expansion or contraction due to the temperature.

SEWERS.

A system of separate sewers was included in the work for the thickly populated portion of the town.

Junction Creek, a stream 20 to 30 feet wide, flowing as it does around the eastern and southern border of town, is the outlet for the disposal of sewage matter, and for the present population meets with the requirements, though in time the main sewer may need extending further down the stream before discharging.

This stream empties into Kelley Lake some two miles to the south-west of the town and situated further down the watershed than Lake Ramsey, the source of water supply.

The main sewer, which extends along Lisgar street in a southerly direction to Junction Creek, is of 18-inch extra hard salt-glazed

sewer-pipe. The laterals extending east and west along the several cross streets are of 12, 10 and 9-inch pipe, as the case demands. The house laterals are of 6 and 4-inch pipe.

In laying the mains junctions were placed every 50 feet (the width of lots), and these, where present connection was not needed, were plugged by means of a circular wooden cap sawn to fit and cemented in. Extra precaution in all sewer joints was necessary, owing to the nature of the soil, which was at that depth a "running sand," and, if at all wet, would find its way through joints like water.

The greatest depth on main sewer was 20 feet, and this trench had to be timbered throughout to prevent caving in. The lower 4 feet of excavating had to be bucketed, shovelling being impracticable. All sewer trenching had to be tightly cribbed to enable safe and sure, as well as speedy, work. As a support or foundation for the pipe in main sewer, two layers of 2-inch planking, sawn in 3-foot lengths, were laid angling across the bottom of trench, the upper layer angling in an opposite direction to that of the lower.

The depth at which this "running sand" is found varies according to the amount of rainfall; in a very wet season three and a half feet is the maximum depth, while in a dry season one can dig five feet at the same place without fear of caving. When exposed to the drying elements this sand becomes quite hard and compact in a short time, but powders very finely.

Manholes were built of brick and cement, with cast-iron covers, over main sewer at all junctions with street laterals, and also at upper ends of street laterals and bends. Through these the sewers are flushed by means of hose attached to hydrants.

On all house laterals a cesspool trap is placed at street line for the protection of mains, which has served as a good check and shown in a few cases where inferior plumbing and careless occupants would ruin a sewer system if not protected by supervision or check as above.

In most cases a uniform grade of 3 inches per 100 foot was adhered to. The smallest grade which I had to resort to was .7 inch per 100 foot.

At outlet of main sewer there is quite a steep grade for 100 feet down the bank of creek, and the discharge is affected below the surface of the water. A solid retaining wall of brick and cement on face and rubble work behind is built around outlet for protection.

A stranger coming into Sudbury certainly fails to see any beauty in his surroundings. But he will be surprised on visiting the small and unpretentious homes of citizens to find all the modern conveniences and comforts afforded by the Waterworks, Sewerage and Electric Light Systems owned and operated by the Corporation of the town.

DISCUSSION.

Mr. Morris—Mr. President, with regard to the trouble they had with their sewerage, I can well understand it, because in 1881, while at Sudbury, it was found impossible, no matter to what expense we went, to dig wells of any kind. I was over a year and a half at Sudbury, and I don't know of a single well ever being dug, and while the work was going on at Sudbury I was always prepared to hear that the putting in of their sewerage system was found to be impracticable owing to quicksand, and the fact that it was found practicable is of some interest, and it is one of those cases where, no matter what the expense is, it is of great moment that the people should have water, for their own supply was merely from springs called Nolan's Creek, and another creek. In this case they went to a great expense in a small town, and the system that they put in was supposed to be foolhardy, but it was practically a necessity, and I don't know of any other case where a sewerage system was put in under such severe circumstances, that is in the way of excavation.

Chairman—There seems to be a tendency in the present days for cities to own their water-works and electric light systems. I know a short time ago I was looking over the report of the City Engineer of Toronto, together with some other reports on the electric lighting of Toronto; he reported on it last year and two or three years ago, and I compiled a table. I know of cities having a population of from ten to twenty-five thousand, including some thirty cities, principally in the United States, one only in Canada, and I found that the cost of operating the electric light was just about 50 per cent., I think, of the amount paid the companies on the average in places of that population.

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SPECIFICATIONS.

By JAMES HUTCHEON.

Guelph.

Land Surveyors in Ontario do nearly all the engineering work in the towns, villages and country districts of the Province, and consequently are frequently called upon to prepare plans and specifications for works of various descriptions about to be undertaken in their respective territories.

If in letting contracts the bidding could be restricted to contractors who have a reputation at stake, plans and specifications might be much less complete, but this cannot be done, and as some of those tendering will be honest, straightforward men, ready to carry out the spirit of their contract to the utmost, while others will be the very reverse, the engineer should do his part in a way that will insure the carrying out of the work contemplated in a regular and proper manner, and not place the honest contractor at a disadvantage with one of less honest intentions. In order to accomplish this, the engineer himself must of necessity have a clear and well-defined knowledge of the work which he wishes to have done, and should, whenever the nature of the undertaking admits of it, supplement his written specifications with both general and detail drawings. In the preparation of both drawings and specifications he must realize that they contain the completed work, and that in preparing them he is really constructing on paper that which he wishes to have carried out in other form. He should not fail to take advantage of every source of information that may be open to him nor to avail himself of the experience and knowledge of those who may have a part in carrying out the work. This is especially important in matters of which he may not have any expert knowledge or to which he has previously given but little attention, as useful hints may often be obtained by submitting a draft of the specification to a manufacturer or mechanic in that particular line of work and adopting such suggestions as commend themselves.

Every surveyor, in the practice of the profession, will gather specifications pertaining to the particular works with which he has to do, and these he should amend or revise from time to time, as experience points out where they can be improved. Standard

specifications prepared by engineers of recognized ability are usually obtainable for the principal engineering works and should be adopted wherever applicable, making such additions or alterations as may be necessary to meet the requirements of the case in hand. New cases, however, occasionally arise to which such specifications will not apply and, with a view to meeting those, the following suggestions are offered:

Let the language of your specifications be clear, concise and easily understood, and so definite that those tendering will know exactly what will be required of them. Make the arrangement such that the essential requirements will stand out prominently and not be buried among the general conditions or clauses of less importance.

The opening clauses should give a general description of the nature and extent of the work as a whole, and where plans accompany the specifications reference should be made to them. The succeeding clauses should define or describe the work in detail, following as nearly as practicable the order in which it will be taken up in construction.

The length of this description will be governed by the complexity of the work and the nature of the plans. In preparing drawings make them as complete as possible; the specifications will then deal chiefly with the quality of the materials, the nature of the workmanship and the final results to be attained. Following this, we should have the general conditions, referring, among other things, to the time and manner of payment, the payment for extra work and what shall constitute an extra, the appliances to be used, the protection of life and property, etc.

As already stated, the chief aim should be to give a clear knowledge of what will be demanded of the contractor. If the work consists of excavation, state the extent of it, tell how it will be classified and measured, how and where it is to be disposed of. If test pits have been sunk or borings made, give the results of those trials, but in general do not guarantee the accuracy of them. Require the contractor to do all pumping and shoring, if such are needed.

If you are building masonry, describe the quality of the stone, give the thickness of the courses, the dimensions of the stones, the manner in which they are to be dressed, the proportion of headers and the nature of the backing, i.e., whether it is to be of stones the same thickness as the face stones, or of stones of various thicknesses or of rubble. If heavy stones are to be used, require them to be handled with a derrick, otherwise you may meet a contractor who will attempt to roll them into place. It is not enough to say that the pointing shall be neatly done, for the contractor's idea of neatness may differ from yours.

It is a hard matter to get ordinary mechanics to change their usual style of work, hence in places where appearance is a secondary consideration don't attempt it, but instead, adapt your specifications to the situation, as nothing but vexation will result from trying to get masons accustomed to building rubble, work to 3-8 inch joints; better in such cases use a higher grade of cement or a richer mortar, with good flat-bedded stones well bonded, and dispense with fine dressing. For mortar, give the proportions of cement and sand, how they are to be measured and the quality of each. The usual proportions are 1 of cement to 2 of sand or 1 of cement to 3 of sand. The measuring can be very easily done in bottomless boxes on the mixing board; a 350-pound barrel of cement measured loose contains about four cubic feet. In small works, where the cement will not be tested, name the brand or brands that may be used. If a quantity will be required, specify the quality by naming the strength it must give in a seven-day test, the specific gravity, the fineness of grinding and soundness in the hot test. If water gives trouble, use a quick-setting cement, otherwise a moderately slow one.

In excavating or trenching in streets, let the surface metal be kept separate to be used in finishing, have the street left in the same condition that it was before beginning the work, and let the contractor maintain the part trenched in such condition for three or six months.

If you have painting to do state the kind and number of colors to be used, as that affects the labor required. If lead is to form the body of the paint, decide on which brands you will accept and require it to be brought on the work in the original unbroken package. Ask for pure linseed oil and forbid the use of benzoine and such adulterants. If the honesty of your contractor is not above suspicion, employ an inspector who understands the business.

In undertakings where unforeseen conditions are apt to arise, reserve the right to make such changes in the plans as may be deemed advisable.

Changes will affect the amount of labor and material required, therefore provide for the extra payment to be made in case of increase, and for the reduction, if the work is lessened.

Make the decision of the engineer final as to the interpretation of the specifications and whether the work is in compliance with them. Remembering that the engineer is only human; do not leave questions to be settled by his opinion where such can be previously provided for.

These suggestions might be extended, but if enough has been said to indicate the line along which the work of preparing specifications should proceed, the object of this paper will have been

attained, and for further guidance in the work I would refer you to Johnson's "Engineering Contracts and Specifications."

DISCUSSION.

Chairman—I might say Mr. Hutcheon has furnished a well thought out paper, full of practical suggestions, and one which covers and makes provision for a great variety of contracts. The paper is now open for discussion.

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THE YORK STREET BRIDGE, TORONTO.

By A. P. WALKER, O.L.S.

Toronto.

This structure stands near the foot of York street, Toronto, and affords access from the city to the water front for vehicles and foot passengers over the intervening railway tracks.

It was built under the provisions of the agreement known as the "Esplanade Agreement, 1892," the parties thereto being the Canadian Pacific and Grand Trunk Railway Companies and the City of Toronto. This agreement was one of the results of the endeavours of the Canadian Pacific to establish a freight yard in the central part of the city, and under it that Company were to construct the bridge, and the cost was to be borne in equal parts by that Company and the City, unless the Courts should decide that the Grand Trunk were liable for a share.

Plans of the proposed structure were prepared in Montreal, under the direction of Mr. P. A. Peterson, the Chief Engineer of the Canadian Pacific, and were approved by the City Engineer, Toronto. Work on the ground was commenced 1st May, 1896, and the bridge was opened for traffic about the beginning of August, 1897. The erection took much longer than anticipated, caused, in the first place, by the contractors for the ironwork being unable to obtain their raw material fast enough; in the second place, by a shipload of timber for the deck being wrecked en route; and, in the third place, by differences arising between the Company and the City regarding the finishing up of the roadway.

The general design of the bridge is a steel trestle, composed of about 32 spans, deck plate girders, ranging from 30 to 70 feet span, with wooden stringers and decks. There are also, in addition, two spans of less than 20 feet, rolled steel I beams. These girders and I beams rest on iron columns standing on stone pedestals, except at the three ends of the bridge, where there are stone abutments. The width of the roadway, except on the southerly ramps, is 37 feet 6 inches, with sidewalks on each side 7 feet 6 inches wide. On the southerly ramps the width of roadway is 32 feet 6 inches, with one 7 feet 6 inch sidewalk.

The ground plan of the bridge is "T-shaped," with the base resting on the south side of Front street, and it extends southerly therefrom across the deviation of York street and the railway tracks to Lake street, a distance of about 906 feet. Here the ramps of the bridge turn, one to the right and the other to the left, and descend to the level of the street. The length of these ramps are each about 316 feet, making a total length of bridge of 1,538 feet.

From Front street the roadway of the bridge rises with a grade of 1 foot in 20 for about 298 feet, and at the Lake street ends there are similar falling grades of one in twenty about 500 feet in length. Heavy loads to the railway freight sheds are taken over these grades every day, and no special difficulty seems to be experienced.

There are in all, three abutments and sixty-eight pedestal blocks. The foundations of the two Lake street abutments and all the pedestal blocks, except fourteen north of the south line of the old Esplanade, are on piles driven to the ledge rock. This was necessary, as this land was formerly part of Toronto Harbour, and had only been filled in the year previously with miscellaneous rubbish, earth, brick-bats, tin-cans, as well as more objectionable refuse.

When piles were to be driven, an excavation was carried down to one foot below zero level of the water of Toronto Harbour, and soundings were then taken down to the rock. The piles were then cut off the correct length and driven home with a "follower." Under the specifications the piles were to be cut off one foot below zero level, and the above method was found less expensive than actually cutting them under water, and it was very seldom that a pile had to be cut when once driven home. Only a very blunt point was made on the pile before driving. Four piles were driven for the small pedestals, 8 for the medium, and 9 for the large pedestals. Under the abutments the piles were 4 feet centres longitudinally and 2 feet 6 inches transversely.

The excavation was then carried down six inches below the top of the pile and two feet in depth of concrete put in. In some cases where the underlying material was very soft, short lengths of two-inch plank were laid flat under the concrete between the piles, in order to keep the concrete from settling in the soft material before it was set. The concrete foundation is 7 feet square under ten of the pedestals carrying the longer spans, 6 feet square under nine of the pedestals, 5 feet 6 inches square under five pedestals, and 4 feet 6 inches square under the remaining 44, and is generally 2 feet deep. The concrete was composed as follows: except when laid under water : Cement 1 part, clean sharp sand 3 parts, broken stone 5 parts, all by measure. Under water the

concrete was composed: Cement 1 part, sand 2 parts, broken stone 5 parts. The cement used was the "Star" brand, made by the Rathbun Company, of Deseronto.

Below ground the stonework is what is known as "rubble masonry;" above ground it is "rock-faced ashlar," and was built under the Canadian Pacific standard masonry specifications. The stone was brought partly from the contractor's quarries at Owen Sound and partly from the Orangeville quarry. The contractor for concrete and masonry work was David Chalmers, of Owen Sound. The piling was done by the Railway Company's own men and their track pile driver. The two top courses of the pedestals had to be drilled before being placed in position to receive the 1 1/4 inch iron rods which secured the iron columns to the masonry, and some little difficulty was experienced in drilling completely through these stones without breaking them. This drilling was done with a steam drill, half from each side of the stone.

The iron work was erected during the winter 1806-7. It was supplied and erected by the Central Bridge and Engineering Co. of Peterborough, Ont., and was paid for at so much per pound in the finished work. The bridge was designed to carry, in addition to its own weight, the following live loads, either singly or in any combination: (a) 100 lbs. per square foot of roadway and sidewalk; (b) one 32,000 lb. road roller having a wheel base of 11 feet 2 inches in length and 7 feet 4 inches transversely; (c) a string of electric cars 26 feet long, each weighing 30,000 lbs., fully loaded, on each track.

All parts of the structure were proportioned so that maximum loads should produce no greater tensile strain upon the net section than 12,000 lbs. per square inch. A wind strain of 400 lbs. for each longitudinal lineal foot, and 150 lbs. for each vertical lineal foot of the trestle bents was allowed for. All steel had to come up to the following requirements: Ultimate strength, 58,000 to 65,000 lbs.; elastic limit, 33,000 lbs.; elongation in 8 inches, 20 per cent.; reduction of area, 40 per cent., and was made by the open hearth process. Before leaving the shop it was thoroughly cleaned of all loose scales and rust with steel scrapers and brushes, and was then giving a good coating of red lead mixed with linseed oil, well worked into all joints and surfaces, and after erection the ironwork was given two more coats of paint.

All the timber in the deck of the bridge, with the exception of the sidewalk planks and paving blocks, is southern yellow pine, creosoted with 10 lbs. of dead oil of coal tar per cubic foot. On top of the joists and 4-inch plank was laid two thicknesses of best tarred paper, thoroughly sealed with roofing pitch to the planking and each other. On top of this was laid the paving

blocks, consisting of square-cut white pine blocks 8 inches x 4 inches x 4 1-2 inches deep, grain upwards. These blocks were held apart at the cross-joints by three specially made nails driven into each block up to the collar, leaving the blocks 3-16 of an inch apart. All joints and vacancies were then filled in with best paving pitch, and the roadway covered one-half inch deep with gravel. A double track girder rail for electric cars was laid across the bridge by the Street Railway Company before the paving was done for possible use in the future. The sidewalk planks are of tamarack, 7 feet 6 inches long, 2 inches thick, laid with 1 1-2 inches fall towards the kerb. The cost of the structure was approximately :

Foundation and earthwork, including piling	\$4,200 00
Stone and concrete work	15,900 00
Ironwork	43,000 00
Damages to St. James Hotel property	4,900 00
Deck and roadways	28,000 00
Engineering	2,000 00
	\$98,000 00

DISCUSSION.

Mr. Morris—I would like to ask Mr. Walker if there is any record of the construction of this work anywhere except what he has given in his paper.

Mr. Walker—I know of no other record.

Mr. Morris—I consider a paper of this kind to be exceedingly valuable not only to this society, but to the city of Toronto, and all those interested in large works in large municipalities.

[This Association is not responsible as a body for any opinions expressed in its Papers by Members.]

AN ILLUSTRATION OF THE NECESSITY FOR ACCURATE DESCRIPTIONS.

By GEO. ROSS, O.L.S.

Welland.

A Land Surveyor is frequently called upon to run out the boundaries and mark the corners of a tract of land in accordance with a description containing many discrepancies and capable of several interpretations, but he is expected to be able to locate all the limits of the parcel without hesitation, so that they will stand for all time to come. In some cases he is expected to do this without having an opportunity to examine the descriptions in the various registered instruments that might affect the limits of the land to be located, although several of the boundaries may be coincident with or governed by those of adjoining lands. The owner of a parcel of land expects the surveyor whom he has employed to run the lines according to his deed and does not want any time taken up in the survey of his neighbours' lands. The description may have been written by some "conveyancer" whose only qualification is that he is unable to make a living at any occupation, and the courses and distances given may overlap or leave vacant spaces between lands supposed to adjoin. However, the unfortunate surveyor is expected to "establish" the boundaries required without delay, although should the matter be brought up in court the acutest solicitors will give varying opinions and the most learned judges will arrive at decisions differing from each other at every stage of the case. Nothing goes further in fermenting and keeping up quarrels in a neighbourhood than disputed boundaries, frequently caused by inaccurate descriptions; and the fact that it is either impossible, or at least a very expensive proceeding, to remedy the defects in them, serves to aggravate the matter. Many erroneous descriptions are based on inaccurate original township plans, and the discrepancies in them are often made worse when the lot or tract covered by the patent from the Crown comes to be divided into several parcels, especially, as is frequently the case, when the descriptions are drawn out by a self-styled "conveyancer," without a special survey being made. The interpretation of a description may appear quite evident to one individual, but as various matters may ulti-

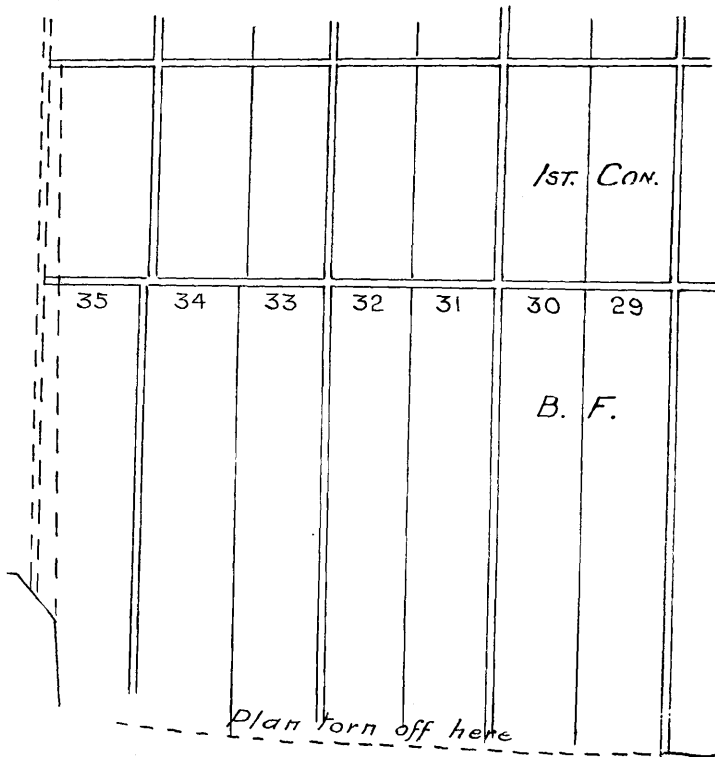
mately be shown to affect the case, it is often difficult to anticipate the final result where a discrepancy exists. The value of correct descriptions is not even appreciated by the legal fraternity,

PLAN N^o1 BERTIE

Supposed to be the original Plan

No date, no signature

Scale 40chs. to 1 Inch



as few of them hesitate to draw up the descriptions for the various parcels into which a block of land may be divided under a will, in accordance with any rough data that may be submitted to them.

However, they are gradually becoming alive to the necessity for accurate descriptions, based on actual survey.

The drafting of proper descriptions is one of the most important matters that can engage the attention of the student in surveying, and I would call to his special notice the papers on this subject already published in our Annual Reports. In this paper I wish to give some account of a case in which the patents from the Crown were founded on inaccurate plans, and caused a dispute as to the ownership of a tract of land, that was only settled after the lapse of a century.

On the 10th of February, 1797, the Crown granted to Timothy Skinner a certain parcel or tract of land, situate in the Township of Bertie, containing 100 acres, more or less, being composed of part of lot number 32, in front, near Point Abino, and situate, lying and being in the Township of Bertie aforesaid, in the County of Lincoln and Home District in the Province of Upper Canada, which said 100 acres of land are butted and bounded or may be otherwise known as follows, that is to say: beginning at a post on Lake Erie marked number 31-32, thence north 50 chains, thence westerly parallel with Lake Erie 20 chains, more or less, thence south to Lake Erie, and thence easterly along the bank to the place of beginning.

If we compare the description in the Skinner patent with plan A 1 of record in the Crown Lands Department, Toronto, it will appear that no part of Point Abino was intended to be included in this grant; but compare it with M. Burwell's plan B 7, on which Point Abino is correctly shown, and it will be seen to include nearly the whole Point.

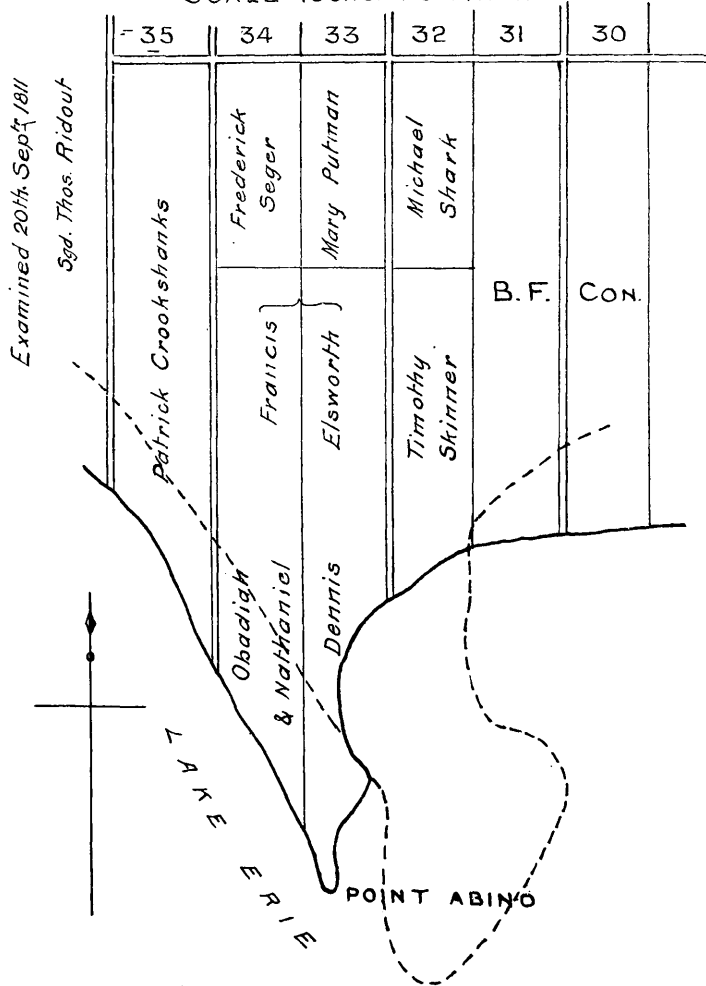
The Township of Bertie in the vicinity of Point Abino was surveyed by Deputy-Surveyor Wm. Hambly in 1894, and Deputy-Surveyor M. Burwell's plan is dated 28th May, 1828, and made from field notes taken in March and April, 1825. On the 20th December, 1793, instructions were issued to Deputy-Surveyor Lewis Grant to survey certain lots in the vicinity of Point Abino, "by continuing to lay off eleven lots of twenty chains front, with a chain of allowance between every other lot." Grant appears to have run out certain lines as shown on Burwell's plan. Deputy-Surveyor Thomas Welch also appears to have made certain "original" surveys in this vicinity in 1794 and 1795.

On the 7th of April, 1808, the Crown granted two hundred and fifty acres, more or less, to Obadiah Dennis and Nathaniel Dennis, being the front of lots numbers 33 and 34, on Point Abino, on Lake Erie, in the Township of Bertie, which said 250 acres of land are butted and bounded, or may be otherwise known as follows, that is to say: Commencing where a post has been planted marked 22. R. 22. standing on a marked line, in the rear of Point

PLAN A1. T^P OF BERTIE

Note: Broken line shows true position of Pt Abino. Not shewn on Plan A1.

SCALE 40CHS. TO 1 INCH



Abino, known by the name of Grant's line, at the south-east angle of lands granted to Francis Ellsworth, and being at the north-east angle of the now granted tract, thence south 21 chains, more or less, to Lake Erie, then southerly along the water's edge on the east side of Point Abino to the southernmost extremity of that Point, then northerly along the water's edge on the western side of that Point to the allowance for road between lots numbers 34 and 35, then north 36 chains, more or less, to the lands granted to the said Francis Ellsworth, then east along the southern boundary of said lands 40 chains, more or less, to the place of beginning.

From this description it would appear to be the intention to grant the whole of the Point to the Dennises, on the supposition that it lay in front of lots 33 and 34, but as it was mainly in front of lot 32.

In 1819 John Burch, P.L.S., made a survey and plan of Point Abino for Nathaniel Dennis and Thomas Otway Page, who then had possession of the land included in the Skinner patent. I attach a copy of Burch's plan, which is reduced from a scale of ten chains to forty chains. To Burch's plan is attached the following: Description of the south half of lot No. 32, in the Township of Bertie and the part of Point Abino in front thereof. Commencing at the north-east corner of the south half of said lot, at an original post marked 31-32, thence south 51 chains to Grant's line, then east one chain to the lake, thence southerly along the lake on the east side of Point Abino to the extremity of that Point, thence northerly along the lake on the west side of the Point to the allowance for road between lots numbers 32 and 33, thence north 57 chains to Grant's line, thence north 51 chains, thence east 20 chains to the place of beginning, containing 380 acres, more or less.

Description of land in front of lots 33 and 34: Commencing at the south-east angle of lot number 33, thence south 57 chains to the lake, thence northerly along the lake to the allowance for road between lots number 34 and 35, thence north 6 chains and 50 links to Grant's line, thence east 40 chains to the place of beginning, containing 127 acres, more or less.

Mr. Burch also took several affidavits, all going to show that the Dennises never claimed any part of Point Abino in lot 32. The following declaration of Nathaniel Dennis will serve as a type:—

“ In the matter of the original posts in the broken front on Lake Erie, on the south half on Point Abino, in the Township of Bertie, in the District of Niagara.

“Nathaniel Dennis, of the said Township of Bertie, in the above district, yeoman, declares and affirms:

“That he resides on the south end of lot 32, on Point Abino, which was granted to one Timothy Skinner in the year 1797. That he has lived on the said lot 32 on Point Abino under the said Timothy Skinner and his successors since 1800 to the present day. That his brother, Obadiah Dennis, in the year 1798 moved on Point Abino from the Grand River at the request of the said Timothy Skinner, when he applied to the Crown for a patent to the south half of lots 33 and 34. That the said patent issued finally in the year 1808. That he has always since the year 1800 been acquainted with the only recognized posts marking the northern boundary of the said grant to Timothy Skinner of the south half of lot 32, on Point Abino. That the said post stands at the north-east angle of the south half of the said lot 32, broken front, on Lake Erie, 50 chains north from the lake bank, between the said lots 32 and 31 in the limits between the north half and south half of the said broken front on Lake Erie. That he never in any way claimed any part of the said south half of the said lot 32, by right of precedence, excepting that he had hoped to buy the equal undivided half interest of one Michael Sherk, who had acquired a title thereto. That by a mistake in the grant for lots 33 and 34 the said patent was unsatisfactory to both grantees of the south parts of lots 33 and 34, and which was issued in 1808. That until 1808 he never heard of a Grant's line marked merely to show the length of one hundred acres. That he does not now claim any of the south part of said lot 32 because of his residence thereon on Point Abino. That he never heard of any other post in the said broken front excepting one at the north-east angle of the grant to Obadiah and Nathaniel Dennis, standing on the allowance for road between lots 32 and 33, fifty chains south from the northern limits of the south half of the said lots 33 and 34.

“Declared before me, at Point Abino, on Monday, the 18th of October, 1819.

“NATHANIEL DENNIS.

“JOHN BURCH, P. L. Surveyor.”

Obadiah Dennis, in his declaration before Mr. Burch, states in part as follows: That he was born in the year 1754, and in the 40th year of his age he did personally assist in fixing the boundaries of lot 32 of broken front Lake Erie, which said lot had been entered by Timothy Skinner in 1789 or 1790 on Point Abino. That the said survey was completed by one Welch for the said Timothy Skinner. . . . That the said Timothy Skinner, before the above survey, had built a good log house, which is standing at the east end of the second sand hill, and had cleared up all

BERTIE PLAN B.7

28th. May 1828

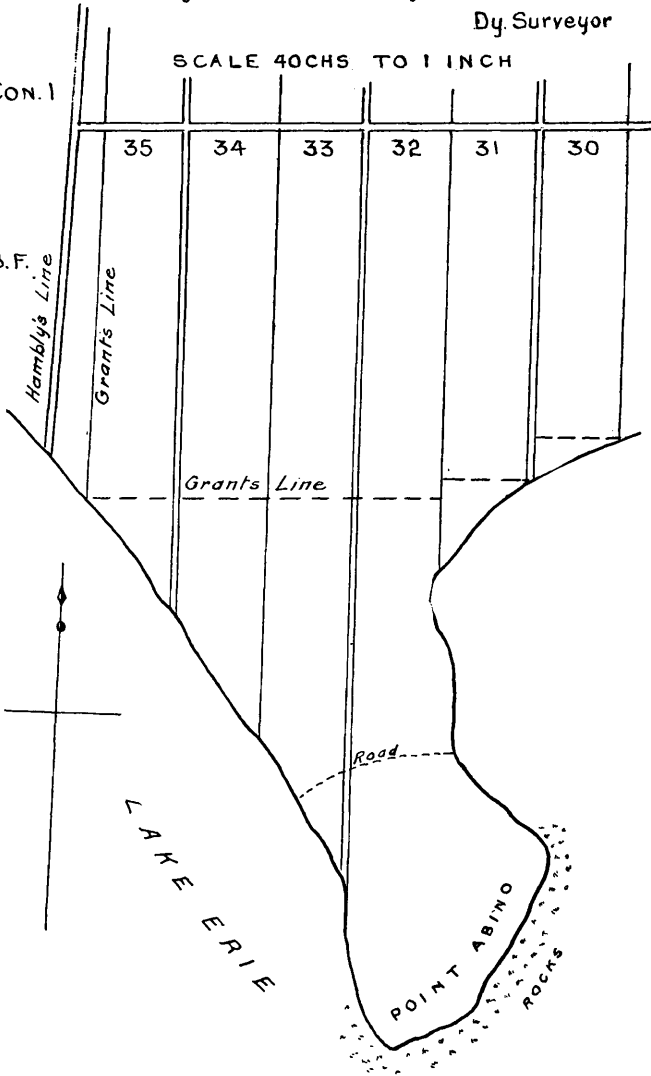
Sgd. M. Burwell

Dy. Surveyor

SCALE 40CHS TO 1 INCH

CON. 1

B.F.



the available land on Point Abino between the first two hills. That the patent issued to the said Timothy Skinner in the spring of 1797 for the whole of the said lot 32, on Point Abino. That on Saturday, the 5th of May, 1798, at the request of the said Timothy Skinner, he moved his family on lot 32, Point Abino, and there lived under the said Timothy Skinner and his successors until the year 1812, when he left Point Abino. That Timothy Skinner built a second log house in the fall of 1787, which his brother, Nathaniel Dennis, lives in till this day. That none of the Dennis family ever claimed any part of the south part of lot 32, broken front, Lake Erie.

The following is an extract from a letter dated Pelham Corners, Saturday, 12th, 6 mo., 1819, from Obadiah Dennis to Thomas Otway Page, who was then the owner of the land granted to Timothy Skinner: "Thomas, thou art mine friend, and by the hand of Brother Nathaniel I send thee this greeting of peace and good-will. Nathaniel came down to see me to glean some information about thine and his troubles at Point Ebineau, and I have felt it my duty to tell thee all I know about the matter, because no one living knows what I do. As far as I can remember, it was about the year 1789 that Timothy Skinner entered Point Ebineau. . . . He expected at first to take up the whole of lots 32, 33 and 34, in the south halves, comprising about 700 acres, in the whole three lots. But before his patent was issued, from old King George he invited my father to go and live on lot 32, or Point Ebineau, in about the year 1793, and then applied for their patents at the same time. Timothy Skinner got his patent for the south part of lot 32 in 1797, and my father having died I moved on Point Ebineau, at the wish of Timothy, and then applied for our patent for lots 33 and 34, again in my name, but which was not issued until 1808."

With all this information before him, it seems Mr. Burch had no difficulty in making the description in the Skinner patent cover the greater part of Point Abino, as well as one hundred acres to the north of the Point. However, it seems unreasonable that he should run one chain east on Grant's line from the east limit of lot 32 to the lake, as, if the east limit of lot 32 did not strike the shore of the lake, then the eastern part of the Point would be in lot 31.

Mr. Burch's account may be of some interest. It runs as follows:—

"BERTIE, 30th October, 1819.

"RE SURVEY POINT ABINO.

"Thomas Otway Page and Nathaniel Dennis, in account with John Burch, Dr. To professional service from the 18th to the 29th of October inclusively:—

	£	s.	D.
To eight days at one pound.....	8	0	0
To eight days assistant at 4s.....	1	12	0
To day's loss of time by rain.....	1	0	0
To two maps and diagrams, field notes, one copy for each.....	3	4	0
To work of assistant copying three affidavits in duplicate.....	0	8	0
To taking affidavit of Obadiah Dennis, since dead	1	0	0
Total	15	4	0
To three quarters cost to Thomas Otway Page	11	8	0
To one quarter cost to Nathaniel Dennis...	3	16	0
Total	15	4	0

“Received from Thomas Otway Page and Nathaniel Dennis cash in full of amount standing opposite each name as proportional share.

“JOHN BURCH, Land Surveyor.

“Bertie, 30th October, 1819.”

On the 5th of November, presumably in the year 1819, Nathaniel Dennis signed a document from which the following extracts are taken:—

“Three years after the date hereof I promise to pay Thomas Otway Page the sum of three pounds sixteen shillings for cash advanced for me to John Burch, the same being my proportional share of our joint survey of lots 32, 33 and 34, B. F. L. E., in the Township of Bertie, in the district of Niagara, on Point Abino, and completed by the said John Burch, a legally qualified surveyor, in October, 1819, and whereby we have irrevocably established the allowance for roads dividing the lands of the said Thomas Otway Page, comprising lot 32, B. F. L. E., and granted by the Crown to Timothy Skinner, in the year 1797, and the lands of Nathaniel Dennis, and granted by the Crown to Obadiah and Nathaniel Dennis, in the year 1808.

“The said allowance for road between lots 32 and 33 runs out on the west side of Point Abino, and only south as far as the rocks on the west, leaving all my lands in lots 33 and 34 west of the said road allowance and on the west side of the Point; wherefore, for mutual protection and convenience I hereby become the voluntary tenant and caretaker of the said lands of Thomas Otway Page,

pending the erection of a suitable tenement or residence upon my own lands."

After matters were thus "irrevocably" and amicably settled one might reasonably suppose there would be no further dispute as to the interpretation of the description in the Skinner and Dennis patents. However, it was nearly eighty years after the date of Burch's survey before the boundaries were finally adjusted by the decision of the Supreme Court of Canada.

The will of Ezekiel Dennis, the father of Obadiah and Nathaniel Dennis, is dated the 26th day of February, 1797, and lodged in the Surrogate Court on the 12th of August, 1803. The following are extracts from it:—

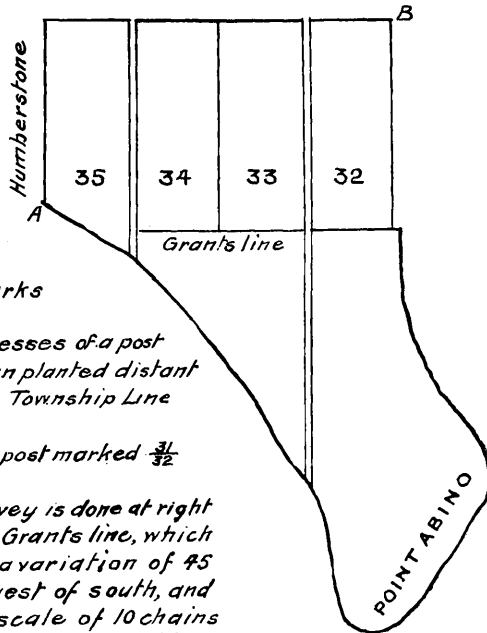
"In the name of God, amen, I Ezekiel Dennis . . . being in perfect mind and memory . . . I recommend my Sol into the hands of Almighty God that gave it . . . and as touching such worldly estate wherewith it hath pleased God to bless me in this life, I give, demise and dispose of the sam in the following manner and form:—First, I giv and bequeath to my oldest son, Obadiah Dennis, and Nathaniel Dennis, my third son, my rites and possessions on Point Ebino, beginning below where Obadiah Dennis' house opposit the road at the lak, and running along the road to the west sid of the point, let ther be more or less land in the survey to be divided between the two Obadiah is to have the aforesaid lin to the hill where between my house and Obadiah running through to the west sid of the point North of this tract of land the remainder from the aforesaid hill to Nathl. Dennis South of the aforesaid land, with my house and Improvements, to the aforesaid Nathaniel Dennis . . . I do giv and bequeath to the aforesaid Obadiah Dennis and Nathl. Dennis . . . to hold and hav forever, the premises, messuages and tenements by them to be possed and enjoyed, and if so be that Government has has refused the aforesaid land the are to hav each of them the right of One hundred accres a peec to tak and lay wher the shall chus themselves, to them, their heirs, Executors and administrators for ever, to hold the aforesaid Nathl. Dennis is to hold the place by virtue of a former article, the lifetime of his mother. Secondly, I do give and bequeath to William, Julia, Sarah, Rachel, Elen, Hannah, Catharin, My Son and Daughters, the Remainder of my land . . . for ever . . . to be equally divided between the Seven after the decess of my loving wife—Nathaniel is to giv her one half of the profit of the place during her lifetime . . . according to an article entered into the year 1792."

The houses and improvements referred to in the will of Ezekiel Dennis were on the eastern part of Point Abino and have remained in possession of Obadiah and Nathaniel Dennis, their heirs and

Plan of Point Abino, in the Tp. of Bertie, in the District of Niagara, and Province of Upper Canada

SCALE 40CHS. TO 1 INCH

*Sgd. John Burch
Land Surveyor*



Remarks

- A. Plain witnesses of a post having been planted distant west of the Township Line 80 links.*
- B. An original post marked $\frac{31}{32}$*

Note: The survey is done at right angles to Grants line, which required a variation of 45 minutes west of south, and laid on a scale of 10 chains (reduced to 40 chains) to an inch.

*sgd. John Burch
Land Surveyor*

successors, to the present time, the successors claiming the whole of Point Abino as far north as Grant's line. The successors of Timothy Skinner claimed all that part of Point Abino lying east of the west limit of lot 32, but it appears they occupied only that part of lot 32 lying between the south limit of the north 50 chains patented to Sherk and Grant's line, which ran east and west at the distance of about 100 chains south of the north limit of the said lot. This would leave the Skinner tract the depth of about fifty chains, as called for in the patent. At the time of Provincial Land Surveyor Burch's survey the Dennises apparently consented to the claims of Thomas Otway Page, the successor of Timothy Skinner. However, as they continued to reside on the eastern part of the Point and conveyed their lands in Point Abino according to the description in the patent of 1808, their successors remained in possession of the whole Point, and the labours of Mr. Burch were soon forgotten.

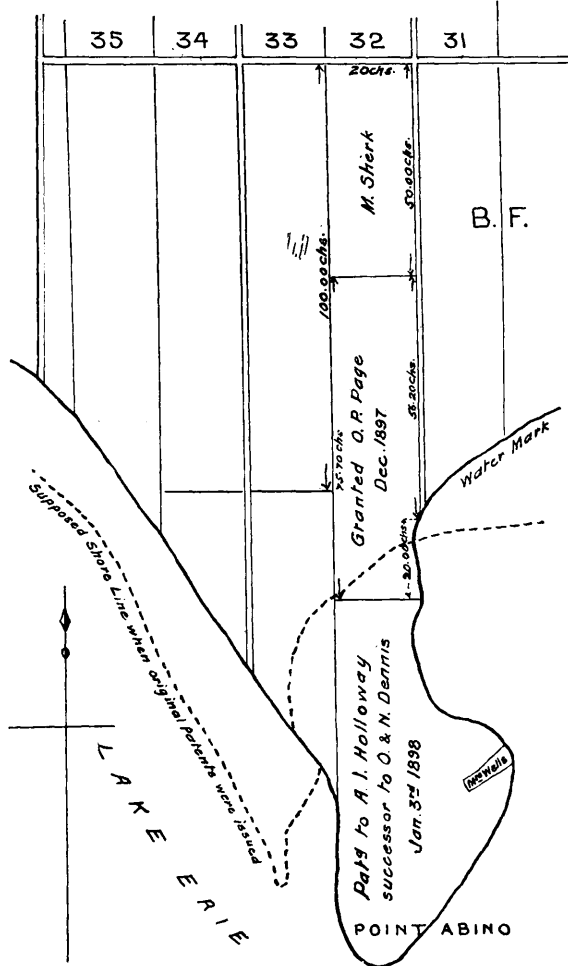
The road allowances, too, which he "irrevocably" established between lots 32 and 33 and between lots 34 and 35, were never opened out there, but are located between lots 31 and 32, and between lots 33 and 34, as it appears from evidence that Deputy-Surveyor Hambly, in the original survey, ran them out in the latter position instead of where they are shown on his map and were supposed to be, by Mr. Burch. Evidently Mr. Hambly, in running out this portion of the Township of Bertie, either laid out his roads between the wrong lots or showed them in the wrong position on the township plan.

According to township plan A 1, lot 32 in question is more than 100 chains in length. This would leave a parcel of land between the north 50 chains granted to Sherk and the south 50 chains granted to Skinner, and on the 22nd of June, 1840, this parcel, supposed to contain 36 acres, more or less, was patented to Samuel Street. It was described as follows: "Commencing in the limit between lots numbers 31 and 32, at the distance of 50 chains (on a course north) from Lake Erie, then north fourteen chains, more or less, to lands granted to Michael Sherk, in the said lot, then west twenty chains, more or less, to the allowance for road between lots numbers 32 and 33, then south twenty-five chains, more or less, to within the distance of fifty chains from Lake Erie, otherwise to lands granted to Timothy Skinner in the said lot, then easterly (along the northern limit of the said lands of Timothy Skinner), at the distance of fifty chains from and always parallel to the shore of Lake Erie, to the place of beginning."

The east limit of lot 32 is about 107 chains instead of 114 chains, and the lake shore being so different to what is shown on map A 1, on which the description is founded, it would be a very difficult matter to define on the ground the land granted to Street.

PLAN SHEWING Result of Litigation

SCALE 40 CHS. TO 1 INCH



However, the Sherk and Skinner tracts were always supposed by their owners to abut and no vacant land from the first was left between them. It seems rather peculiar that the descriptions in the patents for this portion of the township were still drawn out according to plan A 1, after M. Burwell's plan showed it to be so inaccurate.

The dispute as to the ownership of that part of Point Abino which the Skinner patent might cover never died out, but became very much alive when the land along the lake shore in this vicinity became valuable as building sites for summer residences, and on the 20th January, 1893, A. E. Otway Page, claiming under the Skinner patent, commenced an action in the High Court against Allan I. Holloway, who was in possession of Point Abino as successor to the Dennises. Shortly before this Mr. A. Niven, O.L.S., was instructed to proceed to the Township of Bertie and take evidence as to the possession or occupation of that part of Point Abino in dispute. Mr. Niven made a full report on this matter, from which I quote the following extracts: "As to improvements, very little was done until about the year 1870, when the Point came into the possession of Wells and Holloway. The only improvements that appear to have been made up to that date were on that portion of the Point east of lot 32, with the exception of a few acres that were cleared and cultivated . . . and consisted of four or five houses and a barn and lime kiln. The rest of the land in dispute, being unfit for farming purposes, was simply used for pasturage . . . It does not appear from the evidence that Page was ever in possession of any of the land south of Grant's line, as shown on Ross' plan, which line seems to have been by common consent recognized as the boundary between Page and the Point . . . There is now a board and wire fence on Grant's line running across lots 32, 33 and 34. The Point has come into use as a summer resort to some extent . . . Under all the circumstances, I think that Holloway, as successor to the Dennises, can fairly claim that he is entitled to purchase the 191 1-2 acres in excess of the 250 acres called for by the Dennis' patent, and, in my opinion, he and his predecessors in title have had such possession and made such improvements as would entitle him to become the purchaser, and at the same price as was paid for the 250 acres."

The opinion of the Commissioner of Crown Lands may be seen from the following:

Ruling re Point Abino claim of Mr. A. I. Holloway and Mr. O. P. Page:

"I am of opinion that neither the patents to O. and N. Dennis nor Timothy Skinner grants to them the 191 1-2 acres in dispute, but the fee thereof is in the Crown.

"There does not appear to be any ground for Mr. Page's

claim to Point Abino as distinct from the 100 acres granted to T. Skinner by patent granted 10th February, 1797. Nothing is shown which entitles him, in my view, either to be looked upon as the owner in fee or as entitled to become the purchaser at the price charged at the time of the issue of the patent to Skinner. His claim is disallowed."

"The whole parcel is claimed under the original patents by Allan I. Holloway. By plan of survey by Geo. Ross, P.L.S., of 16th March, 1892, the total area of the Point is given as 445 1-2 acres, of which a small parcel of 4 acres shown on the plan is occupied by Mrs. C. J. Wells, leaving 441 1-2 acres claimed by Mr. Holloway, and lying south of Grant's line, as run by De Cew, P.L.S., shown on the plan. There appears to be enough land on lot 32, north of Grant's line, to cover what the patents to T. Skinner and Mr. Sherk call for, but there is apparently no land to fill the patent granted to S. Street 22nd January, 1840, viz., 36 acres. Holloway claims, and the abstract seems to verify it, that Street quitted claim to Page of his right to any land under said patent. Deducting from 441 1-2 acres the area of 250 acres covered by the original Dennis patents, there would appear to be 191 1-2 acres more than the original patent called for, which may be sold to Mr. Holloway at — per acre. A special patent for the whole area, as shown by P. L. S. Ross' plan, may be prepared and issued.

As the additional area now claimed may be viewed as constituting what was intended to be covered under the original location and patent, it would appear to come within the meaning of the O. C. 5th March, 1857, authorizing the Commissioner of Crown Lands to dispose of such lands at \$2 an acre, but under all circumstances the alternative price of \$1 per acre has been charged."

Before a patent was issued to Holloway, the Pages brought suit, as already stated. Holloway's solicitors then applied for a fiat to bring an action in the name of the Attorney-General for Ontario for the cancellation of the Skinner patent. As the description in the patent was based on erroneous maps, was wrong and should be corrected, the action in the name of the Attorney-General was tried at Welland in April, 1894, before Mr. Justice Rose, who held that at the time of the issue of the Skinner patent the Crown was in error as to the true position of Point Abino, and gave judgment vacating the patent, and leaving the Crown to do what was just and right under all the circumstances. Costs against the Pages.

The will of Ezekiel Dennis was not put in evidence before Judge Rose, but when the matter came up before the Divisional Court it was suggested that an effort be made to secure a copy. This was obtained and admitted before a decision was given confirming Judge Rose's judgment, Meredith, J., dissenting and being of opinion that the patent should not be avoided, but that the

rights under it, should be declared. No costs of action or appeal to either party.

This decision was sustained by the Court of Appeal for Ontario, and then the case came before the Supreme Court of Canada. The suggestion came from the judges here that an agreement should be reached between the parties on the basis of the Skinner patent being set aside, and a new patent issued to Mr. Page for an area of land equal to that granted to Skinner and Street, and having a frontage of 20 chains on Lake Erie. An agreement was arrived at and judgment given as follows :

“ It is ordered that the judgment of the Divisional Court varying the judgment at the trial be varied by adding the following paragraphs thereto:—

“ 1. And by consent of Her Majesty's Attorney-General and the defendants by their counsel, it is ordered that a patent do issue to the defendant Otway P. Page of the lands following, that is to say : Commencing at the south-east angle of the lands in lot 32 granted by the Crown to Michael Sherk, thence southerly following the line of the easterly limit of said lot 32 until it strikes the water's edge at high water mark of Lake Erie, thence from that point southerly following the line of the shore for a distance of twenty chains, thence in a westerly direction to the line between lots 32 and 33 at right angles thereto, thence in a northerly direction along said line between lots 32 and 33 to the southerly limits of the said land in lot 32 granted to Michael Sherk, thence easterly along the southerly bounds of the said land granted to Sherk to the place of beginning.

“ 2. And by the like consent this Court doth order that there be no costs of this action or any of the appeals to any of the parties.”

Reference to the annexed plans will show that at about six chains south of Grant's line the east limit of lot 32 will either intersect the shore line of Lake Erie or run very close to and nearly parallel with it for a considerable distance, and a slight variation in the bearing of the line, together with the difficulty of determining high water mark, might carry the line to the south end of the Point without touching the lake shore, and thus open up the whole matter again. This difficulty was apprehended by the counsel on each side, and after consultation, E. Gardiner, O. L. S., was appointed by counsel for one of the parties and the writer by counsel for the other party to proceed to Point Abino and “ lay out upon the ground the description contained in the Minutes of Settlement in the case of Attorney-General vs. Page.” The survey was “ to be without prejudice to the rights of either party and to obtain information for a final delineation of the boundaries of the parties if possible.”

We proceeded to the locality and succeeded in agreeing on the boundaries, which made the east limit of the land to be granted to Mr. Page 56 chains and 20 links on the east limit of lot 32 before striking the high water mark, and on the west limit a distance of 75 chains and 70 links, containing in all nearly 154 acres. Our survey was adopted, but there was another kick because no provision was made for the extension of the side road along the east side of lot 32, through the portion to be granted to Mr. Page, south of the point where the east limit of the lot intersected the high water mark. However, this could not be remedied except by an agreement between the parties to whom the land was to be patented. On the 17th December, 1897, the Crown issued a free grant to O. P. Page as described in the judgment of the Supreme Court, with the exception that the 20 chains along the shore of Lake Erie was given as 20 chains more or less to a post planted by E. Gardiner and G. Ross, O. L. Surveyors, and marked "P." and "Atty. G.," instead of the net distance of 20 chains mentioned in the judgment. A patent was issued to Mr. Holloway on the 3rd of January, 1898, for the remaining 225 acres in lot 32 in Point Abino (excepting four acres occupied by Mrs. Wells), the price charged for the said area being three hundred dollars.

Thus the dispute as to the ownership of this tract of land was finally brought to a close, but as a portion of it had previously been laid out into building lots, a number of which had been sold, it will be seen there still remain some minor difficulties as to the title of the parcels so conveyed. As an error in the description in a registered instrument may have far-reaching consequences, and often can only be corrected, if at all, by a most expensive and annoying lawsuit, the greatest care should be taken to have all descriptions definite and accurate.

DISCUSSION.

Chairman—Gentlemen, I think Mr. Ross has certainly made out his case—that is, that the necessity for accurate descriptions exists.

[*This Association is not responsible as a body for any opinions expressed in its Papers by Members.*]

ASSESSMENT PLANS.

By P. S. GIBSON, O.L.S.

Willowdale.

It is a well understood principle that when land is assessed that a good and sufficient description should be given of the same in the tax bill. If not, and the tax is not paid, and the land be put up for sale for the taxes and sold and a tax deed be given that the owner holding paper title before the tax deed can compel the municipality to redeem the land and remove the flaw in his title caused by the tax deed.

To avoid such difficulties, assessors should be Ontario Land Surveyors, but as this would cause too much expense the next best thing is to have the surveyors prepare Assessment Plans, by which the ordinary assessor can make proper assessments. These plans must include all registered plans and amendments of same, all lands not shown on registered plans, all land properties exempt from taxes, as church, school, cemetery lots, and all public and private roads.

For these purposes the lands to be taxed must be divided up so each plan, if more than one, will show a special division, as a block or section, or a certain number of township lots. On a scale of 200 feet to the inch, the ordinary block or section 100 chains square can be shown on a plan about 3 1-2 feet square, which forms a convenient size for handling and answers well for township assessment plans, as lots of 20 feet frontage and lanes can be shown.

At first sight such plans may be considered very simple and to be easily prepared, whereas it will be found they are the most difficult plans to make.

An ordinary plan of town lots for registration by an owner is straight work, as is also an amendment of the same.

A complete or compiled plan of a village is considered by some to include only a compilation of registered plans and by others the addition of all lands, whether held by paper title as deeds, and is required to be put in the registry office, and by some registrars is entered up as a registered plan and by others simply filed and no index opened.

An assessment plan or plans are not to be registered and must show all the lands to be assessed in each division in such manner

that a proper description can be made by the assessor, which includes finding areas of each parcel which is to be assessed by the area.

For an ordinary "compiled" plan of a village, if we are to enter all properties held by deed or otherwise and not shown on a registered plan, we are entitled to take the proper title as it reads, whether correct or not, but for assessment plans it is necessary that the description on the plan shall be such as to cover the land in actual possession, or, as sometimes said, take the dirt title, which can only be obtained from an actual survey on the ground. Again, should we go to the registry office for the paper titles to lands not shown on registered plans, we find difficulties not only from defective descriptions, but from not registering deeds and remnants.

Under the above circumstances we find it much easier sometimes to make surveys of the properties, taking the names of the owners and occupants in each case. This is particularly necessary when taxes are levied for local improvements on the frontage or areas, even when the lots may be shown on registered plans as the actual frontage in possession may not, and often is not, the same as shown on the registered plan. So often is this the case, we find it advisable for all local improvement assessments to make a special survey and plan of the frontages liable to be attached to the by-law.

Another important matter is to show clearly the lines between different municipalities, and when these lines cut through lands owned by the same person or persons to show clearly the assessable part in each.

Again, after the plans are completed and in the hands of the assessors, care must be taken to see that any amending plans, such as where the smaller lots are put in blocks, that these plans shall also be in the possession of the assessors.

It is found necessary to furnish blue prints of the plans to the assessors, as the clerk and treasurer require the original plans, and on account of the cost it would not do to have the plans carried about and liable to be lost.

In the year 1897 the Council of the Township of York, in the County of York, ordered the amending of the assessment plans made some years before, and to have three blue prints of each. These plans are 21 in number, and about 3 1-2 feet square.

Another very important matter to be shown on the plans are certain topographical features of the country, as the forests, rivers, hills, in order to assist Assessment Commissioners to revise or understand the assessor rolls. Also as in the future it is expected that more attention will be paid to preserving our forests and replanting, plans of this kind would be of great use, as in some foreign countries.

In this short paper the design has been to merely suggest some matters for the consideration of the Ontario Land Surveyors of our Province, so they may see their way to inducing more municipalities to have such plans prepared as it would give them work and would pay the municipalities to have such plans, as it is well known that where there is negligence in assessing lots according to registered plans that land companies and individuals often neglect to pay their taxes until the returns are made to the county treasurer, when they apply for a certificate as to taxes due on their lots, according to certain numbers of registered plans, and as the assessors have not had plans to assess by the land has been assessed in bulk, and in some cases not assessed so the applicants receive certificates that there are no taxes due on such lots.

DISCUSSION.

Mr. Ross—You made some remarks about compiled plans that I think are very appropriate. I know in Welland County our Registrar insists on having every parcel designated by letter or number, and opens up every lot.

I was pleased with your remark that surveyors were well paid for these Corporation plans. I find there is a great deal of work in making Corporation plans and a great deal of care to be taken to prevent error, and I find it is very hard to make it pay even if you get a fair price for it.

[This Association is not responsible as a body for any opinions expressed in its Papers by Members.]

SILICA PORTLAND CEMENT.

By M. J. BUTLER, O.L.S., M. INST. C.E., M. AM Soc. C.E.,
M. CAN. SOC. C.E.

Napanee, Ont.

If it be true that the man who makes two blades of grass grow where one formerly grew is a public benefactor, then in that case F. L. Smidth & Co. should be considered public benefactors, for they have discovered a means by which it is possible to take one barrel of cement and make two of it, with increased strength at the same time.

The first thing to bear in mind is this, that in the grinding of ordinary Portland cement it is practically impossible to reduce it to such a degree that less than 10 per cent. residue will be left on a sieve of 10,000 holes to a square inch; that when tested on the 40,000 mesh sieve not more than 75 per cent. of it will pass that sieve, leaving 25 per cent. residue; that the residuum on any sieve, however fine, has no cementitious property whatever. This is the fundamental principle which underlies sand cement. That is to say, the unground portion of Portland cement is sand to all intents and purposes.

Now, taking advantage of this fact, F. L. Smidth & Co., of Copenhagen, Denmark, who are the inventors and discoverers of the process, substitute for that unground portion of the Portland cement, pure sand; it must be silicious sand, free from mica or earthy matter and feldspar and other soft or friable substances.

It is important that the cement itself be of the very highest grade—extremely important. It is as important that the cement be good, as in the Mannesman tube rolling process, that the steel be of the highest class to make a success of the actual working of the plant.

So, too, the sand should be clean. It must be pure Silica. Taking all the known methods of grinding up to the time of Smidth & Co.'s discovery, it was impossible to grind to such a degree as is requisite for the successful making of sand cement.

They invented the tube mill and in order to give a proper idea of it I will just briefly describe same. It is a cylin-

der 25 feet long, 48 inches to 50 inches in diameter, lined with cast iron plates, revolving at the rate of about 60 revolutions a minute. The tube itself is filled half full of flint pebbles. The pebbles are brought from Norway and delivered in Canada and in all parts of the world where they are working under these patents.

The clinker is fed in at a uniform rate into the tube mill. As it passes through the length of the mill revolving, it hammers itself together, the clinker and the balls revolving and pounding it, until they are ground to such a degree that the Portland cement ground in this way will leave not more than 10 per cent. residue on the 10,000 sieve and not more than 20 to 25 per cent. on the 40,000 sieve. Now, that is about the practice required to grind Portland cement. When we mix sand and cement in equal proportions, we can now grind all of the cement to an impalpable degree of fineness, so you cannot find it on any known sieve, and the sand itself will be reduced to such a degree that not more than 4 per cent. residue will be left on a 10,000 sieve, and not more than 8 to 10 per cent. residue will be left on a 40,000 sieve. Consequently we now have every particle of active cement material in the cement acting upon a sharp, finely ground portion of Silica.

In itself that minute particle of Silica is stronger than any corresponding minute particle of Portland cement. The cement flour rubs around that particle of Silica and has something to grip to, a sharp, fine particle of Silica. That is, perhaps, the explanation of the action of sand cement, and why it is that when you make a mortar composed say of Portland cement and ordinary commercial sand, in the proportion of 3 to 1, that if you take that same Portland cement and grind one part sand with it and mix this sand cement in the proportion of 3 to 1, and test it in the testing machine, the sand cement will beat the original cement from which it was made, and with corresponding economy to the consumer.

Of course, as engineers, in order that our clients may get the benefit of sand cement, we should satisfy ourselves by standard tests that the material is suitable for the work in hand and then specify that sand cement will be accepted. Thus the client will get the benefit, otherwise the contractor will get the benefit of it, and he generally does, because he will bring his cement and place it before the engineer, who will test it and get the best results, and of course that is all he has to do with it and the contractor is pocketing the profit.

On this continent probably the largest consumption of sand cement has been by the firm controlled by General William Sooy-smith, on one contract 10,000 barrels in the great Cathedral of St. John the Divine, in the city of New York, was used.

I will read a test made by Prof. H. T. Bovey, at McGill College, Montreal.

McGill University, Montreal, Testing Laboratories. Report of tests of "Ensign" Silica Portland Cement, for the Rathbun Company, Deseronto, Ont.

I. "ENSIGN" Silica Portland, composed of Rathbun "STAR" Portland and Sand, ground together in the proportion of 1 to 1.

This Silica Cement was mixed with standard sand, in the proportion of 1 to 3.

- (a) With rammed briquettes and the addition of 10 per cent. by weight of water, the tensile strength after six days, 189 lbs. per square inch; the tensile strength after thirteen days, 201 lbs. per square inch.
- (b) With rammed briquettes and the addition of 12 per cent. by weight of water, the tensile strength after six days, 178 lbs. per square inch; the tensile strength after thirteen days, 183 lbs. per square inch.

II. Blowing test: The pats were mixed in the ratio of 16 of cement to 4 of water, by weight. The pats were subjected to hot vapor at 120 deg. F. for 24 hours, and were then submerged in boiling water for about the same time. The results were most satisfactory, showing no trace of free lime.

III. Fineness: Residue on No. 120 sieve, 0.7 per cent. 7-10 of 1 per cent.; residue on No. 100 sieve, 0.6 per cent. 6-10 of 1 per cent.; residue on No. 80 sieve, 0.0 per cent.; 0 per cent.; residue on No. 50 sieve, 0.0 per cent. 0 per cent.

(Signed) HENRY T. BOVEY.

May 27th, 1897.

To satisfy himself about this matter, Mr. Henry C. Bamber, F.I.C., of London, England, selected a sample of English Portland cement, without revealing its identity, and packed it in barrels, sealed and sent to the Sand Cement Works at Denmark, of Homan Smith & Co. The seals were then broken in the presence of Mr. Bamber.

ABSTRACT QUOTED NEARLY VERBATIM FROM BAMBER'S REPORT.

The English Cement was sifted in 200 sieve, 40,000 square inch, residue 39 per cent.; 76 sieve, 5,776 square inch, residue 8.7 per cent.

Sand was sifted through 20 sieve, 400 per square inch; remaining on 30 sieve, 900 per square inch for Comparative Standard tests—using only what remained on the 30 sieve.

The Sand Cement was made from usual Clean Sea Sand. All the Sand Cement left about 3 per cent. residue on 200 sieve, 40,000 square inch. The proportions of Sand Cement and Water were taken by weight. The water used was chilled rain water.

Experiment	Mixture by weight			The mixture Contains		Tensile strain lbs Per sq. in.			Guaged with p.c. of water
	Cement Sand	Sand Cement	Sand not ground	Cem't	Sand	7 dys	28 dys	3 mos.	
No. 1	1		3	1	3	113	178	255	11
" 2	1	2	2	1	8	164	248	332	9
" 3*	1	3	2	1	11	111	197	280	9
" 4	1	3	3	1	15	84.5	135	182	7
" 5	1	12	2	1	38	35	75	124	8
" 6	1		11	1	11		57	90	4
" 7	1		15	1	15		35	66	3.5

We use this way of indicating the mixture of mortar as e. g. 1 : 3 : 2, meaning one part Sand Cement, 1 : 3 with 2 parts coarse sand; as Sand Cement 1 : 3 contains one part Cement and 3 of Sand, ground together, 1 : 3 : 2 mortar, will to each part. Cement have 3 of ground Sand and 8 of Coarse Sand, or 11 parts of Sand altogether.

*With reference to this experiment No. 3 it is of interest to note that the countless experiments made with Sand Cement 1 : 3 : 2 and 1 : 2 : 3, which both contain 11 parts of Sand to one of Cement, have proved that they are almost identical in respect of strength. Accordingly the Sand Cement 1 : 2 when used for mortar with 3 parts sand is superior to "Neat Cement used with the same amount of Sand."

This shows the investigation of an eminent English chemist and is associated with the firm known as K. B. & S., English Portland Cement.

There is also a record taken at the School of Practical Science, Toronto, which shows as follows:—

SCHOOL OF PRACTICAL SCIENCE,
TORONTO, April 17th, 1897.

Partial record of test of a sample of "Ensign Brand" Cement:—

NEAT CEMENT		2 DAYS IN WATER—1 DAY IN AIR :	
Briquettes were guaged with 20 % of Water } Cement rammed into moulds..... }	No. 1—375		
	" 2—335		
	" 3—340		
	" 4—355		
	" 5—365	Average—	354
Briquettes were guaged with 20 % of water } rammed into moulds..... }		6 DAYS IN WATER:—1 DAY IN AIR	
	No. 1—475		
	" 2—540		
	" 3—460		
	" 4—480		
	" 5—455	Average—	482
Sand { 1 part Cement Test { 3 parts Standard Sand..... }	1 DAY IN AIR—6 DAYS IN WATER:		
	No. 1—137		
	" 2—177		
	" 3—165		
	" 4—176		
	" 5—176	Average—	166

Hot Test—Pats of the Neat Cement placed in Hot Water for 48 hours, (2 days) turned out perfectly sound. C. H. C. WRIGHT.

DISCUSSION.

Mr. Walker—I would like to ask what the price of it is ?

Mr. Butler—I think it is about 10c. to 15c. per barrel less than that of Portland cement. The cost of grinding is just in the ratio of 5 to 12, so that the other items were reduced practically in nearly the same proportion. You see, adding on the cost of grinding, this comes on in the proportion which the cost of sand would bear to cement clinker.

Mr. Walker—The grinding costs less ?

Mr. Butler—The grinding costs more. in the ratio of 5 to 12. Sand is worth 60 cents a cubic yard, and cement worth a good many dollars a cubic yard, but the grinding being slightly more expensive it reduces the cost about 10 to 15 cents per barrel.

Chairman—What facility does this give for adulterating cement ? Does it give a better chance ?

Mr. Butler—No.

Mr. Van Buskirk—What portion of sand is in the cement in Canada ?

Mr. Butler—One and one by weight—that is to say, the sand cement itself is made up of 100 lbs. of Portland cement and 100 lbs. of dried sand.

Mr. Van Buskirk—I had some sand cement tenders the other day, but I would not accept any because the amount of sand was not given.

Mr. Butler—We are putting the cement in such shape that you get more use out of what cement there is, and when you realize that every barrel is practically 25 per cent. of sand, that question does not arise.

Chairman—I suppose the strength consists in this, instead of having the real Portland cement in your sand, you have Silica cement and the real Portland cement itself is ground to an impalpable powder.

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THE KILBURN SWAMP DRAIN.

By F. W. FARNCOMB.

London.

The Kilburn Swamp, the drainage of which this paper is the subject, lies in the heart of Hullett, and has long been an eyesore in this, one of the most prosperous, if not the banner township of the Country of Huron. The land in the surrounding country being high and rolling and intersected by numerous rapid flowing springs and rivulets, offering ample outlet for the well-drained farms emptying into them, has required few large ditches; in fact, this is the first work of the kind, and probably the only one, which has been necessary for the municipality to undertake.

It is, therefore, likely that the apparent indifference of the owners of the swamp lands, as well as the Township Council, to the state of affairs and their want of enterprise was mainly due to the fact that improvements of a similar nature had never been attempted; the gospel of the "Drainage Acts" had never shed its rays upon these fortunate people or revealed to them the responsibility of their brethren on the hills in the enigmatic forms of "outlet" and "injuring liability," and the ever increasing floods were taken as a matter of course. But finally a well-known character, who had already had several lawsuits with the Township, "mired" his team in a vain attempt to get along the apology for a road during the close season to a few acres of land which he had cleared in the swamp. He brought an action against the municipality, and the outcome was the employment of the writer to see what could be done towards draining and opening up at least a portion of the concession road. It was then found that this meant the drainage of the whole swamp, for the Council were advised that any work done would be thrown away without the deepening of the south branch of the Maitland River. Levels were taken down the river, which supported this theory, and finally a petition of a majority of the owners was obtained, mainly through the instrumentality and foresight of an enterprising citizen of Clinton, who owns several hundred acres of this swamp land and who, though at first opposed to the scheme, on the ground of damage to timber, on examination of the plans, became its firmest supporter, predicting that if

the plans were carried out he would have the finest land, when cleared, in the township, and his prophecy has certainly been fulfilled.

Referring to the accompanying sketch, it will be seen that the swamp in the main extends from side roads 6 and 7 to side roads 15 and 16 and across concessions 4, 5 and 6, with a total area of about 2,500 acres. It is bounded on the northerly side by high-rolling land and on the southerly side by a peculiar ridge of drift sand and gravel, averaging less than half a mile in width and from 60 to 80 feet in height above the river, which it follows to a point about three miles below the swamp proper, where it crosses to the northward and meets the higher land.

Before this ridge, popularly known as the "Hog's Back," had been thus worn through at this point by the waters penned back, many thousand acres must have been submerged.

The Maitland River enters the swamp, as shown, on the easterly side, following along near the south and westerly sides and below follows closely along the ridge described until it breaks across and gains rapid fall.

The portion of river in the swamp was extremely crooked and in some places disappearing from view in masses of rubbish and drift, the accumulation of years.

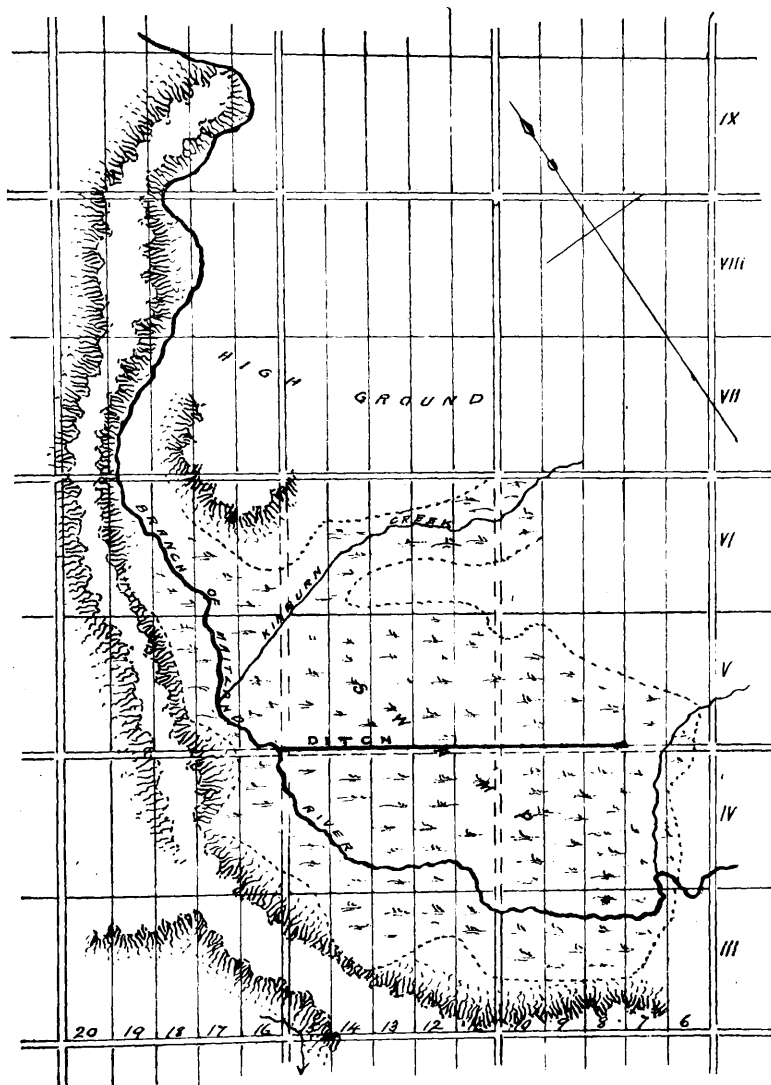
The total fall in the river from the middle of the swamp to a point just above the present outlet, a distance of over five miles, was less than four feet. The first two miles being practically "dead," the channel narrow, shallow and crooked.

The lower portion of the river is wide (six or eight rods) and confined by high banks, so that the adjoining lands derived little or no benefit from the work.

The survey plans and reports were completed and filed in December, 1894, and the contract let to Messrs. Chalmers and Hill, of Toronto, the following spring for about \$150 less than the estimated cost, or about \$9,000.

This contract included the construction of an open ditch along the north side of the concession road about two miles in length, about one-half through stump and burnt land and the remainder standing timber (mostly black ash), as well as the improvement of the Kinburn Creek and the dredging of the river. The contract required the excavation in the river of a channel twenty feet wide in the bottom, with foot to foot slope, the earth deposited five feet clear of the edges and sloped back two feet horizontal to one vertical.

The grade given the bottom was two feet per mile the first three miles, and the remainder 17-10 feet per mile. This gave a depth in swamp of about six feet below ground and an average cut in the bed of river at lower end of work of about five feet.



This work was done with an old "Beattie" dredge, floating on a scow 18 feet by 30 feet and 5 feet deep, and run by a 30-horse power engine; capacity of dipper about three-quarters of a yard.

Towards the lower end very hard digging was encountered, necessitating the use of steel teeth on the dipper throughout. Large boulders imbedded in this "hard pan" added to the difficulty, and in one place dynamite was effectively used to "loosen up."

Even at a depth of six feet this deposit seemed to be none the less hard, and marks of the steel teeth were plainly visibly in places on sides of cut even after the spring and fall freshets had passed through the channel.

However, this mixture of clay and boulders, which was deposited wet on the sides, seems to have baked equally hard in that position, and at the present time does not appear to be filling in in the slightest.

In the swamp an immense amount of the "black muck" which formerly filled the river has washed away down stream, leaving the channel deeper in places than when first dredged.

The total amount of earth excavated in the river was 54,154 cubic yards, and the estimated cost was 12 cents per cubic yard.

By making the ditch along the concession road deeper at the outlet, and as it follows the natural inclination of the swamp, a fair fall of about three and a half feet per mile was obtained.

The road, through another contract, was closed, chopped and cleared at the same time, and the earth excavated used to grade up.

This ditch was made two and a half and three feet bottom, sides sloped one to one, no water outside of that in swamp north of the road having to be dealt with after the top was off; most of the work was done with a plough and scraper, the rich bluish clay under the mould cutting like cheese; no quicksand was encountered.

The work on the Kinburn Creek ditch, which enters the swamp and river near the north side, was light, excepting a portion near the river, it having been dug recently.

Prior to this work being done, the water in spring and fall freshets of late years rose to a height of over eight feet in low ground, and fully 2,000 acres were flooded.

The swamp remained full of water all winter and disappeared, as a rule, in July, but in some seasons has remained all summer. The area drained by the river at this point is about 60,000 acres. The flood height is now about five feet, and the spring and fall freshets are confined to the river in six or seven days. The spring flood is passed of within one week after thaw is complete.

A considerable area of the land reclaimed has been cleared and logged, and it has already been demonstrated that excellent crops will be obtained, while hundreds of cattle have been pastured

where formerly a beast could not enter, excepting in the mid-summer months.

A bridge has been thrown across the river on a concession road, and an excellent road has been made through the swamp, as well as the opening up of side roads 10 and 11 and 15 and 16.

In view of the results obtained with so small an expenditure, there is already some talk of further enlarging the channel in the river in the near future, though when first advocated there was vigorous opposition to the scheme because of the cost.

The land, which before was sold for the timber at \$12 and \$15 an acre, has trebled in value.

In conclusion, it may be said that the object of this letter is not to uphold this scheme as complete in any respect, but in the hope that the results obtained may be of some use to any members of this association who, like the writer, may not have had sufficient experience in dealing with the flow of large bodies of water, to be able to say with confidence exactly what the result would be.

DISCUSSION.

Chairman—This very interesting and practical paper is now open for discussion by the members.

Mr. VanNostrand—I am sorry Mr. Farncomb is not here to further enlarge on some particulars, but I think we have sufficient here to be of great service to the members when put in the report.

The complaint is sometimes made that, although we are an Association of Land Surveyors, we read papers on a number of matters that appear to be foreign to our profession, but I think that we are quite justified in doing so. It is only in an occasional instance that the land surveyor meets with a piece of work which will profitably turn out a good paper, whereas in engineering nearly every kind of work will form a paper in itself, and the benefit to be derived from it both by the members of the Association and by the public at large is very great.

No doubt there are a number of places in the Province similar to the one described by Mr. Farncomb that have lain for a great many years surrounded by well tilled farms, and these have been worse than waste lands. In this instance the waste lands have been reclaimed, and the profit on the investment is at least three or four hundred per cent., besides the convenience resulting from the opening up of the various roads. I think if our members keep this case in view some of them will be able to find swamps, each one in his own district, that may be treated similarly.

Mr. Code—It would be a good idea to get together as many of these cases as we could and write a separate paper on each about the cost, the difficulties of the work, and the area drained.

We could get the systems of assessment used on different drains, and I think if we got some general average assessment, it would be useful.

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“ ARBITRATORS AND WITNESSES.”

BY HERBERT J. BOWMAN, O.L.S., M. CAN. SOC. C.E.

Berlin.

In the year 1894 the town of Berlin, pursuant to the Municipal Act, and with the assent of the ratepayers, passed a By-law enacting as follows:—“ That from and after passage of this By-law all future expediture in the town of Berlin for the opening, widening, prolonging or altering, macadamizing, grading, levelling, paving or planking any street, lane, alley or public way or place, or for constructing any sidewalk, bridge, culvert or embankment, forming part of a highway therein, or of curbing, sodding or planking any street, lane, alley, square or other public place, or either of them, shall be by special assessment on the property benefitted and not exempted by law from assessment.”

In short, all street opening and construction may be done only as Local Improvements and cannot be paid for out of the general funds of the municipality.

Considerable work has been done upon existing streets since this By-law was passed, and some new streets have been opened. As a town grows in population, and land near the business centre becomes too valuable for gardening purposes, new streets will be required, and there is no doubt they should be paid for by special assessment on the property benefitted, and they should not be paid for by the municipality at large. Where the property owners accept the amounts mentioned in the By-law as to be tendered for the lands required for the opening of the new street, the lands are deeded at once to the corporation. However, in case of non-acceptance of the amount tendered an arbitration must follow. If the amount claimed for compensation does not exceed \$1,000, the Municipal Act, consolidated in the Revised Statutes 1897, directs that the claim shall be settled by award of the County Judge, sitting as sole arbitrator, or by such other sole arbitrator as the Judge, on application of either party, may appoint. This is a step in the right direction, reducing the cost, delay and uncertainty under the old method of three arbitrators in every case. However, where the claim is for a larger amount than \$1,000, and in all cases in townships and villages, the old method must be followed, one arbitrator being

appointed by the Corporation, another by the property owner, and these two meet and appoint a third arbitrator. If they fail within seven days to do this, the County Judge nominates as an arbitrator a fit person, resident without the limits of the municipality in which the property in question is situated.

When a lawyer is appointed as an arbitrator, he usually understands the duties he is supposed to perform and, of course, would not plead ignorance of the law. Other arbitrators, however, often proceed on a wrong basis. They suppose that they ought to act, in a measure, as counsel for the parties appointing them, and they do not appreciate the importance of the oath taken before proceeding to try the matter of the arbitration, viz.:

"I (A. B.), do swear (or affirm) that I will well and truly try the matters referred to me by the parties, and a true and impartial award make in the premises, according to the evidence and my skill and knowledge. So help me God."

From the wording of this oath it will be seen that when once sworn in, the board of arbitrators becomes a court, in which all the members have like duties, and no greater consideration should be shown by any arbitrator to one side of a case than to the other in order that an impartial award may be made.

A similar misapprehension exists as to what is expected of a witness in giving evidence in a court of law. Nearly every member of this association is frequently served with subpoenas commanding him to attend some court or arbitration to give evidence on behalf of one or other of the parties, but does this mean that he is to place himself entirely in the hands of one side and shut his eyes to everything else? The answer to this question will again be found in the oath administered to the witness, viz.:

"The evidence you shall give touching the matter in question, between the parties in this action, shall be the truth, the whole truth, and nothing but the truth."

It will be seen from this that a surveyor or engineer going into the witness box should give his evidence in a straightforward manner and never become a partisan. As remarked by the judge in a recent trial in Toronto, "A witness has no counsel," and the questions of counsel on both sides should be answered with equal frankness. It is easily seen that often a witness does not understand the nature of the oath and is trying to present only one side of the case, but it is hard to see how a professional witness who is familiar with the oath could act in this manner.

From the foregoing it will be seen that the assumption is unsound, that a civil engineer or land surveyor may aid or oppose either party to an action when he goes into the box. If this assumption were correct, how could a corporation engineer or surveyor give evidence in an action taken by a property owner

against the municipality? Were he to champion the cause of the municipality alone, would not the property owner feel that his course was indefensible, and as a contributor to his salary, be apt to maintain that he should have the engineer's aid rather than his opposition? The engineer, however, should never be an advocate, but place the facts impartially before the Court regardless of which side has had the subpoena issued commanding him to attend.

DISCUSSION.

Mr. Morris—With regard to the civil engineer and land surveyor as a witness, the paper refers to their not being partizans as witnesses, but giving their evidence truthfully. Well, we would expect that in a land surveyor, but in the case of a land surveyor who is trying to act as it were as arbitrator on a law suit, acting on both sides, as some poor land surveyors have been led to do at times, he finds he has got both lawyers on to his back; and, as far as I am concerned, I made up my mind that I would, if necessary, rather take a strong stand on one side, you might say as a partizan, than ever attempt to give evidence so as to endeavor to have both sides of the case. You are always misunderstood, and they look upon you as if you were trying to give evidence to save yourself; I think that the surveyor puts himself in a better position in a court of law where he does take the position of a partizan that is in the endeavor to secure truthful evidence as to the side in which he is interested. He is better understood by the Court, better understood by the opposing side, and then he is in no doubtful position.

Mr. Code—It is curious how men see it in different lights. Now, I had a case some time ago, and one of the engineers took a very decided stand; in fact, he rather overdid the thing, and as he was acting against a township, the result is he does no work for that township now, because he was so bitter a partizan.

Mr. Butler—I am sorry to say I did not hear the whole of this paper. There is one little point Mr. Bowman mentioned with reference to hearing the truth, the whole truth and nothing but the truth. Now, it must not be forgotten as a rule of law and evidence that answers must be responsive to the questions asked, and that the witness has no right whatever to volunteer testimony.

On the other hand, it seems to me the surveyor particularly, or the engineer, is a sort of free lance—the surveyor is bound by oath of office, he should approach the question from a judicial standpoint. Beyond question he should seek to inform himself of all the facts without any bias whatever. He should be sure he is right, but

once satisfied that he is right he should take high and strong ground.

In that sense he should be a partizan, and a strong partizan, but up to that stage he has no right whatever to take a partizan stand.

Mr. Niven—I agree with Mr. Butler there. I think when a surveyor is called in on a question his first duty is to satisfy himself of the merits of the case, the right and the wrong of it, and then as regards being a witness he should answer the questions that are put to him truthfully. I think if he does that he is doing all that is necessary in the case.

Mr. Morris—That would be suggesting that the surveyor become a kind of adviser to the solicitor on one side. You see the surveyor or engineer does, in most cases, become an adviser to the solicitor.

Mr. Butler—I don't consider he becomes a partizan, though, unless from the beginning he is employed to prove a certain state of things, and that is a wrong position. He has a right to stand independent until he has satisfied himself; but having satisfied himself, he should take the strongest stand possible.

Chairman—The custom is, I think, for the surveyor or engineer called in on a question of this kind, after he has examined into the matter and has made up his mind, to report to the lawyer who employed him.

Now, I have two cases in my mind in which I was called in, when my contention would have strengthened the other side rather than the side who employed me, and I was not called as a witness at all. But I think, especially in engineering questions, an engineer can often work up a case for a lawyer in a way in which he could not do it, and it is right he should devote his time to it and make as strong a case as possible consistent with the truth.

Mr. Morris—I have been misunderstood. I don't mean to say from the start we should become active partizans, but that we should take an interest, and advise, as we often do advise the lawyer, if it is in his interest to make a settlement, but at the same time that we should have at heart the interests of that side on which we are employed.

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THE USE OF FIELD TILE FOR LARGE DRAINS.

By MAJOR W. MAHLON DAVIS.

Woodstock.

The reduction in the price of field tile and their construction in large sizes has the effect of closing many large open drains, and causing tile to be adopted in many locations where it would otherwise be impracticable.

Putting aside aesthetic considerations, leaving out of the question the depreciation in value caused by an unsightly open drain meandering through a farm, there are sufficient practical reasons to warrant the use of tile wherever they can be procured of adequate capacity.

In comparing the cost of open drains with that of tile drains, the following are the most important questions to be considered:

(1) Cost of construction.

(2) Annual cost of maintenance. This, in the case of tile drains, is practically nothing, and in open drains can only be determined by experience. Cleaning out will certainly be required once in three or four years, but cost of the work and its frequency will depend on the locality; this amount should be capitalized and added to the first cost.

(3) Value of the land occupied by the drain, which in the case of the tile drain is nil, but for the open drain is very considerable, and is made up as follows:—

(a) Value of the land, taken as a fractional part of the entire farm.

(b) Add to the above the enhanced value of a narrow strip, the tillage of which costs nothing (that is, the land occupied by the open drain would be cultivated in connection with the contiguous land without any extra expenditure of labor.

(c) To the above must be added such sum as will make compensation for the inconvenience of tilling fields of irregular shape.

The following table gives approximately the comparative cost of open and tile drains of various depths:—

COST PER ROD.

DEPTH	OPEN DRAIN	FIELD TILE.					
		6 in.	8 in.	10 in.	12 in.	14 in.	18 in.
3 FT	\$ 1.08	0.90	1.20				
4 "	1.80	0.96	1.26	1.86	2.19	3.00	
5 "	2.52	1.27	1.60	2.00	2.40	3.60	5.00

It would appear from the above that for depths up to 5 feet and for sizes of tile up to 12 inch, that the tile drain has the advantage, considering only first cost, and taking all things into account field tile of any size capable of carrying off the water, and for any depth, are cheaper than an open drain.

In deciding on the size of tile it is not necessary to provide a capacity that would be ample for a culvert, neither is it safe to calculate on a drain having twelve months in which to dispose of the annual rainfall.

In this latitude a rainfall exceeding one inch in twenty-four hours is exceptional, so that this quantity may reasonably be taken as a basis for our calculations. Not more than one half the rainfall can be depended on to reach the trunk drain, a proportion which decreases as the area of the watershed increases. If the water can be removed within forty-eight hours, as a rule no damage to the crops will result, therefore a trunk drain that will convey about 900 cubic feet of water per acre in twenty-four hours will be ample for ordinary drainage; lateral drains will require a greater capacity depending on the facility with which the rainfall reaches the tile.

Cases frequently occur where the largest size of tile obtainable is insufficient, but where a depression can be left over the tile for freshets, the depression should be slight and the slopes very gradual, so that farm implements can cross without trouble.

DETAILS OF CONSTRUCTION.

Tile over twelve inches in diameter should not be less than two feet in length, as they can be laid more evenly. They should be particularly well burned and moulded from the toughest clay. Many qualities of clay which make fair tile of small size are totally unfit for those of large diameter. The thickness should increase from one inch for 12 inch tile to 1 3/4 inch for 18 inch tile.

Two factors of vital importance in drainage are perfect alignment and grade the curves should not have a less radius than 60

feet. An accurate grade can best be obtained by means of "boning rods," that is, by placing two bridges across the trench, about 300 feet apart, the tops being adjusted so that a line joining the top of one with the top of the other will be parallel with the grade line. A rod equal in length to the distance of this line from the grade line is then used to obtain the exact elevation of each tile; this method is especially advantageous when working in quicksand. Difficulty is sometimes experienced in obtaining a safe foundation for the tile, the importance of the work not justifying the adoption of the expensive methods customary in sewer work. An inch board, 8 or 10 inches in width, has been placed under tile, and proved satisfactory. The writer once overcame a very bad place by excavating below the grade and refilling with gravel. The pipe was laid to the exact grade and when tested a week later had not stirred.

In backfilling, particularly in deep cuttings, care should be taken to pack the earth firmly about the haunches of the tile, and in running sand the joints should be covered with a sod, or, if this is not obtainable, use clay loam.

Catch basins, or manholes, should be placed about 1,000 feet apart, to admit of easy inspection of the drain. They should have a pit 18 inches below the grade line for the purpose of intercepting sand. They also provide a convenient means of connecting lateral drains. Wherever possible these catchbasins should be placed at crossings of fences.

A tile drain when properly constructed is a permanent work, requiring little or no expenditure for maintenance. The best soil which is being carried off by open ditches is retained. In the winter and spring, when the open ditches are dammed by the accumulation of ice and snow, the tile drain is quietly at work carrying off the water which would otherwise lie stagnant in the earth, and the heat of the sun in spring time, instead of being expended in the evaporation of the water, exercises its genial influence in warming the soil and promoting the growth of plants.

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LAKE ERIE SURVEY.

By OTTO J. KLOTZ ASTRONOMER FOR THE DEPARTMENT OF
THE INTERIOR, CANADA.

Ottawa.

During the season of 1896 a survey of the north shore of Lake Erie was made under my direction. The immediate object of the survey was to obtain the exact geographical position of that part of the shore, the original township surveys being inadequate and lacking accuracy for that purpose, and Bayfield's chart, although very good in its day, did not meet the present requirements. Besides, the position of the shore line to-day is in many places materially different from that of the original surveys of townships bordering the lake.

The survey was divided into three parts—the survey of the shore line; the survey of the road nearest the lake, with connections with the shore survey every few miles; and the determination of the fathom line in the lake.

A word about the road survey. As is well known, the United States have completed a survey of the Great Lakes. A monumental work, occupying 41 years and costing over three million dollars. High-class work is expensive in the first instance, but cheap in the end, for it requires to be done but once. The U. S. survey was begun at Duluth, the westernmost point of Lake Superior, and a chain of triangles carried thence along Lakes Superior, Michigan, Erie, Ontario and the River St. Lawrence to near the international boundary of the 45th parallel of latitude. Base lines in the primary chain of triangles were measured—Minnesota (Duluth), Keweenaw, Fond du Lac, Chicago, Sandusky, Buffalo, and Sandy Creek (Oswego), while a base at Mackinaw was put into the chain thrown across the northern end of Lake Michigan, and one at Olney for the chain south from Chicago. Wherever the width of the lakes and the topography of the country permitted, geodetic points were established also on the Canadian side. We have thus a number of well determined points at the western end of Lake Superior, at the east and west ends of Lake Erie, and at the east end of Lake Ontario, to which we can tie hereafter surveys of precision. Two of such geodetic points, "Grand River" and "Kingsville," were utilized in the survey of 1896, the former being the initial point and the latter the closing point thereof.

It was desirable that the survey of the north shore be made with a precision equal to that of the south shore, and for two reasons, in the first place, for the sake of precision itself, and in the second place, for the more important reason for the opportunity offered of inaugurating a Geodetic Survey in Canada, which in years should extend and grow, and eventually cross our wide domain from ocean to ocean. I have written and spoken so much on this subject of a Geodetic Survey for the past twenty years that I will not here, and before you who are conversant with the matter, dilate thereon. The attention of the Government was drawn to the position of the matter in connection with the Lake Erie survey. However, in consideration of the immediate requirements—the position of the boundary line in Lake Erie—and the unfavorable topographic configuration of the country there, for triangulation purposes, especially the western part of the peninsula, it was determined to base the shore survey on an accurate survey of the road running near the lake. This road is mostly straight and comparatively level, so that a considerable degree of accuracy was obtainable by direct linear measurement thereon. Every two or three miles, on a side road or otherwise, a line was run from the road to connect the two surveys and keep the work under proper control.

For both the road and shore surveys, 6-inch D. L. transits—Troughton & Simms—graduated to $^{\circ}.004$, aperture 1 1-4 inches, one horizontal plate only, inverting eye-piece, were used. The linear measurements were made with 100-foot Chesterman's steel tapes, whose lengths were determined by means of the comparison or standard tape tested and issued under statutory authority. It is scarcely necessary to state that these tapes have the zero marks on the tape and not at the end of the handles, as obtained with the old link chain. For establishing the fathom line a light, trussed sounding rod, about 13 feet long, was used; on one end the six feet were marked by a transverse painted line, the other end carried, six feet apart, two disks, and these latter were used for micrometer readings thereon, or the determination of the distance from a shore survey station to the point on the fathom line where the boatman held the rod vertically. The micrometer used was of the Lugeol type, with divided objective. This form of micrometer we have found the best, and is used on all the exploratory surveys made for our Department. Experience has shown its error to be about 1 in 800. The value of a division of the micrometer was determined at the beginning of the survey, during the survey, and at the end thereof, for the fixed length between the disks on the sounding rod, and at distances from 200 to 3,000 feet at 100 feet intervals, and no material change in the thread of the screw found. The angular measures were controlled by azimuth observations on Polaris daily, or as often as the weather permitted. The observa-

tions were always made in daylight and generally shortly before sunset. A striding level was used. As the azimuth observations were dependent on the exact hour angle of Polaris, observations for time were always made at the same time, for which purpose sidereal pocket chronometers were carried. The want of such a chronometer should, however, not debar anyone from making similar observations, as an ordinary good watch will, with time corrections that readily suggest themselves, answer the purpose quite well. The angles on the road and shore surveys were read in both positions of the instrument—circle right and circle left—and the three verniers were read each time. This gave two independent determinations of the angle between back sight and fore sight. Every day, circumstances permitting, the road survey was brought down to the lake and there a common point made with the shore survey, and thereby a check on the latter obtained. This check was in the first instance in azimuth by account, and in the second place in latitude and departure. Theoretically, the quantities spoken of should be identical for the two surveys. There was seldom any marked disparity between the two azimuths, but the linear measures on the lake required at times remeasurement to ensure greater accuracy. From the physical character of the lake shore and adjoining precipitous banks and ravines, the difficulty of carrying on linear measures becomes apparent. The location of the position of the sounding rod when held on the fathom line was determined by an azimuth shot from one of the shore stations and by micrometer readings—forward and reversed motion of micrometer head.

The survey was begun at the United States Lake Survey Geodetic Station, "Grand River,"

Latitude 42 deg. 50 minutes 49.96 seconds,

Longitude 79 deg. 37 minutes, 23.82 seconds,
and ended at a similar station, "Kingsville,"

Latitude 42 deg. 01 minute 36.1 seconds,

Longitude 82 deg. 44 minutes 21.4 seconds,

passing around Pointe Pelee, the most southerly part of continental Canada. The former station is a "primary" one, about two and a half miles west of the mouth of the Grand River, and the latter a "secondary" one, in the village of the same name. The United States geodetic stations are marked on the ground by a stone monument placed beneath the surface for greater security from disturbance, and by three stone reference posts placed at some convenient distance and favorable spot. Both "Grand River" and "Kingsville" were readily found by means of these reference posts, which are still in position after twenty years. About ten miles west of Long Point there was another geodetic station, "Houghton," but being, or having been, on one of the large drifting sand hills,

no monument whatever could be found. From the nature of the hill and the sand and the prevailing wind it would appear that the hill travels. In fact from other evidence—fences, etc.—we know that it does.

The greater part of the lake front surveyed is bordered by high, precipitous, cut banks, attaining their maximum height, about 120 feet, in the vicinity of Port Stanley. The cut banks often descend directly into the water, i.e., there is no beach whatever. This necessitated taking the survey to the top of the banks; there, often meeting woods and many deep ravines filled with brush, much retarding the progress and increasing the difficulty of attaining accuracy of the survey. The extensive marshes of Turkey Point and Long Point gave an opportunity for testing the imperviousness of the epidermis. To one accustomed to the wilds of the North-West and British Columbia, the mosquitoes of Lake Erie were a pleasure. In the County of Haldimand, on the lake shore, we find rock (highly fossiliferous limestone) exposure, showing beautiful parallel glacial groovings. By means of a prismatic compass I determined the direction of the groovings and found it to be N. 40 deg. 30 minutes E. on lot No. 12, in the Township of Rainham, and on lot No. 1, nearly five miles west, N. 48 deg. 30 minutes E. magnetic. Beyond, no rock exposure was encountered, and boulders were scarce until we reached the western end of the survey. The most of the so-called ports along the shore of Lake Erie are but a memory of the past. A few piles of a former wharf speak of shipping of by-gone days. Deforestation and the advent of railways are the principal causes of this change.

The history of Talbot road, now one of the best roads in Canada, has an interest from physiographic reasons. Originally it was a colonization road reserved along the strip five rods wide in front of the lake. As the prevailing winds on the lake are southwesterly, the north shore is especially subject to erosion, and the banks have in consequence been slowly and continuously receding, necessitating from time to time the shifting of fences to make room for the lake road, besides the renewal of bridges near the lake over creeks and ravines. When the trouble arising therefrom became so acute the various Township Councils concluded to shift the Talbot road to a safe distance from the lake, and we have the present, in many respects, model road. Much information of the wasting away of the banks was gathered from old farmers who have spent their lives on farms abutting the lake. The evidence was, of course, always of a circumstantial kind, but none the less conclusive. An illustration will, perhaps, explain the fact. In the Crown patents one finds: "Reserving Talbot road and one chain in front thereof." This was along the lake front. A farmer would say to me when interrogated about the former and present positions of the bank:

"Do you see that hickory tree out there on the edge of the bank? Well, when I was a boy, the Talbot road used to run on the south side of that tree." Now, this is pretty good evidence that about eight rods of land have disappeared into the lake. It may be stated that this erosion has not increased the beach at all, but undoubtedly tends to shoal the lake in general, and especially along the shore, so that where formerly small craft could land, it is now inaccessible. Erosion along the north shore has been general, and, westward of Port Stanley, has averaged within the past fifty years from four to eight rods. There has been some accretion on the west side of Pointe Pelee. This is explained by its position in the lake, and the prevailing winds. Being situate near the western end of the lake, the westerly winds lower the water at that end so that while accretions take place on the westerly side of the point, decretion obtains on the opposite or easterly side. This effect is well illustrated, too, at Port Stanley through the artificial obstruction, the pier. To the west of the pier several hundred feet of beach have been added and materially help to make Port Stanley a favorite summer resort. Along the eastern part of the lake, where we have rock exposure underlying the alluvium, there has been less wasting away of the banks.

The low stage of the water for some years has exposed the rim of the bottom to the action of the wind, and in consequence, where the banks are low, as they are a little west of Morpeth, sand hills have grown and partially cover trees standing near the lake shore.

That Lake Erie is very shallow is well known, and an ocean liner would, if sunk almost anywhere in the lake, show its masts above water, but what calls one's attention to the fact very forcibly are the pound-net fishing arrangements. For the row of tamarack piles which extend into the lake for about a mile are only about 40 feet long, of which five feet are in the ground and seven feet above water. These piles are removed every fall to prevent damage from ice and also to prevent fouling of the fishing ground by debris gathering around the poles.

The two deep bays shown on the township plans of Romney as "The Two Rivers" are now but a memory, for one walks dryshod over their former mouth. A number of the streams discharging into the lake do so by filtration.

At several points east of Pointe Pelee coarse gold has been found on the beach.

In the Townships of Romney, East Tilbury and Raleigh we have the peculiarity of the land immediately adjoining the lake having its natural drainage northward into the Thames basin, so that the artificial drainage of the long, narrow farms, which is made into Lake Erie, becomes rather expensive on account of the

depth to which the drains must be carried. By erosion one of these drains was found to be a narrow V-shaped channel over fifty feet in depth, threatening calamity to the buildings near by.

A few miles east of Wheatley, in the County of Kent, some engineer's stakes were encountered, having been placed in connection with a proposed canal across the peninsula from Lake St. Clair into Lake Erie, for shortening the distance.

In view of the possible future triangulation of the country north of the lake it may be mentioned that on the ridge in the Township of Orford a suitable primary station might be found. From the level character of the country in the extreme western part of Ontario, suitable ground for such stations is difficult to find. Another one that came under my notice is a little west of Woodstock, which, with one near Port Stanley and the Houghton sand hill, would form nearly an equilateral triangle of about 35 miles to a side.

THE REDUCTION OF THE WORK.

I shall treat the matter in the order in which the work was done; this pertains to the road survey alone, as the shore survey was adjusted for each block of two or three miles between points common to the two surveys. Azimuths were reckoned from north through east to north, paying attention to the quadrants for giving the proper sign to the functions sine and cosine. There are 580 stations in the road survey, and of the observation stations 24 were adopted as initial meridians for carrying forward the azimuth between the latter. The latitudes and departures were computed from one initial meridian to another. Their algebraic sum gave the difference in latitude and longitude between the initial and terminal points. Converting the difference of longitude into arc along the middle parallel (using the very useful tables of the Dominion Lands Manual) and multiplying by the sine of the middle latitude, we obtain the convergence between the two meridians, and by applying this to our terminal azimuth obtain the computed true azimuth thereof, which, compared with the observed azimuth (at the terminal meridian) gives us the accumulated angle error between these two meridians. On the assumption that the angles of the traverse have all been equally well read, which is a matter solely of personal knowledge, the angle error was equally distributed amongst the angles read. It may be stated that the average correction per angle was $3.33''$, the maximum correction was $5.80''$ and the minimum $.09''$. Furthermore, all the corrections, with the exception of two were positive, showing, I think, unmistakably that the angle error was markedly due to torsion, making the angles too small. The instrument was always turned in the same way—to the right—whether for circle right or circle left.

Applying the angle correction a new azimuth results for each course, and hence corrected latitude and departures. These latter were deduced from the already computed ones by the use of deflection tables, specially computed for each second of arc. From the corrected latitude and departures the true differences of latitude and longitude of the initial and terminal points of a "block" are found, after applying to the former the necessary reduction to the parallel of latitude at the terminal point. This reduction is of the form $-d \lambda \sin (1/2 d \lambda'' \sin \phi)$ converted into arc of latitude, $d \lambda$ representing the difference of longitude for the middle latitude ϕ .

The quantity within the brackets represents the deflection from the prime vertical at an initial point and the deflecting great circle cutting the parallel of latitude of such initial point at the distance $d \lambda$ therefrom.

Carrying the work thus forward from block to block, we ultimately reach the final station, the geodetic point U. S. Lake Survey, "Kingsville." In doing work carefully we have an a priori confidence in the ultimate result, and are justified in expecting the closing error to be either within certain limits or of a particular nature. In the present instance it is seen that the azimuth of the traverse was continually kept under control, and in the computation and reduction of the traverse the small angle errors applied so that there was no reason that a sensible error in closing at the final station, whose geographic co-ordinates are known, due to azimuth of the traverse should occur. But with the linear measure the case stood differently. To begin with, the steel tape had a correction to standard length—as every tape has, although the correction may be very small—then we have the personal equation of chaining, and thirdly the correction for inclination of ground, either when tape is laid thereon, or when through too much of an incline the tape is elevated at one end. The correction to the horizontal is invariably negative, i.e., the recorded chainage is too great. The signs of the other two corrections may be either positive or negative.

When a traverse extends over a considerable distance, and closes on a geodetic point, we have a further correction to the former for reducing the linear measure, or rather the derivatives—latitude and departure—to sea level. In the present instance, taking the mean level above the sea of the traverse line at 650 feet, the correction in longitude equals a third of a second of arc. This correction is always negative. The road survey is 265 miles in length, including the lines running to the lake. From the manner in which the work was done and the reduction of the traverse made, it was natural to expect the closing error to be one due almost wholly to linear measure. Carrying the computation uncorrected for length of chain and elevation above sea, forward as

above indicated, the geographical co-ordinates of the U. S. stone monument "Kingsville" are found to be $\phi=42^{\circ} 01' 34''.58$, $\lambda=82^{\circ} 44' 27''.41$. The U.S. Lake Survey gives $\phi=42^{\circ} 01' 36''.1$, $\lambda=82^{\circ} 44' 21''.4$, giving a difference in ϕ of $1''.52$, and in λ of $6''.0$. Now as the ratio of the difference of latitude and longitude of the initial and terminal stations is 100-380 and the ratio of the closing errors in ϕ and λ is 100-389, we see that the *a priori* conclusion was well founded, i.e., that the closing error is due to linear measurement. Hence no change in the adopted azimuths of the traverse was made. In the adjusted and final computation the latitudes and departures were all decreased respectively in the ratio of the closing error in latitude and departure to the total distance of latitude and longitude, which is equivalent to multiplying all the lengths by a constant. To apply more mathematics—method of least squares—to this survey would be like cracking nuts with a sledge hammer. The result of the work has now been plotted on five large sheets on a scale of half a mile to the inch; a large scale, yet so small that the plotting of a refined geodetic survey of the same work on that scale would coincide with the former. From these sheets a reduced chart has been made on a scale of 1-400,000, the south shore and extremities of the lake being taken from the U. S. Lake Survey sheet of that scale. It may be mentioned that for the purpose of transfer of the latter a "dry" print had to be obtained from Washington, as ordinarily the sheets when printed are moist, and in consequence afterwards even the best of maps and charts suffer seriously from distortion. A suitable non-distorting material for map printing has yet to be discovered.

After the completion of the traverse an astronomical station was established at Port Stanley, which was tied to the traverse. A substantial stone pier was erected for the transit and zenith telescope and a small observatory built over the pier. For longitude the observatory was connected with Ottawa, which is now well established in longitude, and a successful series of transits obtained, although bad weather—October and November—retarded the work.

The observers, Mr. W. F. King and myself, exchanged stations. The final reductions for longitude are not yet quite complete. For latitude I obtained 54 observations, and from which the position of the pier (observatory) is found to be $\phi=42^{\circ} 39' 52''.73$ $\lambda=82^{\circ} 44' 09''.09$. The final traverse reduction, above indicated, gives for the same point $\phi=42^{\circ} 39' 53''.24$, a difference of half a second of arc, a satisfactory agreement.

The Lake Erie survey cannot be called a geodetic survey, but simply a careful traverse, in the reduction of which, however, geodetic considerations have been applied throughout.

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by Authors.]

DOCUMENTARY HISTORY OF THE FIRST SURVEYS IN THE PROVINCE OF ONTARIO.

By J. J. MURPHY, DEPARTMENT OF CROWN LANDS.

Toronto.

The Treaty of Peace, signed at Paris on the 7th February, 1763, completed the conquest of Canada, and added to the territory of Great Britain fully half a continent. On the 7th of October of the same year a royal proclamation was issued, erecting the government of the Province of Quebec, defining its limits and providing for liberal grants of the lands of the Crown to the inhabitants and other persons who should decide to settle in the province. Special provision was made for rewarding the conduct and bravery of the officers and men of the army and navy who had taken part in the late war, and the quantities of land which they were to receive, according to rank, and without fee or reward, were particularly set out. This proclamation was received in Canada in August, 1764, but notwithstanding the liberal grants offered to induce settlement, nearly twenty years were to elapse before any movement was made to colonize that part of the newly acquired territory, now known as Ontario. Up to 1783 the settlements extended very little beyond the city of Montreal in a westerly direction. Various reasons may be given for this state of affairs; in the first place, the members of the disbanded British regiments who decided to remain in Canada preferred settling in the inhabited portions of the province to braving the dangers of the *wild Indian regions*; in fact settlement in the Indian territory was discouraged until the claims of the Indian tribes were arranged for and ceded. Then there was no immigration from abroad. The popular prejudice which prevailed in the Old Country at the time, and which apparently has not even to this day been fully dispelled, was that the Canadian climate was "nine months of snow and ice and three months of cold weather."

But the chief obstacle was, no doubt, the troubles connected with the revolt of the American colonies, which, unfortunately, began shortly after the conquest and continued up to 1783. During this time the whole attention of the colonial administration

was fully occupied in preventing the new province from following their example.

With the cessation of hostilities in 1783 and the recognition of the independence of the United States, a change took place. There were many of the American colonists who had adhered to the royal cause, and when it became apparent that this cause was lost their hopes were ended. Their homes and property had been confiscated; they were subject to continuous persecution from the victorious party, and were destitute and dependent. A large number of them, therefore, decided to seek a refuge on Canadian soil. Sir Guy Carleton was then in command of the British forces in New York, and General Frederick Haldimand Governor-General at Quebec. They took prompt and active measures to provide for the removal of these Loyalists to Canada, and for their settlement on suitable lands of the Crown. In anticipation of their arrival, and without waiting for definite instructions from the home authorities, Haldimand sent exploring parties to examine the country along the St. Lawrence west of Montreal and in the neighborhood of the old French fort at Cataragui. He also gave instructions for the survey of the lands at the last-named place. This letter of instructions from Governor Haldimand to the Surveyor-General, Major Holland, was dated on the 26th of May, 1783, and, so far as known, this was the first survey ordered in the Province of Ontario. Major Holland proceeded at once to the locality, began to lay out a town plot, and having examined the surrounding country and formed his plans for future operations, he returned to Quebec and reported to Governor Haldimand.

The Deputy Surveyor-General, John Collins, with two assistants, was sent up and proceeded vigorously with the surveys. During the fall of 1783 and the following year they surveyed the outlines of five townships and partly subdivided them. These townships, which extended westward from Cataragui around the Bay of Quinte, were numbered consecutively, 1, 2, 3, 4 and 5. They were afterwards called Kingston, Ernestown, Fredericksburgh, Adolphustown and Marysburgh, but were generally known for many years by their numerals.

Early in the January of 1784 the first band of United Empire Loyalists, under the leadership of Captain Michael Grass, arrived from New York and, the following May, they ascended the St. Lawrence in batteaux, to take possession of the lands which had been surveyed for them. Sir John Johnston and Deputy Surveyor-General Collins were instructed to proceed with the party and settle them on the lands, which were to be drawn for, in order to prevent partiality. Mr. Collins was also appointed to administer the oath of allegiance. Provisions, seeds and implements were supplied, and energetic efforts were made to have these refugees settled comfort-

ably. The greater part of Captain Grass' party were settled in township No. 1, and this was the first effective settlement made within the boundaries of what is now the Province of Ontario, and may be justly considered as the foundation of the province.

Major Samuel Holland was the first Surveyor-General of the Province of Quebec. He was appointed on the 10th of February, 1764, by His Majesty in Council, and appears to have been engaged on surveys in various parts of the American colonies; but he resumed his duties in Quebec when the Revolutionary War broke out. He died there on the 28th January, 1802. Maj. Holland was a British officer who distinguished himself at Louisburg, and had also fought bravely under Wolfe on the Plains of Abraham. He was a great favorite of Wolfe, was with him during his last moments at the close of the battle, and was also one of his legatees.

Major Holland contributed some scientific papers to the proceedings of the London Philosophical Society in 1768, '69 and '74, and he compiled several maps of the Province of Quebec. The most important of these, "A New Topographical Map of the Province of Lower Canada," was published in London the year after his death.

On the 8th September, 1764, Major Holland appointed John Collins Deputy Surveyor-General, and he directed the surveys in the upper part of the province until its division into two distinct provinces of Upper and Lower Canada by the Constitutional Act of 1791. From an account rendered by Mr. Collins, it appears that when engaged on the surveys at Cataraqui and the Bay of Quinte, he was paid for his services as Deputy Surveyor-General at the rate of fifteen shillings a day, besides expenses, and that the other surveyors employed at that time were paid at the rate of 7 shillings and 6 pence a day, with 1 shilling and 3 pence additional for provisions. The following is an extract from a report, in which he sets out the instruments which he had in his office: "There are no instruments in the Surveyor-General's office which belong to the Government. The following list are instruments belonging to Mr. Collins:—A theodolite by Rowley, F.D.; an acromatic telescope, 3-8 in length, the magnifying powers with eyeglasses for land objects about 50 times, and with those for astronomical uses 80 times; one Hadley's quadrant; one Mason's level; one English chain; one French chain. The Deputy Surveyor and the Assistant Surveyors furnish their own instruments for the ordinary business of surveying lands.

JOHN COLLINS,
Deputy Surveyor-General.

The following documents containing the instructions and correspondence connected with these first surveys have been collected

partly from the records of the Crown Lands Department, but chiefly from the Haldimand Papers in the Archives office in Ottawa. They are, as far as possible, arranged in chronological order.

LETTER FROM GOVERNOR HALDIMAND TO SURVEYOR-GENERAL HOLLAND.

HEADQUARTERS, QUEBEC, 26th May, 1783.

Major Holland, Surveyor-General :

SIR,—As it is necessary that I should be informed of the nature of the country from the last concessions to Catarqui, and thence to Niagara, on the north side of Lake Ontario, you are hereby directed to set off immediately for Montreal, and to proceed to Catarqui, where you will minutely examine into the situation and state of the post formerly occupied by the French, and the land and country adjacent; considering the facility of establishing settlement there, and the advantages and disadvantages that might attend that measure, all of which you will report to me as soon as possible; and in the meantime, if you find the fort in such a state as is correspondent with the views and instructions I have communicated to you, you will, without loss of time, make application to Major Harris, commanding at Carleton Island, for workmen and all other assistance in his power to afford, and also to Major Ross, commanding at Oswego, who has orders, upon your application, to send Lieut. Tinling, acting engineer, and with him such artificers, tools and materials as you shall require, to join you immediately. You will dismiss the Canadian Batteauxmen at Carleton Island and procure soldiers or seamen, as you shall think best, to proceed to Catarqui.

Having made your observations at Catarqui and given such directions as you shall think necessary at that place, you will send forward the gentlemen who accompany you for the purpose of continuing the examination of the country to Niagara, and return yourself to Quebec without loss of time.

I am, etc.,

F. HALDIMAND.

FROM MAJOR HOLLAND TO GENERAL HALDIMAND.

QUEBEC, 26th June, 1783.

SIR,—Agreeably to the commands contained in your Excellency's letter to me dated the 26th of last month, I immediately set off for Montreal, with the two Mohawks, Captain Brant and Johan; there I left them, Captain Brant being unable to proceed from sickness. On the 3rd of June Captain LaForce joined me at LeChine,

and we proceeded, with two batteaux, for Carleton Island. As the time limited by your Excellency for my return would not permit me to make an actual survey of the ungranted lands on the north side of the River St. Lawrence, I examined them with attention, and collected all the information I could as to the facility of establishing settlements there, and I found that from the supposed bounds of the Seigneurie of Soulange the property of Monsieur de Longueille on the Lake St. Francis the lands are low towards the water side and fit for meadows, but at the same distance the soil is exceedingly good tillage. From the upper part of Lake St. Francis to the Long Sault no land can be more promising, covered with fine timber fit for building vessels, and in some places pineries fit for masts. The shore along the Long Sault has not an inviting aspect, but the soil, 'tis said, at no great distance back is equal to that on Lake St. Francis.

There are fine pineries two or three miles from the water's edge where large masts may be procured.

From the head of the Long Sault to the top of the uppermost rapid, where the navigation begins, the country has a most favorable appearance. From hence to Cataraqi the shore is high and rocky, but opening here and there into beautiful coves and bays, where the view extends a great way into fine natural meadows, and though the shore appears rough and uninviting the soil is rich at some distance—fit for all purposes of agriculture, as I have been informed.

I arrived at Carleton Island on the 10th, late at night, and applied to Major Harris to despatch your orders for Major Ross and Mr. Tingling, the assistant engineer. On the 12th I reached Cataraqi, and began the survey of the Fort and entrenchments made there by the French troops. On the following day my assistant proceeded to survey the harbor and Captain La Force to take the soundings. Lieut. Tingling joined me on the 17th, when I examined the fort, and made arrangements for the re-establishment of this important post, which in every part surpassed the favorable idea I had formed of it. Your Excellency will perceive its advantageous situation by the plans and drawings which accompany this letter.

The vaults still remain entire, with part of the walls of the fort, barracks, etc., etc., and are in such a state as will contribute to lessen the expense of its re-establishment. The works or lines began by the French on the commanding grounds near the fort will cover a sufficient space for a town. The harbor is in every respect good, and most conveniently situated to command Lake Ontario. The battetaux men prefer keeping over on this side, as they can follow the shore without crossing to the islands in their course.

Captain Joseph Brant, with several Indians of the Six Nations, went up to Cataraqi Falls and made excursions into the woods. They seemed to be well satisfied with the country. At their return they declined saying anything concerning the lands; but told me that as soon as they have examined the north side of the lake they will inform your Excellency of the spot where they'll choose to fix their abode. For this purpose they have sent Captain Isaac with six men of their number to accompany the surveying party.

On the 19th we returned to Carleton Island, where I arranged matters with Major Harris, and wrote to Major Ross for fifty men from each post, and to transport materials to Cataraqi to prosecute the works carrying on there under Mr. Tinling, with whom I left Lieut. Holland as an assistant, who was despatched to forward materials from Oswego.

Captain La Force, Mr. Cotte, and Mr. Peachy proceeded to survey the north shore of the Lake Ontario all the way to Niagara, having received my instructions for that purpose. On the 20th I set out from Carleton Island for Quebec, where I arrived yesterday.

I have the honor to be, etc.,

SAMUEL HOLLAND.

FROM MAJOR HOLLAND TO GENERAL HALDIMAND.

NEAR QUEBEC, 10th July, 1783.

MY DEAR GENERAL,—I should not have been wanting in sending your excellency those volumes of Pre Charlevoix which make mention about Cataraqi before now; if the second volume had not been lent out in town, which was only returned last night.

The first mentionings made by this author is in volume the second, page 244 and 245, when the first project was made in the year 1672, to take post there by Monsieur de Courcelles and his successor, Count Frontenac, built the fort. Page 372 in the same volume it is mentioned that in the year 1688 the Iroquois formed a blockade. Page 406 to 409, the same volume, it was proposed to be abandoned, but opposed by Count Frontenac, though it was evacuated in 1689. In the third volume, page 222 to 227, the fort is retained by Count Frontenac against the advice of everybody, and well executed by Monsieur Cryan; thus in the year 1695, in the fifth volume, page 281 to 288, some reflections on the fort, its situation, and road to it. Page 301 in the same volume P. Charlevoix mentions his arrival and leaving Cataracouy. I have only sent those three volumes, which have any relation to Cataracouy, and marked those pages mentioned above.

Your Excellency will perceive through the whole the importance of this post, which by this present Revolution is become nearly of the same consequence as it was in the times of Count Frontenac, or rather to the time of Monseieur de Montcalm (before he took Oswego), which induced him to take possession of the commanding ground near it, by which he would have covered the fort and would have taken in a sufficient space for a town. Your Excellency will be convinced by the plan which I had the honor of transmitting to you that if those lines are judiciously disposed of it must perpetuate Fort Haldimand, at Cataracouy, to all posterity, to which none shall be more happy to contribute to than,

My dear General,

Your Excellency's most obedient and most obliged
humble servant,

SAMUEL HOLLAND.

His Excellency the Commander-in-Chief.

FROM CAPT. MATHEWS TO MAJOR ROSS (OSWEGO).

HEADQUARTERS, QUEBEC, 28th July, 1783.

MAJOR ROSS:

SIR,—By order of His Excellency the Commander-in-Chief I transmit to you the enclosed sketch and explanatory letters for a township His Excellency has in contemplation for Cataracoui. The hurry of business in which the General is involved by the departure of the German troops prevents his entering fully into this matter at present, but that no time may be lost in taking every preparatory measure, His Excellency desires you will have the survey mentioned in Major Holland's letter immediately taken, and that you will transmit it to him with every additional remark that shall strike you as useful information on this occasion.

His Excellency is further pleased to direct that all buildings and materials that can be with propriety removed from Carleton Island for the use of the new post and to put the stores, etc., under cover in case of evacuation this fall, be particularly attended to, which His Excellency desires you will communicate his wishes on this subject to Major Harris, for his mutual assistance in this as well as all other circumstances that can facilitate the speedy establishment of the post at Cataracoui.

I am, etc.,

R. MATHEWS.

P. S.—His Excellency not having yet received the least information or instructions concerning the settlement of Loyalists in

this Province, and having it only in view to place them in such situations as appears to him most eligible, desires you will not mention anything of the present scheme to any person whosoever.

R. M.

FROM MAJOR HOLLAND TO GENERAL HALDIMAND.

NEAR QUEBEC, 23rd July, 1783.

SIR,—As your Excellency was pleased to desire my thoughts on the situation for a town on the harbor of Cataraqui, I have made a sketch of its environs, which I have the honor to join, and for the illustration of this subject I have been obliged to take the liberty to adopt names to the several places which must come in question. The peninsula on the east side of the entrance of Cataraqui harbor seems to me a most advantageous place for the purpose, as vessels (sufficient for the navigation in those parts) may lay in safety most all around it, with the help of some small wharfs, may lay to load and unload with great conveniency. At Point Frederick a proper space, A, for a fort, with a convenient distance for an esplanade, B, should be reserved, which may serve as well for military use as for a market place. The principal streets should run through the middle from the fort to the neck; a convenient space for a street or landing must be reserved on both sides the town along the waterside. At Point C a proper space should be reserved for batteries and naval purposes, with sufficient space on the neck D, where in time fortifications for the security of the town may be constructed. At the same time I must recommend to your Excellency's consideration that a common for the feeding of the cattle belonging to a town is of the greatest benefit to its inhabitants, and if a N. W. line is drawn from the head of Hamilton Cove to Cataraqui Harbor I think a sufficient tract will remain for that purpose; if not, Cedar Island may be included for that purpose. If your Excellency is pleased to approve of what I have the honor to represent, it will be necessary that an exact survey be made and laid down by a scale of fifty or sixty feet to an inch, and to ascertain the exact breadth of the ground. Avenues should be cut through as marked on the sketched plan E F. where some of the principal cross streets must fall; and on the neck marked G H it will be also necessary to have cuts through for the same reasons, as the ground intended for the town is only wanting on a large scale. The commons may be laid down by a scale of 100 feet to an inch.

I beg leave to submit the whole to your Excellency's consideration, and have the honor to be, etc.,

SAMUEL HOLLAND.

FROM MAJOR ROSS TO CAPTAIN MATHEWS.

CATARAQUI, 31st July, 1783.

SIR,—The contrary winds made it impracticable to remove the troops from Oswego until the 28th instant, as the vessels did not arrive sooner, but everything being in readiness no time was lost, and we arrived here the 30th, in the morning.

I have perused with attention the instructions given to Lieutenant Tingling by Major Holland, which shall be strictly adhered to, and were it not for a scarcity of masons I should hope in a very short time to have the honor to inform His Excellency of everything being finished accordingly.

There is a very advantageous place for building mills about five miles from this fort, but nothing more can be done than to collect and prepare materials until a millwright arrives. Please present the enclosed sketch to the General.

The iron-work, etc., arrived yesterday.

I have the honor to be, etc.,

(Signed) JOHN ROSS.

FROM MAJOR ROSS TO GENERAL HALDIMAND.

CATARAQUI, 3rd September, 1783.

SIR,—Agreeable to your Excellency's orders of the 20th of July, I have the honor to transmit the survey directed; exclusive of the survey I have taken every necessary height and distance, and with as much accuracy as possible have endeavored to examine every part that comes within the scale of useful information.

Your Excellency did me the honor to require my remarks on this occasion. With due submission I shall endeavor to explain matters to the best of my humble judgment. If I have presumed to differ from the plan laid down by Major Holland, it is from this circumstance that both the engineer and myself are of opinion that the old works or the ground contiguous to them cannot be well fortified, being commanded from a rising ground at the distance of point blank cannon shot.

The next object which strikes me is the high land above Cape Henry at A, elevated above the surface of the water upwards of one hundred and twenty feet. This place I take the liberty to say is eligible ground to fortify, and place my ideas accordingly.

I have sounded the harbor in Haldimand Bay, where there is water sufficient. Point Frederick, being subjected to an advantageous cannonade from the west side of Cataraqui Harbor, may I then take the liberty to say (although no town can be placed here

secure from bombardment) that the land on east side of Haldimand Cove is preferable for a town, where, I think, there is sufficient space under the guns of the supposed fort at A. At B the naval purposes may be executed, where wharfs can conveniently be erected. I take the liberty to propose this place being the safest side of the bay for anchorage, and as it is the additional breadth of the point distant from the land on the west side of Catarqui harbor, may be judged a proper place for store-houses.

The town common, as before described, the land is not arable, being a rocky surface, but may do for pasture. Cedar Island is perfectly barren. These are all the remarks which I shall take the liberty to present to your Excellency at present, and will conclude with this observation, that the high ground at A is most respectable—it commands Hamilton Cove, Cedar Island, Point Henry, Haldimand Cove, Point Frederick, Catarqui Harbor, and even the old fort is not secure from thence.

I would have caused the survey of the fort and this side of Catarqui Harbor to be added to the plan sent, but as it would have occasioned a delay and Mr. Tinling informs me that your Excellency is already furnished with one, thought it best not to wait.

I have the honor to be, etc.,

JOHN ROSS.

GENERAL HALDIMAND TO MAJOR ROSS.

HEADQUARTERS, QUEBEC,

7th September, 1783.

MAJOR ROSS:

SIR,—This will be delivered to you by Mr. Collins, whom I send, with proper assistance, to Catarqui, in order to survey and mark out the settlement intended at that place for the refugee Loyalists. I enclose for your information a copy of my instructions to Mr. Collins, by which you will perceive that it is my intention to have the lands distributed in townships containing lots of 120 acres, which will be useful to you as a general answer to applications which may probably be made for particular spots or quantities of land.

Capt. Laforce, Capt. Sherwood and others skilled in land, and the principles of colonization accompany Mr. Collins. They have also a number of men in order to cut down and square timber to make a beginning; and it is very probable that some of them may choose to winter there. Should that be the case, I wish them to set down upon the ground intended for the town, and small lots to be given to them on the common, in order to clear it as

soon as possible. Any persons so settling may obtain leases for thirty years (as expressed in the instructions), but if they should not choose to take leases upon those terms, and notwithstanding to hut themselves for the winter, they must sign agreements to relinquish their lots whenever they shall be required so to do.

You will give the necessary directions for victualling the Loyalists that accompany Mr. Collins, and as they are chiefly artificers, such of them as shall not be wanted on the survey, you will employ as you shall see necessary in forwarding the establishment of the post. Any tools, nails, etc., that they may want you will supply, if you have them, or otherwise by requisition to Carleton Island, from any department where they are to be found.

I am, sir, etc.,

F. HALDIMAND.

FROM GENERAL HALDIMAND TO JOHN COLLINS.

HEADQUARTERS, QUEBEC,
11th September, 1783.

JOHN COLLINS, Esq.:

SIR,—It being my intention to establish settlements for the provision of part of the distressed Loyalists resorting to this Province at and in the neighborhood of Cataragui, upon Lake Ontario, you are hereby directed to proceed to that place without loss of time for the purpose of surveying and laying out the several lands in townships and lots agreeably to the following instructions :—

1. You will make an exact survey of the neck intended for the town lot, describing and expressing the nature of the ground and soil, and if Point Frederick is not commanded from Point Henry, on both which places sufficient spaces for fortifications must be reserved.

2. At the west side of Cataragui Harbor the ground near the fort and within the lines (as marked in the plan A, B, C) must remain to the Crown, for the use of the garrison, and as a place of resort for the Indians, where some of the most noted might be allowed to build, reserving sufficient spaces round the slips (where vessels were formerly constructed) unincumbered with buildings.

3. Though a common, containing about 400 acres, must be reserved for the use of the town, leases may be given for a term of years, not exceeding thirty years, to settle there: as the people for the present will be glad to be as near the town as possible, and the common will be cleared by the time the town will be in want of it.

4. The method of laying out townships of six miles square I consider as the best to be followed, as the people to be settled there are most used to it, and will best answer the proportion of lands I propose to grant to each family, viz.: 120 acres, of which six are to be in front, which will make 19 chains in front and 63 chains 25 links in depth, so that every township will have 25 lots in front and four chains 75 links will remain for roads, with 7 concessions in depth. Fifty-eight links will remain for a road, by which distribution each township will contain 175 lots of 120 acres.

For your assistance in the execution of this business you will be joined at Montreal by Capt. Sherwood and Lieut. Cotte and also by Mr. Grass, captain of one of the companies of militia intended for that settlement, and these gentlemen will be attended with axemen, etc., proper for that occasion.

You will begin your survey by a township on each side of the bay, and transmit it to me, together with your remarks, reporting to me in the like manner from time to time the progress you shall make.

As it is not improbable that in exploring these lands some of the persons employed may make choice of particular situations, and make preparations accordingly, to prevent which you are to signify to them that my intentions are to distribute the lots impartially by drawing for them, and that all timber cut down this fall, or any log houses they may choose to make and reside in until the settlements shall be regularly granted, will not be considered as any right of such persons, but entered as a temporary beginning, and should any of them prefer remaining there this winter to returning to Sorel, may have lots of four acres marked out for them in the common, which they will enjoy for thirty years, as before mentioned, by which means whatever work is done will forward the clearing of the common and be for the public good. The officers commanding at Carleton Island, Cataragui, or any post you shall have occasion to call at are hereby directed to afford you every assistance in their power, whether in provisions or otherwise, for the speedy and effectual execution of these instructions.

Wishing you success, etc.,

F. HALDIMAND.

FROM GENERAL HALDIMAND TO JOHN COLLINS.

HEADQUARTERS, QUEBEC,

JOHN COLLINS, Esq.:

15th September, 1783.

SIR,—Since your departure from Quebec I have received letters from Major Ross which induce me to change the situa-

tion of the proposed township near Catarauqui, and to desire it may be placed on Point Henry, to explain which I enclose you a sketch of that point, copied from that Major Ross sent me, and I desire you will begin by opening a large avenue from Point Henry in a direct line towards the high ground marked 122 feet above the water, and near D, and on the line I would cut several other avenues, all at right angles therewith, as the line in pencil shows; but in doing this and every other service, you must conform yourself to such orders as Major Ross may think proper to give you.

I am, sir, etc.,

F. HALDIMAND.

FROM GENERAL HALDIMAND TO MAJOR ROSS.

QUEBEC, September 15th, 1783.

SIR,—I have received your letter of the 3rd instant, with the sketch of Point Henry, etc., and am very much obliged to you for the trouble you have taken to examine the ground near Catarauqui. I entirely approve of your idea of changing the situation of the town to Point Henry, and have given my orders to Mr. Collins accordingly, subject, however, to any alteration which you may think necessary, and, in case of any future discovery, of situation, proper to be fortified you will preserve such an extent of ground round them as you judge proper, and communicate to me your ideas concerning them.

In a few days Lieut. French, of Major Jessup's Corps, will leave Montreal with a party of Loyalists, to examine the great River Ottawa, and when at a proper distance to endeavor from thence to fall upon Catarauqui. When they arrive you will supply them with everything they may want and provide them with the means of returning to Montreal as soon as possible. . . . and in order more fully to accomplish my intentions on this point, I could wish you would send some small party with savages somewhere near the same road, but they should be accompanied by an intelligent person, who would keep a journal of the distances and the course they steer, with every other necessary remark. Our plans of this country are very imperfect. According to them I should conjecture that due north from your post the great river lies about 150 miles distant. I mention this, but have no doubt that the savages are much better acquainted with the distance than we are.

From the report of Sir John Johnson I have reason to expect that the Mohawks and some other tribes of savages will establish themselves near the Bay of Kintie, and I understand it is their

wish to have the Loyalists in their neighborhood. All which, I think, will be an advantage by rendering the settlement respectable, and consequently secure. The only difficulty seems to be, giving uneasiness to the Missisagues, as they claim the northern part of Lake Ontario, to avoid which I have directed Sir J. Johnson to treat with them on this matter, and if necessary to make such purchases as the King's service may require, which he tells me will easily be accomplished.

I am, sir,

Your most humble and most obedient servant,

F. HALDIMAND.

FROM MAJOR ROSS TO CAPTAIN MATHEWS.

CATARAQUI, 2nd October, 1783.

SIR,—Mr. Collins arrived here last night with Capt. Sherwood, by whom I had the honor to receive His Excellency's directions. Accordingly I shall be extremely happy to contribute as much as in my power to expedite the business they are sent upon.

I am glad we have anticipated His Excellency's intentions in sending those gentlemen, from which view I have employed myself from time to time traversing the lands adjacent, and cutting almost all the paths and avenues about this fort which become necessary to render a proper and speedy information to His Excellency.

The Indians have not as yet been advised on this occasion. I am doubtful they will make more difficulty than Sir John Johnson imagines; but still I hope of no great moment or importance. I have had no rum to give them since my arrival to which they are absolutely devoted. Any little I have given them as yet has been my own, but it has been but trifling.

The troops will be in barracks in a few days, and I have informed the commissary that he may direct the transport of provisions to this place when he pleases. Storehouses are in great forwardness.

I have the honor to be, etc.,

JOHN ROSS.

FROM JOHN COLLINS TO GENERAL HALDIMAND.

CATARAQUI, October 2nd, 1783.

SIR,—I have the honor of your Excellency's favor of the 15th September, by which I observe the change your Excellency directs

to be made with respect to the situation of the township near Cata-raqui, and my receiving orders from Major Ross. Your Excellency may rest assured I shall conform myself to them in every particular.

I arrived here yesterday evening in company with Captain Sherwood, etc., having had excessive bad weather almost every day since I left Quebec. I waited on Major Ross and showed him my instructions. He advised that as the lands proposed for townships were not yet purchased from the savages I should stop a few days till that was done, as a person was sent to bring them in for that purpose. In the meantime I shall employ myself in surveying that part fronting the lake, and the other business recommended by your Excellency.

I have the honor to be, etc.,

JOHN COLLINS.

FROM JOHN COLLINS TO GENERAL HALDIMAND.

CATARAQUI, 3rd November, 1783.

SIR,—Through Capt. Mathews I have had the honor of your Excellency's commands of the 13th ultimo, by which I find the weather with you has been similar to what we have had here. All the low lands on the small rivers which this country abounds with are covered with water in such a manner as greatly to retard our progress. All I have been able to do has been to complete the survey of one township, the plan and report of which I have the honor to transmit to your Excellency by this conveyance, with a plan of Point Henry, surveyed by Mr. Cotte, accompanied with such remarks as I hope will prove satisfactory. Mr. Cotte has been constantly employed on that business since his arrival here, but sets off to-morrow with Captain Sherwood and myself in order to lay out a second township, which will be a few miles above the first. The lands between the two are stoney and unfit for cultivation. Your Excellency will please to observe that the township I have laid out is on the west side the River Cata-raqui. The lands on the east side, back of Point Henry, by Capt. Sherwood's report, are stoney and barren and not more than half a dozen good lots could be found for some miles back, which report, with the approbation of Major Ross, made me decline laying out a township on the east side the river.

Captain Sherwood and his officers have been constantly employed from their arrival here till the 24th ultimo in exploring the country on this side the lake, a report of which I have likewise the honor to enclose.

Mr. Holland, from indisposition, has not been able to attend me as yet, but will, I expect, in a few days. In the meantime, your Excellency may rest assured that I shall exert my best abilities in complying with your wishes and in expediting this business as fast as possible. At the same time am very much afraid that it will be greatly retarded from the badness of the weather.

I have the honor to be, etc.,

JOHN COLLINS.

FROM MAJOR ROSS TO CAPTAIN MATHEWS.

CATARAQUI, 3rd November, 1783.

SIR,—I had the honor to receive your letter of the 13th ultimo. The lands have been purchased from the Missisagoes, which bargain was much facilitated by an old chief of them whose usual residence is in Canada, but happened to be here at the time. His name is Mynass, has been in Europe, is now an old man, and expects, as he really deserves, that his services on the occasion will be considered by Sir John Johnson, to whom he is recommended.

As soon as the purchase was made, which (up the lake) extends about forty-five miles, I sent some officers of the garrison to explore the country. They report that the lands in general are of a most excellent quality, easily cleared and intersected with rivers on which are several falls where mills can conveniently be erected.

I am much obliged to His Excellency for the order on Carleton Island for rum. Such is the nature of the Indians here that if their services are wanted they are exceedingly covetous, but if they are not employed seldom ask for anything. As the latter is mostly the case at present, a very small quantity of rum or provisions will satisfy them, both of which shall be managed with the greatest economy. Indeed of late I have greatly weaned them from both, and without any discontent. This nation in peaceable times will be very little expense to Government.

The party which went to meet Lieut. French returned some days after his arrival here. They travelled about sixty miles, nearly a northern course. The lands in general are of a better quality than those reported by Lieut. French on the banks of the River Ganenencui, which he has described as very barren. They did not touch upon that river—the Indians would go no further.

The weather has been exceedingly bad here lately—very unfavorable for carrying on the works, and in particular for Mr. Collins' operations.

I was in hopes the saw-mills would have been finished this fall, which the badness of the weather has in some measure prevented. Lieut. Brass not being materially wanted after the arrival of the men sent by Captain Twiss, I have not taken the liberty to write for him, especially as there are so many people employed here at present.

I have the honor to enclose the necessary obligations from such as had permission to build here.

I have the honor to be, etc.,

JOHN ROSS.

CAPT. J. SHERWOOD'S JOURNAL OF EXPLORATION
FROM THE WEST END OF LAKE ST. FRANCIS
TO THE BAY OF QUINTE.

Sept. 19th, 1783.—Left Montreal with Lieut. Johns and two men of the King's Rangers, Ensign Bothem and seven men of the Loyal Rangers; proceeded up the River St. Lawrence in a boat. 23rd. Arrived at the west end of Lake St. Francis, which is about sixty-five miles from Montreal. 24th. Sent out a party to go by land three miles back from the river and to proceed ten miles up the river and there wait for the boat. We encamped this evening at Mille Roche, eighteen miles up from the lake. Here the party joined us. They report that they went four miles back from the water, and that the land is all the way of the best quality they ever saw, it being a black deep mould, entirely free from stones, ledges or swamps. The timber is very thin, but grows exceedingly large and tall. It is a mixture of beech, maple, elm, basswood, butternut, white oak, hickory, and some pine. The land is exceedingly pleasant all along the shore, and there is a number of fine islands in the river, but there is a great scarcity of water back from the river. 25th. Sent out a party to go by land, and proceeded this day five leagues, which brought us two leagues above the rapid Long Sou. Here the party who went by land joined us. They report that they went two leagues back from the river, that the land is all the way exceeding good, the soil black and deep, mixed with clay loam, the timber the same in quality as described yesterday. Lieut. Johns, who was one of the party, says he never before saw so fine a country of land for all kind of cultivation. They crossed a large creek which emptys into the river just at the head of Long Sou; about two miles up this they saw a very convenient place, and falls for mills, surrounded by a fine grove of pine and white oak timber.

26th and 27th. Proceeded to the head of all the rapids, about twenty-eight miles. This place is called La Galloom, and is about three leagues below Oswegatchie. I sent out frequent parties all this way, as before, and their reports all agree in the excellent quality of the land which is in general as above described, and the river all the way interspersed with fine islands, the soil and timber exceedingly good.

28th. Proceeded five leagues. The land in this distance is not so good as above described, it being somewhat stony, but the soil is deep and rich and may be cultivated to great advantage. On the whole the land may all be said to be of the very best quality from the Lake St. Francis all the way up the river, twelve miles above Oswegatcha, and would admit of at least twelve townships on the river, each six miles square, but the six lower townships would be the best of the twelve. Indeed, I think there cannot be better land in America.

29th. I sent three men with six days provision to go by land from two leagues above Oswegatcha to Cataraqui.

30th. We arrived at Carleton Island. There is a vast number of islands between Oswegatcha and this place, but in general they appear to be barren rock, excepting one called Grenadier Island, which appears to be fine land.

Oct. 1st. Arrived at Cataraqui. I came from Carleton Island to this place in a bark canoe and crossed the island called Long Isle; this appears to be very good land, nearly equal to the Long Sou, and from every information I can get from my own people and others who are good judges of land, I am persuaded here may be two very valuable townships, one east and the other west of the Portage.

2nd, 3rd and 4th. Went to view the land from Cataraqui to Six Nation Bay, which is about seven miles west. This township will in general be stoney on the lake, but about a mile back the land is good, especially up Little Cataracqui, and between that and Six Nation Bay the land is very good.

6th. The party who came by land from two leagues above Oswegatcha joined us at Cataraqui, where they report that for the first six miles of their march the land would admit of a tolerable good settlement; that this township will be watered by three fine creeks, on one of which is a good place for a mill, about two miles from the lake; that all the rest of their march, within five miles of Cataraqui, the land was exceeding bad, being a constant succession of stoney ledges and sunken swamps, altogether unfit for cultivation, for three miles at least back from the lake; that on the east five miles next to Cataraqui the land was broken, but in many places was improvable and would admit of scattering settlement. This day I went with the boat to view the land all the

way to the Bay Quinte. We found the land for three miles west of Six Nation Bay to be very broken and stoney for three miles back from the lake. We encamped this night at a bay nine miles west of Cataragui. This place is called Muddy Bay.

7th. Proceeded up the lake, always keeping a party out by land, two or three miles distant from the water. At about three and a half miles from Muddy Bay we came to a very fine river, which the Indians call Mittabi Kitaga, or Stoney Creek. Between this bay and creek the land is very good except a small distance on the edge of the shore, which is stoney, but in general the stones do not extend more than 200 yards from the water, and then begins very good land. This river has two very fine falls, the uppermost not a quarter of a mile from the lake. From this we proceeded to the entrance of the Bay of Quinte, which is about seven and a half miles from Stoney Creek. The land all the way for three miles back, which was as far as we went, is extraordinary good for any kind of cultivation. The soil is deep and rich; the timber is beech, maple, elm, basswood, with some pine, and white oak. We went this afternoon up the bay on a course west by south, about eighteen miles. Here the bay turns north by east as far as we could see, which we judged to be fifteen miles. The bay in general as far as we went is about two miles wide. We encamped this night by a small creek the south side of the bay, on the tongue of land between it and the lake. The land on the north side of this bay thus far is very good.

8th. I sent Lieut. Johns and one man to explore the tongue of land from our encampment back to the mouth of the bay, and Ensign Bothem, with one man to find the distance due south across the tongue to the lake.

9th. This morning Ensign Bothem returned, and reports that it is about six miles on a south line from our camp to the lake. The first two miles the land is extraordinary good, as it is for two miles next the lake, but the two miles in the middle is generally cedar swamps. We returned this evening to the mouth of the bay, where we met Lieut. Johns on the point of the tongue. He reports that he thinks that this tongue of land is about fifteen miles long and about five miles wide in general, and that the land for about a mile and a half from the water on each side is very good, the soil being deep and black, very heavy timbered, generally maple, elm and basswood, with some large pines. The middle is almost one entire cedar and hemlock swamp (or rather grove), not too wet in general for pasture and meadow. The soil is very rich.

10th. Returned to Cataragui.

11th. Went to look at the country east of Cataragui. Proceeded fifteen miles to a large river, which the Indians call Cada-

nockui. Near the mouth of this river is a waterfall of about twenty feet perpendicular, which forms the most convenient place for mills I ever saw. The land from Cataracqui is for five miles down broken and stoney, but intermixed with grades of choice good land, and, considering its vicinity to the garrison it may be a valuable township, but then the lots must be picked out wherever the good land can be found, for if they are laid and drawn for in a regular form many men would get lots that would be worse than none. From this township to the River Cadanockui the land is altogether unfit for settlement, being one continued bed of rocks, with intervals of sunken spruce swamps two miles from the lake. There may be a good farm on the east side Cadanockui River. There is three delightful little islands near its mouth, but in general the land is very bad on each side this river.

13th. Returned to Catarockui, and on our way explored the island. This begins six miles below Cataracqui, is about seven miles long by two wide, and in general is very fine land, fit for any cultivation.

14th. I sent Ensign Bothem with the boat to land Lieut. Johns on the north side of the Bay of Quinte, at the western extremity of the late Indian purchase, from whence he is to proceed with two men one day's march north, then east until he falls in with the Cataracqui River, then down the river to the garrison. Ensign Bothem is to explore the land three miles back from the bay, from where he lands Lieut. Johns to the east and west angle.

15th. I went with two men in a bark canoe up Stoney Creek, with an intention to find its source. This stream is very pure water, and so rapid that we were many times obliged to wade to our knees and draw the canoe for an hour at a time. We proceeded up in this manner for a day and a half, which brought us about six miles north from the lake. For one mile from the mouth of this creek the land is broken and stoney, but then begins delightful land, and as far up as we went equally in quality to the Long Sou.

17th. The logs in the river prevented our proceeding any further by water. We took out the canoe and I went north by land for about three miles, which brought me in sight of a lake which appeared to be six or eight miles long and about half as wide, but a large sunken marsh prevented me from going to it. Here I began with my compass to take the angles of this serpentine river, guessing at the distance from angle to angle, and found it as follows:—From the great swamp next the small lake the creek runs west 4 deg. south two miles, then south-west one mile, then west three-quarters of a mile, then south twenty rods, then south-west ten rods, then south ten rods, then south-west eighteen rods, then south-east twenty-five rods, south-west twenty-seven

rods, west thirty rods, south-east seventeen rods, south-west eight rods, south-east eighty rods, south ten rods, south fifteen degrees west twenty rods, south twenty-five deg. east fifty rods, south-east forty-five rods, west fifteen deg. north 90 rods, fifteen deg. ten rods west, eighteen deg. north twenty-eight rods, south twenty-five rods, south-east eighty rods, north-east ninety rods, east thirty rods, north-east twenty-two rods, east thirty-three rods, north-east twelve rods, east twenty-nine deg. north ten rods, south-east fifteen rods, south thirty-two deg. east ninety rods, south twenty rods, south-east sixty rods, south 44 rods, south seven degrees east one hundred rods, south-east fifty-six rods. All this distance every angle in the river forms the most beautiful bows of proper intervals, land of the richest soil and the upland back for two miles on each side of the river is of the best kind. Here the river runs through bad stoney land south forty-five rods to a fall which is about seven feet perpendicular, then south-east eighteen rods, a very rapid current, then south seventeen degrees east thirty rods to another cataract which falls at least twelve feet, then south twelve degrees east twenty-four rods, then south twelve rods to the mouth of the river. This is a noble stream, and should be in the centre of the second township and the lots be laid east and west, bounded on each side of it. From this as far up the Bay of Quinte as I have been is good land, sufficient for four townships; the tongue between the bay and the lake, two townships; the Isle Tonte, one; the Long Island, two; so that from Cataraqui eighteen miles into Bay Quinte, a distance of about thirty-eight miles, we have ten townships (including two islands), the land in general nearly equal to that on the Long Sou, and the climate much preferable.

20th. I returned to Cataraqui.

23rd October. Ensign Bothem returned, and reports that after landing Lieut. Johns and party at DeMulek House, he proceeded to explore the country from said house on the east side of the Bay Quinte back to its mouth, and finds the land in general to be of the best quality. From the entrance of this bay it bears of south of west eighteen miles to a point which he calls oak point; here it turns to the east of north about three miles; then a bay about a mile wide puts in near three miles to the east; about three miles still north puts in a second bay to the east near four miles. From this bay, which is about one mile and a half wide, they proceeded still north about three and a half miles to a third bay, near two miles wide, which Mr. Bothem judged to be about ten miles long, bearing south-east from the mouth to the head. From the head of this third bay he marched due south about two miles, which brought him to the lake near one mile east of the entrance, or mouth, of Bay Quinte. There is a number of fine creeks put into the heads of the above mentioned small bays, which forms the most beautiful land he ever

saw, all the way from the mouth of the Quinte Bay to DeMulek House, an extent of thirty miles. From Messrs. Johns and Bothem's report, compared with my tour up Stoney Creek (which puts into the lake twelve miles west from Cataraqui), it appears that, between Bay Quinte and a north line drawn from the mouth of this creek lies a very extensive country of land equal in quality to the Long Sou, or any other part of North America.

J. SHERWOOD,
Captain Loyal Rangers.

To John Collins, Esq.,
Deputy Surveyor-General.

LIEUT. JOHN'S JOURNEY THROUGH THE WOOD
FROM BAY QUINTE TO CATARAQUI.

DE MULAK HOUSE, 19th October, 1783.

Set out from said house and marched north two miles, and struck a large river that came from the north-east and ran to the south-west. We marched up the river two miles, and met with a pair of falls on the river. We judged them to be about eight feet high. From that we marched about four miles and encamped. Good land the day through.

October 20th. We continued our course four miles; then we altered our course and steered east. We marched eight miles and encamped. One cedar swamp about one mile; the rest good land.

21st. We continued our course east and marched about five miles, and struck a river that came from the north-west and ran to the south-east, on which is very good falls for mills. We judged the falls to be about six feet perpendicular, with rapids some way after. From that we marched two miles and struck a large river that came from the north-east and runs south-west. We marched up the river about one mile, in hopes to find a ford, but finding none we made a raft and crossed the river, and marched about one and a half miles and encamped. Good land the day through.

22nd. We continued our course and marched five miles, and came to a small creek that came from the north-east and ran to the south-west. From that we marched four miles and struck another small creek that came from the north and ran to the south. From that we marched about one and a half miles, and struck another small creek that came from the north-east and ran to the south-west. From that we marched one and a half miles and struck a small lake that lay north-east and south-west. We marched down the lake side to the south-west about one and a half miles, when a river ran out the same course west. Followed that for one and a half miles and encamped. Good land the day through.

23rd. It being a stormy day, lay still.

24th. We made a raft and crossed the creek. We judged the creek to be about 150 yards wide. We then continued our course east and marched four and a half miles, and struck a river that came from the north and ran to the south, on which there is good falls for mills. We judged the falls to be eight feet. From that we struck a large cedar swamp in about three and a half miles, which caused us to turn our course more to the north-east, which course we continued about three and a half miles and encamped. The land the day through very bad, being nothing but cedar swamps and stoney ridges, but a number of beautiful springs running from the feet of the ridges.

25th. We continued our course east and marched about four miles and struck a small creek that came from the north and ran south. From that we marched south by east two miles, and struck the road that leads from Cataraqui to the mills above.

J. JOHNS,
Lieut. K. R.

DESCRIPTIONS OF THE TOWNSHIPS WEST OF
CATARAQUI WHICH WERE OUTLINED BY THE
DEPUTY SURVEYOR-GENERAL (COLLINS) DUR-
ING THE FALL OF 1783, AND SUB-DIVIDED
DURING THE FOLLOWING YEAR.

TOWNSHIP NO. 1 (KINGSTON).

A township or tract of land six miles square, lying and being in the Province of Quebec, situate on the north side of Lake Ontario, near the ancient Fort Frontenac, beginning at a stone boundary standing south 49 degrees, west two hundred and twenty perches from the west angle of the said fort, and six perches from the bank of the lake, runs due west, crossing the mouth of the Little Cataraqui six miles to a stone boundary standing six perches from the bank of the Bay Tonegeyon; and from thence due north, crossing the head of the Bay Tonegeyon, and a small creek that discharges itself into the said bay, six miles to a stone boundary; and from thence a due east course, passing through a low country six miles to a stone boundary standing on a hill twenty-eight perches from the main branch of the little River Cataraqui; and from thence due south, crossing the main branch of the little River Cataraqui and two other branches that discharge into the said river, terminates on the north bank of Lake Ontario at the first station, including twenty-three thousand and forty superficial acres of land, the greater part of which appears to be of an excellent quality, fit for the production of wheat, oats, Indian corn, hemp,

flax, timothy and clover. The woods in general are maple, bass, hickory, ash, elm, pine and white oak, etc.—the two latter in many parts from two and a half to three feet diameter.

This township hath a great many advantages on account of its situation, having Lake Ontario on its front. All the small bays afford good harbor for boats, and the lake abounds with a great variety of fish and wild fowl. The little River Cataraqui is navigable for batteaux from its entrance into the lake to the upper boundary of the township, in which space are many proper places for erecting saw-mills.

J. COLLINS,
D S General.

TOWNSHIP NO. 2 (ERNESTTOWN, SO CALLED AFTER PRINCE ERNEST, EIGHTH CHILD OF GEORGE III).

Surveyed according to the above scheme or plot hereunto annexed, a township or tract of land of six miles square, situate on the north side of Lake Ontario, bounded in front by the said lake, and in depth by the ungranted lands belonging to the King; on the east by the ungranted lands as aforesaid, and on the west by a township marked on the plan No. 3, beginning at a stone boundary, and runs up the lake south 59 degrees west six miles, to a stone boundary; from thence along a line of marked trees, north thirty-one degrees west six miles, to a stone boundary; and from thence along a line of marked trees north fifty-nine degrees, east six miles, to a stone boundary; thence south thirty-one degrees east six miles to the first station, including twenty-three thousand and forty superficial acres of land, which appear to be equal in quality to the best lands in America. The woods the same as described in No. 1. Surveyed the 7th day of November, 1783."

TOWNSHIP NO. 3 (AFTERWARDS CALLED FREDERICKSBURGH, AFTER FREDERICK, DUKE OF SUSSEX, NINTH CHILD OF THE KING).

Surveyed according to the above scheme or plot hereunto annexed, a township or tract of land situate on the north side of Lake Ontario, bounded in front by the said lake, and in depth by the ungranted lands belonging to the King; on the east by No. 2, and on the west by No. 4, beginning at a stone boundary standing thirty perches from the bank of the lake, and runs up the same south fifty-nine degrees east six miles to a stone boundary standing on the north bank of the Bay of Quinte; from thence along a line of marked trees north thirty-one degrees west, crossing a large bay six miles and one hundred and forty-one perches to a stone boundary; and from thence along a line of marked trees north fifty-

nine degrees east six miles to a stone boundary standing on line No. 2; thence down the said line south thirty-one degrees east six miles and one hundred and forty perches to the first station. The quality of the land and woods the same as described in No. 1. Surveyed the 12th day of November, 1783.

J. COLLINS,

D. S. General.

Assisted by Capt. Sherwood and Lieut. Kotte.

TOWNSHIP NO. 4 (ADOLPHUSTOWN, CALLED AFTER THE DUKE OF CAMBRIDGE, TENTH SON OF GEORGE III., AND FREDERICKSBURGH, ADDITIONAL).

Surveyed according to the above scheme or plot hereunto annexed, a township or tract of land situate on the north side of the Bay of Quinte, bounded in front by the aforesaid bay, and in depth by the ungranted lands belonging to the King; on the west by the bay aforesaid, and on the east by the division line that divides this township from No. 3.

Beginning at a stone fixed on the north bank of the Bay of Quinte, the upper boundary of No. 3, and runs up the bay the several courses of the water to the west point or peninsula of land that lies between the said Bay of Quinte and Savannah Bay; thence crossing Savannah Bay north fifty-one degrees east seven hundred and fifty-nine perches to a stone boundary standing in the line of No. 3; thence down the said line south thirty-one degrees east five miles and two hundred and eighty perches to the first station. Surveyed the 15th day of November, 1783.

J. COLLINS,

D. S. General.

Assisted by Capt. Sherwood and Lieut. Kotte.

MINUTE OF A MEETING OF THE COUNCIL HELD ON THE 14TH APRIL, 1784, IN THE CASTLE OF ST. LOUIS, QUEBEC, TO CONSIDER THE ALLOTMENTS OF LAND TO REDUCED OFFICERS, DISBANDED SOLDIERS AND LOYALISTS.

GÖVERNOR HALDIMAND'S SPEECH.

"GENTLEMEN.—I have assembled you this day as the King's Council, in order to communicate to you two additional instructions which I have had the honor to receive concerning the allotments of lands within this Province to be made to reduced officers, disbanded soldiers and Loyalists.

“ Previous to the receipt of these instructions I had ordered the unconceded lands above and below Quebec to be explored by proper persons, and I have had the satisfaction to receive from them such favorable reports as induce me to hope that his Majesty's gracious intentions towards the Loyalists will be fully answered. The measures taken for the settlement of the Loyalists in this Province are proof of His Majesty's determination to retain and defend it.

“ The Surveyor-General, with his deputy and other persons, are employed in making out plans of Seigniories agreeable to the instructions. When they are finished I shall assemble you again.

“ Upon this business, in the meantime, the instructions, with extracts of two letters from the Secretary of State relating to them, shall remain in the Council Office for the perusal and consideration of the members.” Read His Majesty's instructions, dated St. James', the 16th of July, and another dated the 7th of August, 1783. Read also extracts from two letters from the Right Honorable Lord North, one of His Majesty's principal Secretaries of State, to His Excellency General Haldimand, dated Whitehall, 24th of July and 7th of August, 1783. Ordered that the instructions and extracts remain in the Council Office for the perusal and consideration of the members of the Council.

EXTRACT FROM HIS MAJESTY'S INSTRUCTIONS TO
HIS EXCELLENCY GOVERNOR HALDIMAND,
DATED ST. JAMES', THE 16TH DAY OF JULY, 1783.

Whereas, many loyal subjects, inhabitants of the Colonies and Provinces now the United States of America, are desirous of retaining their allegiance to us, and of living in our Dominions, and for this purpose are disposed to take up and improve lands in our Province of Quebec, and being desirous to encourage our said loyal subjects in such their intentions, and to testify our approbation of their loyalty to us, and obedience to our Government, by allotting lands for them in our said Province;

And whereas we are also desirous of testifying our approbation of the bravery and loyalty of our forces serving in our said Province, and who may be reduced there, by allowing a certain quantity of land to such non-commissioned officers and private men of our said forces who are inclined to become settlers thereon.

It is our will and pleasure that immediately after you shall receive this our instructions, you do direct your Surveyor-General of Lands for our said Province of Quebec to admeasure and lay out such a quantity of land as you, with the advice of your Council, shall deem necessary and convenient for the settlement of our said loyal subjects and the non-commissioned officers and private men

of our forces which may be reduced in our said Province who shall be desirous of becoming settlers therein, and you shall allot such parts of the same as shall be applied for by any of our said loyal subjects, non-commissioned officers and private men of our forces, reduced as aforesaid, in the following proportions, that is to say:

To every master of a family one hundred acres, and fifty acres for each person of which his family shall consist.

To every single man, fifty acres.

To every non-commission officer of our forces reduced in Quebec, two hundred acres.

To every private man, reduced as aforesaid, one hundred acres, and for every one of their family fifty acres.

A true extract,

H. Motz.

EXTRACT FROM HIS MAJESTY'S INSTRUCTIONS TO HIS EXCELLENCY GOVERNOR HALDIMAND, DATED ST. JAMES', THE 7TH AUGUST, 1783.

Whereas our additional instructions to you, bearing date 16th of July last, authorized and empowered you to allot certain portions of land, with the Seigniories, to be surveyed and laid out in the Province of Quebec, by virtue of the said instruction, and to remain vested in us, our heirs and successors, to such of the non-commissioned officers and privates of our forces who shall be reduced in our said Province.

And whereas we are desirous of testifying our entire approbation of the loyalty, suffering and services of the commissioned officers of our Provincial troops who may be so reduced;

It is, therefore, our will and pleasure that upon application of the said commissioned officers who shall be willing immediately to settle and improve lands in our said Province, you do allot such part of the Seigniories to be surveyed and laid out as aforesaid in the following proportion, that is to say:

To every field officer.....	1,000 acres.
To every captain.....	700 "
To every subaltern, staff and warrant officer.....	500 "

Exclusive of fifty acres for each person of which family of such officer shall consist;

And whereas many of our loyal and deserving subjects have taken arms, and associated themselves in the Provinces now the United States of America for the support of our Government and authority, under the name of Associated Loyalists, without being put upon any particular establishment, many of whom may take refuge in our Province of Quebec;

It is our will and pleasure that the commissioned and non-commissioned officers and privates of the said Associated Loyalists shall be in every respect entitled to the same allotments of land and every encouragement intended and given by our said recited additional instructions to the non-commissioned officers and privates of our forces, who shall be reduced in our said Province, and by this our instruction to the commissioned officers of our Provincial forces who shall be reduced.

A true extract,

H. MOTZ.

LETTER FROM GOVERNOR HALDIMAND TO SIR
JOHN JOHNSON, APPOINTING HIM TO TAKE
CHARGE OF SETTLING THE LOYALISTS ON
THEIR LANDS.

HEADQUARTERS, QUEBEC,
17th May, 1784.

SIR,—From your approved zeal for the King's service, the interest which you have at all times taken in the happiness of his loyal subjects, who, owing to their attachment to His Majesty's Government, have been obliged to abandon their properties and take refuge in this Province, and from your knowledge in general of and influence with these people, I have thought fit to request that you will take upon you the management and direction of distributing to the said Loyalists and to the disbanded troops in the upper part of this Province, the Crown Lands which, in pursuance of His Majesty's instructions, I have allotted for their reception.

You will herewith receive particular instructions for your guidance in the execution of this important public service, in which the officers commanding posts and all others, civil and military, are hereby strictly required to afford you every aid and assistance in their power to give.

I am, etc.,

Sir John Johnson.

F. HALDIMAND.

LETTER FROM GOVERNOR HALDIMAND TO DEPUTY
SURVEYOR-GENERAL COLLINS, WITH INSTRU-
CTIONS REGARDING THE SETTLING OF THE
LOYALISTS.

QUEBEC, 18th May, 1784.

SIR,—Having communicated to you His Majesty's instructions for granting lands in this Province to such of his disbanded troops and refugee Loyalists who are desirous of settling therein, and the mode I have adopted for execution thereof, and having fur-

nished you with copies of the same, with every instruction and power necessary for laying out the lands allotted for that purpose, you are hereby directed to proceed without loss of time to Sorel, where I have ordered that all persons of the above description in that district shall be assembled to declare ultimately their choice of situation. You will, therefore, make out particular returns, specifying their names, number of each family and places where they shall choose to settle, which you will communicate to Capt. Barnes, of the Quarter-master General's Department, who has my directions to forward them immediately on their different routes. From Sorel you will proceed to Montreal, where you will confer with Sir John Johnson, to whose direction I have thought fit to commit the settlement of the disbanded troops and Loyalists in the upper district of the Province, and to whom you will give every assistance in your power in the execution of that service. Sir John Johnson will communicate to you my instructions to him, upon this subject, and you will deliver to him the books containing the King's instructions, oaths and declarations to be made and subscribed, together with the certificates for the settlers, which are to be distributed throughout the settlements, as Sir John Johnson and you shall think best. The advanced season of the year requires the utmost despatch in this business. You will, of course, first proceed to settle the Royal Regiment of New York upon the ground allotted for them, which I hope is by this time nearly laid out from thence upwards to Cataragui. His Majesty's instructions respecting the manner of laying out the land and the portions to be distributed are so full that it is unnecessary for me to add to them, further than to remind you of what I have verbally mentioned—that every partiality is to be avoided—for which purpose my instructions to Sir John Johnson direct that the townships and lots in each are to be indiscriminately drawn for, as well by the officers as the men. Your progress in this business will depend so much upon local circumstances and unforeseen contingencies that it would be in vain to offer any other than general instructions. On Sir John Johnson's and your zeal for the King's service and the happiness of the settlers, I therefore, rely on a successful execution of it.

You shall hear from me upon the subject of the settlement at Niagara, concerning which I shall send directions to Lieut.-Col. DePeyster and to Major Ross to send up Lieut. Tinning to lay out the ground lately purchased at that place, which, considering the quantity that must be reserved for the King, is by no means sufficient to settle all the Corps of Rangers, part of which will, consequently, come down to Cataragui.

I am, etc.,

FRED. HALDIMAND.

N. B.—The instructions which were given to Lieut.-Governor Cox for settling the Loyalists in the Bay of Chaleurs are in every respect the same as those alluded to in the above letters, with this addition, that 100 acres of wood land should be reserved in the rear of the fishing beaches, that every person occupying a station here should have (immediately behind it) a sufficient quantity of the necessary timber for the construction of flakes and stages, indispensibly necessary in carrying on the fishery.

To Major Holland and Sir John Johnson.

COMMISSION TO THE DEPUTY SURVEYOR-GENERAL
TO ADMINISTER THE OATH OF ALLEGIANCE,
ETC., TO THE LOYALISTS.

George the Third, by the Grace of God King of Great Britain and of the Territories thereunto, Defender of the Faith, etc.

To our trusty and well-beloved the Hon. John Collins, of the District of Montreal, in the Province of Quebec—Greeting:

Know you that we have thought fit to empower you, and we do hereby give and grant unto you full power and authority to tender and administer unto all persons whom it may concern, the oaths directed by the law and the declaration following, that is to say: "I, ———, do promise and declare that I will maintain, and defend to the utmost of my power, the authority of the King in his Parliament as the supreme Legislature of this Province"; and to receive from such persons their subscriptions severally to the oath and declaration. And what you shall do herein, you are here to make return into the office of our Clerk of the Council for our said Province, together with this writ.

Witness, our trusty and our well-beloved Frederick Haldimand, our Captain-General and Governor-in-Chief of our said Province of Quebec, at our Castle of St. Louis, in our City of Quebec, the seventeenth day of May, in the year of our Lord, 1784.

FRED. HALDIMAND.

By His Excellency's command,

A. GRAY.

REPORT OF THE DEPUTY SURVEYOR-GENERAL TO
GENERAL HALDIMAND.

CATARAQUI, 12th August, 1784.

SIR,—I had the honor to receive Your Excellency's letter of the 20th of July, enclosing the *Dedimus Potestatem*, authorizing me

to administer the several oaths therein mentioned to Major Ross and Mr. Neil McLean, which I have accordingly done, and enclose the same herewith, together with the *Dedimus Potestatem*.

I have likewise the honor to report to Your Excellency that I have completed the survey and settlement of the 5th township,* situate on the Peninsula between Lake Ontario and Bay of Quinte. The whole of the disbanded British troops and Germans have drawn their lots. Each man has taken the oaths, agreeable to the King's instructions, signed the books, received his certificate, and is now in possession of his land, with which I am persuaded they will be pleased, as the land in general appears to be of good quality.

I am sorry to acquaint Your Excellency that the business with respect to completing the survey and settlement of the townships laid out last autumn is not so forward as could be wished, or, from the length of time, Your Excellency has reason to expect. The poor people have set themselves down, half a dozen together, in different parts of the townships, not knowing where to find their lots, except those on the front; nor can it be expected, until the several lines between the different concessions be drawn and boundaries fixed, which has not yet been done. I should have set out on that business this day, but find myself too weak, having just got quit of a fever which I have had for some days past. However, I have employed Mr. Tuffe and Mr. Henry Holland, with each a good party, in drawing the lines of the second and third concessions of the first township. On their return I shall proceed up the lake and complete the survey of the second and third townships in the same manner. With respect to the fourth township, nothing can be done until Your Excellency determines to whom it belongs. No doubt the party who is obliged to quit their claims will expect their land in some other place. I shall, therefore, without loss of time, when the business above mentioned is completed, go in search of another township, and by the first conveyance send Your Excellency a plan of the settlement lately made, with an account of my success.

I find great difficulty to get men, and am obliged to pay high. I have taken the liberty to draw on Capt. Maurer for £100 currency to carry on this service, which I hope Your Excellency will approve of. Your Excellency may faithfully rely on my bringing this troublesome business to as speedy a conclusion as possible.

I have the honor to be,
Your Excellency's most obedient and humble servant,

To His Excellency General Haldimand.

JOHN COLLINS,
D. S. General.

*Afterwards called Mary'sburgh, after the Duchess of Gloucester—eleventh child of the King.

LETTER FROM GENERAL HALDIMAND TO SIR JOHN JOHNSON, BARONET, DATED HEADQUARTERS, 16TH AUGUST, 1784.

SIR,—It is with concern that I learn from Major Holland the very unfavorable report which he made to you, upon his way to this place, of the settlers belonging to your second battalion at Cataraqui, particularly of some of the officers, who, instead of conciliating the minds of such as are disposed to be discontented, and reconciling any difficulties which, from local or other circumstances, cannot be obviated, are active in encouraging and supporting them in disregarding the instructions, which, it appears by Mr. Collins' certificate and others, you had left for execution with Major Holland. A slight indisposition has prevented me from enquiring into the particulars of the affair, but I have directed Major Holland to make a faithful report to me, in writing, of every circumstance relating to it, that proper notice may be taken of such persons, whose conduct has been so reprehensible. In the meantime, finding that it has not only impeded, but actually stopped the progress of the settlement, the purport of this letter is to desire that you will immediately despatch an express to Mr. Collins, with my positive orders that he shall proceed in allotting the fourth township as proposed by Major Holland, leaving the proportions of the officers of your second battalion, Major Rogers' detachment, and Major Vanalstine's party, that cannot be completed in three and four, to be laid out for them as soon as possible where they can most conveniently be had.

You will at the same time give such directions as you shall think proper to the refractory persons in question, to second Mr. Collins in the execution of this order, in which, if they do not immediately acquiesce, they are to come down from thence, and will assuredly be deprived of every bounty a proper conduct would entitle them to from Government.

FRED. HALDIMAND.

To Sir John Johnson, Baronet, etc., etc., etc.

LETTER FROM THE DEPUTY SURVEYOR-GENERAL TO GENERAL HALDIMAND.

CATARAQUI, the 16th day of September, 1784.

SIR,—The sudden departure of the batteaux by which I write this, leaves me only time to report to Your Excellency that I am this moment returned from Bay of Quinte, where I have completely settled all matters respecting land affairs with Sir John Johnson

and Major Rogers' corps, and Major Vanalstine's party, to the general satisfaction of all parties. The plan formerly promised Your Excellency shall go by the first conveyance.

I have the honor to be,
Your Excellency's most faithful and most obedient
humble servant,

J. COLLINS,
Deputy Surveyor-General.

His Excellency General Haldimand.

MEETING OF COUNCIL, AT WHICH HIS EXCEL-
LENCY MAKES KNOWN THE PROGRESS MADE
IN SETTLING THE DISBANDED SOLDIERS AND
LOYALISTS WITHIN THE PROVINCE.

On Tuesday, the 16th of November, 1784. At the Council Chambers in the Castle of St. Louis. Present: His Excellency, Frederick Haldimand, Governor; the Honorable Henry Hamilton, Lieutenant-Governor; Hugh Finlay, Thomas Dunn, Francis Adam Mabane, George Pownall, Samuel Holland, J. G. C. DeLery, John Fraser, Henry Caldwell, Francis Baby, and George Davison, Esquires.

His Excellency had acquainted the Council that, agreeable to the intention which he had communicated to them on the 1st of May last, he had exerted his utmost efforts to form the settlement of the disbanded soldiers and Loyalists upon the Crown Lands within the Province. That with this view he had appointed Sir John Johnson, with Major Holland, the Surveyor-General of the Province, his deputy, and other assistants, to superintend the settlements from Point au Baudet upwards to Cataraqui and the Bay of Quinte, and Lieutenant-Governor Cox, with assistant surveyors, to superintend the allotments of lands at Bay of Chaleurs and Gaspé.

His Excellency the Governor laid before the Council plans and surveys of different seigniories from Point au Badet to about fifteen miles above Oswegatcha, upon which seigniories the numbers settled are as follows, viz.:—

Men.	Women.	Children,		Servants.	Total.
		Males.	Females.		
815	360	436	449	33	2,093

His Excellency likewise laid before the Council plans and surveys of seigniories above Cataraqui to the Bay of Quinte, upon which seigniories the number settled was as follows, viz.:—

		Children,			
Men.	Women.	Males.	Females.	Servants.	Total.
799	275	303	326	43	1,746

His Excellency acquainted the Council that the return of the disbanded soldiers and Loyalists at Gaspé and Percé had not been received, but the numbers settled at Paspabiac, in the Bay of Chaleur, were as follows, viz.:—194 men, 69 women, 172 children; total, 435.

His Excellency was further pleased to acquaint the Council that, besides provisions, spades, hoes, and other such implements of agriculture, clothing and camp equipage had been furnished to the settlers from the King's stores, and that precautions were taken to procure for their use wheat, Indian corn, potatoes and garden seeds for the ensuing spring.

His Excellency ordered the Surveyor-General to make copies of the plans and surveys, to be lodged in the Council office.

GENERAL ABSTRACT OF MEN, WOMEN AND CHILDREN SETTLED ON THE NEW TOWNSHIPS OF THE RIVER ST. LAWRENCE.

THESE BEGIN AT NO. 1, LAKE ST. FRANCIS, GOING UPWARDS MONTREAL, JULY, 1784.	MEN.	WOMEN.	CHILDREN.	SERVANTS.	TOTAL.
1st Battalion late King's Royal Regiment, New York, and those attached, settled on Townships Nos. 1, 2, 3, 4 and 5	549	257	631	25	1,462
Part of Major Jessup's Corps and those attached, settled on Townships Nos. 6, 7 and part of 8	187	85	211	12	495
2nd Battalion late King's Royal Regiment, New York, and those attached, settled on Townships Nos. 3 and 4, Cataraqui	199	32	69	10	310
Capt. Grass's party and those attached, on Township No. 1, Cataraqui	88	33	66	..	187
Part of Major Jessup's and those attached, settled on Township No. 2, Cataraqui	137	71	214	12	434
Major Roger's Corps and those attached, settled on Township No. 3, Cataraqui	120	47	118	14	299
Major Van Alstine's party of Loyalists, settled on Township No. 4, Cataraqui	92	46	103	17	258
Different detachments of disbanded Regular Regiments, settled on Township No. 5, Cataraqui	153	39	67	..	259
Detachment of Germans with Baron Reitzenstein, settled in Township No. 5, Cataraqui	30	8	6	..	44
Rangers of the Six Nation Department and Loyalists, settled with the Mohawk Indians at the Bay of Quinte	13	8	7	..	28
	1,568	626	1,492	90	3,776

JOHN JOHNSON.

INSTRUCTIONS FROM LIEUT.-GOVERNOR HAMILTON
TO THE DEPUTY SURVEYOR-GENERAL TO MAKE
AN EXPLORATORY SURVEY OF THE COUNTRY
LYING BETWEEN THE BAY OF QUINTE AND
LAKE HURON.

QUEBEC, 22nd May, 1785.

SIR,—You will please immediately upon your arrival at Montreal to wait on the General and acquaint him with the time of your intended departure from thence, and receive his commands for any of the settlements on your route.

You will confer with Mr. Delancy before you leave Montreal, and should anything appear necessary to be communicated to me, either on account of the Loyalists or the intended survey, you will have no time to inform me of it. You will consult the heads of the townships and report to me briefly the state and progress of each, with their real wants, not their fancied ones.

Having settled with Mr. McLean about the management of the Loyalists at the upper townships, and directed how the mills are to be worked for the common benefit, having settled Captain Brant's lot, and distributed the garden seeds, having left your instructions with Mr. Kotte how he is to proceed, and arranged all for the best with Captain Potts, you will proceed upwards to take a survey of the communication between the Bay of Quinte and Lake Huron, by Lake La Clie.

You will particularly note the depth of water at every necessary place and mark the soundings in your plan or chart—the parts navigable for the different sorts of craft; the nature of the soil and its produce, particularly timber; the Indian tribes on the communication, their number, disposition, etc.; what tracts of land it may be necessary to purchase, and at what rate; calculate the time and expense of rendering the different portages, etc., practicable; consider and weigh well the disadvantages as well as the favorable points; the tracts which the transport of goods would require if the roads were in good condition; consult the merchants of Montreal upon the idea of erecting stores at the different convenient places, and if you find they are desirous of encouraging the project, write me immediately.

Your prudence will suggest other measures. I wish you all health and good weather, and am, sir,

Your most obedient and most humble servant,

John Collins, Esq.,
Deputy Surveyor-General.

HENRY HAMILTON.

APPENDIX.

ONTARIO LAND SURVEYORS.

MINIMUM TARIFF OF CHARGES ADOPTED AT THE GENERAL ANNUAL MEETING OF THE ASSOCIATION, ON FEBRUARY 26TH, 27TH AND 28TH, 1889.

Field and Office Work, per day of eight hours	\$6 00
First Assistant, per day of eight hours	3 00
Second " " " "	1 50

Time taken going to and returning from the Survey, to be included in above eight hours. Not less than half a day to be charged.

Surveys of Single City Lots, not less than	\$6 00
Unless previous Surveys have been made of adjoining lots in same plan, then	5 00
No description to be drawn for less than	1 00
Services at Registry Office and at Consultations, per hour, not less than	1 00
No charge to be less than	1 00

All expenses, such as Railway Fare, Hotel Expenses, Conveyance of any kind, Posts, Monuments, are to be charged for as extra.

H. J. BROWNE, Toronto,	} Special Committee on Tariff.
C. F. MILES, Walkerton,	
M. GAVILLER, Barrie,	
E. STEWART, Collingwood,	
A. NIVEN, Haliburton,	
T. B. SPEIGHT, Toronto,	
J. P. B. CASGRAIN, Morrisburg.	

ARTICLED STUDENTS.

RESOLUTION PASSED AT THE GENERAL ANNUAL MEETING OF MARCH, 1888.

RESOLVED—"That, in the opinion of this Association, the bonus to be paid by any articulated pupil, to the Surveyor to whom articulated, shall not be less than \$200." Carried.

WILLIS CHIPMAN,
Secretary-Treasurer.

A. NIVEN,
President.

22nd April, 1889.

OBITUARY.

JOSEPH DeGURSE.

Joseph DeGurse was born in Moore Township, in the County of Lambton, Ont., on February 26th, 1857. He spent his youth on a farm, but on arriving at manhood he decided on entering the profession of surveying and engineering, and with this object in view he studied at Assumption College, Sandwich, and at the School of Practical Science, Toronto, and after his apprenticeship in the office of Mr. T. Byrne, who at that time was practising in Sarnia, but is now at Sault Ste. Marie, he passed his final examination and received his commission as P. L. Surveyor in April, A.D. 1883.

On October 28th, 1884, he married Miss Annie Mulligan, daughter of Thos. Mulligan, of Lambton County, and then settled in Windsor, where he has since been engaged in professional work.

During the first few years of his professional life he made many Government surveys in the Algoma and Nipissing Districts and in the North-West.

In November, 1887, he obtained the responsible position of Chief Engineer of the Lake Erie and Detroit River Railway, and in both his professional and private capacity he was highly esteemed by the Directorate of that road.

Under his superintendence the road was located and built from Walkerville to its present terminus at Ridgetown, and surveys and plans were prepared for its extension to St. Thomas. By him also the old wooden bridges on the London & Port Stanley Railroad were replaced by first-class steel bridges. Terminal buildings were erected at London and many improvements were made in the roadbed and at the terminus at Port Stanley.

During the summer of 1897 he prepared plans and specifications for a ferry slip dock at Port Stanley harbor.

In addition to his extensive railroad engagements he attended to a large and varied local practice in surveying and engineering.

The cost of the pavements and sewers alone constructed under him in Windsor and Walkerville exceeded \$300,000.

Notwithstanding his busy professional life, he yet found time to discharge judiciously many social and other duties.

He served some years with ability on the Board of Education. For several years he was Chairman of the North Essex Board

of License Commissioners, and at the time of his death was Chairman of the Windsor Board of License Commissioners.

He was President of St. Vincent de Paul Society, and took a very active part and interest in the welfare of the poor and unfortunate members of the community.

In politics he was an ardent Reformer, and whenever the occasion arose he considered no sacrifice in time or labor too great in order to further the interests of that party.

He was loved and honored by all who knew him, and he leaves a devoted wife to mourn his loss.

EDWARD C. CADDY.

Edward C. Caddy, O.L.S. and D.L.S., fifth son of the late Col. Caddy, B.A., was born at Quebec June 28th, 1815, where his father was then quartered. A short time after this the family returned to England. He came to Canada again in 1833, but soon returned to England for a few years. Finally he settled in Canada and studied surveying with the late John Reid, P.L.S., and passed his examination as surveyor in 1846, and made his home in Cobourg. For some time he was employed in resurveying Hamilton and the surrounding townships.

He was among the first surveyors sent out to the North-West. His first survey in 1872 was about eighteen miles from Fort Garry. Between that time and 1884 he made eight different trips to the North-West on surveyors' work. He finally returned to Ontario in July, 1884, and since then did very little professional work.

Most conscientious in all his dealings, he took a great interest in his profession.

In 1856 he married Miss S. Rogers, daughter of James G. Rogers, of Grafton. He died September 26th, 1897, leaving a wife and eight children.

JOHN CHISHOLM McNABB.

John Chisholm McNabb, O.L.S., C.E., was educated at the High School, Hamilton, Ontario, and commenced his professional studies with D. C. O'Keefe, in that city, about the year 1869. He found employment in the Public Works Department under the Hon Arch. McKellar, Commissioner of Public Works.

He served his apprenticeship with T. N. Molesworth, P.L.S., passed his examination, and was sworn in P.L.S. in 1880. He was

employed in the laying out of the Erie & Huron Railway, and was for some time occupied in railway work in the State of Arkansas. While residing in Chatham he was appointed engineer for that city.

Latterly he made his home in Hamilton, where he died on 16th October, 1897.

JOSEPH MILLER OLIVER CROMWELL.

Joseph Miller Oliver Cromwell, O.L.S., was born at Road, in Somersetshire, England, on January 1st, 1820, and came to this country at a very early age. About the year 1845 he commenced the study of surveying under Josias Richie, P.L.S., and when duly qualified he commenced professional work on his own account, and soon became prominent in his profession in the north-eastern portion of Ontario, being specially consulted on all questions regarding boundaries. After a successful career, age compelled him to retire from his profession after over 50 years of continuous work. He had many apprentices, who were afterwards well-known surveyors, and he survived them all but one. He passed away at his home in Perth, Ont., on October 19th, 1897.

In Memoriam.

NAME.	LATE RESIDENCE.	DATE OF P.L.S. CERTIFICATE.	DATE OF O.L.S. REGISTRATION.	DIED.
Bolger, Francis.....	Lindsay.....	10th October, 1863....	1892.....	3rd November, 1895.
Bowman, Leander Meyer.....	Toronto.....	14th April, 1892.....	1892.....	20th September, 1895.
Burke, William Robert.....	Ingersoll.....	5th April, 1878.....	1892.....	10th June, 1875.
Caddy, Edward C.....	Cobourg.....	18th December, 1846..	1892.....	26th September, 1897.
Coad, Richard.....	Glencoe.....	8th October, 1879....	1892.....	17th May, 1897.
Creswicke, Henry.....	Barrie.....	8th July, 1864.....	1892.....	22nd January, 1898
Cromwell, Joseph M. O.....	Perth.....	1st October, 1846....	1892.....	19th October, 1897.
Deane, Michael.....	Windsor.....	26th May, 1848.....	19th December, 1892.	3rd April, 1897.
DeGurse, Joseph.....	Windsor.....	5th April, 1883.....	1892.....	22nd March, 1898.
Fowle, Albert.....	Orillia.....	13th January, 1863....	1892.....	— April, 1898.
Gibbs, Thomas Fraser.....	Adolphustown.....	31st May, 1841.....	1892.....	17th April, 1893.
Haskins, William.....	Hamilton.....	5th July, 1855.....	1892.....	5th July, 1896.
Hewson, Thomas Ringwood.....	Hamilton.....	6th July, 1877.....	1892.....	21st October, 1898.
Howitt, Alfred.....	Gourcock.....	12th January, 1856....	1892.....	6th May, 1896.
MacNabb, John Chisholm.....	Hamilton.....	8th January, 1886....	1892.....	16th October, 1897.
Ogilvie, John Henry.....	Rat Portage.....	8th April, 1876.....	24th April, 1894....	21st September, 1898.
Pedder, James Robert.....	Doon.....	10th November, 1891..	23rd December, 1892.	17th January, 1897.
Robinson, William.....	London.....	— May, 1846.....	1892.....	11th October, 1894.
Thomson, Augustus Clifford.....	Chicago.....	14th January, 1861....	1892.....	— December, 1896.
Walsh, Thomas William.....	Simcoe.....	25th April, 1842.....	1892.....	14th March, 1895.
Wheelock, Charles John.....	Orangeville.....	—, 1856....	1892.....	4th July, 1897.

LIST OF OFFICERS OF THE ASSOCIATION OF SURVEYORS

1886 TO 1892 (BEFORE)

OFFICERS.	1886-7.	1887-8.	1888-9.
President	Geo. B. Kirkpatrick.	Geo. B. Kirkpatrick.	A. Niven
Vice-President	John Galbraith	John Galbraith	Villiers Sankey
Secretary-Treasurer.	Willis Chipman	Willis Chipman.....	Willis Chipman.....
Councillors	M. J. Butler	M. J. Butler	John McAree
	E. Stewart	Villiers Sankey	H. B. Proudfoot
	Villiers Sankey	P. S. Gibson	W. R. Aylsworth.....

1892 TO 1898 (SINCE)

OFFICERS.	1892-3.	1893-4.	1894-5.
President	E. Stewart	E. Stewart	M. J. Butler
Vice-President	M. J. Butler	M. J. Butler	M. Gaviller.....
Secretary-Treasurer.	A. J. Van Nostrand.	A. J. Van Nostrand.	A. J. Van Nostrand.
Members of Council.	Hon. A. S. Hardy..	Hon. A. S. Hardy..	Hon. A. S. Hardy..
	P. S. Gibson	Geo. B. Kirkpatrick.	Villiers Sankey* ...
	M. Gaviller.....	A. Niven	Herbert J. Bowman.
	John McAree	P. S. Gibson	Geo. B. Kirkpatrick.
	Villiers Sankey*....	M. Gaviller.....	A. Niven
	A. Niven	J. McAree.....	P. S. Gibson.....
	Geo. B. Kirkpatrick.	Villiers Sankey* ...	Willis Chipman.....

TION FORMED IN 1886 BY THE LAND
OF ONTARIO.

INCORPORATION).

1889-90.	1890-1.	1891-2.	1892 (to 1st July).
A. Niven	Villiers Sankey.....	Villiers Sankey	E. Stewart.
Villiers Sankey	E. Stewart	E. Stewart	M. J. Butler.
Willis Chipman	A. J. Van Nostrand.	A. J. Van Nostrand	A. J. Van Nostrand.
E. Stewart	H. B. Proudfoot....	M. J. Butler	John McAree.
John McAree	M. Gaviller	H. B. Proudfoot ...	M. Gaviller.
P. S. Gibson.....	T. H. Jones.....	M. Gaviller.....	P. S. Gibson.

INCORPORATION).

1895-6.	1896-7.	1897-8.	1898-9.
M. Gaviller	Willis Chipman	T. Harry Jones	P. S. Gibson.
Willis Chipman	T. Harry Jones	P. S. Gibson	H. J. Bowman.
A. J. VanNostrand..	A. J. Van Nostrand.	A. J. Van Nostrand.	A. J. Van Nostrand.
Hon. A. S. Hardy ..	Hon. A. S. Hardy ..	Hon. J. M. Gibson .	Hon. J. M. Gibson.
P. S. Gibson	Geo. B. Kirkpatrick.	Villiers Sankey* ...	J. L. Morris.
F. L. Foster	A. Niven	J. W. Tyrrell	F. L. Foster.
Villiers Sankey*....	P. S. Gibson.....	Geo. B. Kirkpatrick.	Villiers Sankey.*
Herbert J. Bowman.	F. L. Foster	A. Niven	J. W. Tyrrell.
Geo. B. Kirkpatrick.	Villiers Sankey*....	F. L. Foster	Geo. B. Kirkpatrick.
A. Niven	Herbert J. Bowman.	J. L. Morris	A. Niven.
		(vice P. S. Gibson)	

* Chairman of Council.

LIST OF MEMBERS.

1st SEPTEMBER, 1898.

The names of those members granted exemption by By-laws ratified by the Association are marked*.

NAME AND P.O. ADDRESS.	DATE OF ADMISSION BY BOARD.
Abrey, George Brockitt, Sawbill, Dist. of Rainy River.....	10th Jan., 1860 D.L.S.
Allan, John Richard, Renfrew.....	6th Nov., 1894 Grad. S.P.S.
Anderson, John Drummond, Trail, B.C.....	13th April, 1892
Aylsworth, Charles Fraser, Sr., Madoc.....	2nd April, 1861 D.L.S.
Aylsworth, Charles Fraser, Jr., Madoc.....	8th Jan., 1886
Aylsworth, John Sidney, Selby, P.O. Box 23.....	9th Jan., 1871 D.L.S.
Aylsworth, William Robert, Belleville, P.O. Box 2.....	8th Nov., 1861 D.L.S.
Baird, Alexander, Leamington.....	7th July, 1877 D.L.S., C.E.
Barrow, Ernest George, Hamilton.....	4th Oct., 1877 D.L.S., Mem. Can. Soc. C.E., City Engineer.
Bazett, Edward, Burk's Falls.....	8th July, 1881 D.L.S.
Beatty, David, Parry Sound.....	12th July, 1869 D.L.S.
Beatty, Herbert John, Eganville.....	8th Nov., 1893 Grad. S.P.S.
Beatty, Walter, Delta.....	19th July, 1858 D.L.S., M.P.P.
Bell, Andrew, Almonte.....	6th Oct., 1866 D.L.S.
Bell, James Anthony, St. Thomas.....	11th Oct., 1875 D.L.S., Co. Engineer, Elgin; City Engineer, St. Thomas.
Bigger, Charles Albert, Ottawa, 68 Daly Ave..	6th Jan., 1882

LIST OF MEMBERS.

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NAME AND P.O. ADDRESS.	DATE OF ADMISSION BY BOARD.
Bolger, Thomas Oliver, Kingston D.L.S., City Engineer.	6th July, 1865
Bolton, Ellsworth Doan, Ottawa, Geological Survey Dept. B.A.Sc. (McGill.)	7th Nov., 1895
Bolton, Jesse Nunn, Toronto, 264 Major st. D.L.S.	6th April, 1867
Bolton, Lewis, Listowel D.L.S.	9th July, 1864
Booth, Charles Edward Stuart, Kingston, 196 Colborne st.	6th April, 1882
Boswell, Elias John, Peterborough Grad. S.P.S.	7th Nov., 1896
Bowman, Clemens Dersteine, West Montrose.	10th July, 1879
Bowman, Herbert Joseph, Berlin D.L.S., Grad. S.P.S., Town Engineer. Assoc. Mem. Can. Soc. C.E.	7th Jan., 1887
Bray, Edgar, Oakville D.L.S.	6th Oct., 1866
Bray, Harry Freeman, Oakville	10th July, 1882
Bray, Samuel, Ottawa, Dept. of Indian Affairs. C.E., D.L.S.	6th Jan., 1877
Brown, David Rose, Cornwall D.L.S.	10th Oct., 1850
Brown, George Laing, Morrisburg Grad. S.P.S.	19th Feb., 1898
*Brown, John Smith, Kemptville D.L.S.	8th July, 1852
Browne, Harry John, Toronto, 17 Toronto st. C.E.	6th July, 1872
Browne, William Albert, Toronto, 17 Toronto st.	10th April, 1876
Burt, Frederick Percy, New York, N.Y. Manager and Treasurer Engineering News Pub. Co., 220 Broadway.	8th July, 1885
Butler, Matthew Joseph, Napanee, P.O. Box 359 M.I.C.E., Mem. Am. Soc. C.E., Mem. Can. Soc. C.E., O.E.	11th Jan., 1878
Byrne, Thomas, Sault Ste. Marie D.L.S.	15th July, 1862
Caddy, Cyprian Francis, Campbellford D.L.S.	10th July, 1860

NAME AND P.O. ADDRESS.	DATE OF ADMISSION BY BOARD.
Caddy, John St. Vincent, Ottawa, 559 King st.	6th Oct., 1866
<small>D.L.S.</small>	
Cameron, Alfred John, Peterborough.....	9th April, 1889
Campbell, Archibald William, Toronto, Parliament Building	10th April, 1885
<small>C.E. Provincial Instructor in Road Making.</small>	
Carre, Henry, Belleville, P.O. Box 203,	8th Nov., 1861
<small>City Engineer, B.A. and C.E. (Trin. Coll., Dublin), D.L.S.</small>	
Carroll, Cyrus, Rat Portage.....	10th Jan., 1860
<small>Mem. Can. Soc. C.E., D.L.S.</small>	
Casgrain, Joseph Philippe Baby, Morrisburg... 5th Jan., 1887	
<small>D.L.S., P.L.S. (Que.), C.E., Assoc. Mem. Can. Soc., C.E., Chief Eng. M. & P. J. BY.</small>	
Cavana, Allan George, Orillia.....	8th July, 1876
<small>D.L.S.</small>	
Chalmers, John, Rat Portage.....	14th April, 1896
<small>Grad. S.P.S.</small>	
Charlesworth, Lionel Clare, Rat Portage....	14th April, 1896
<small>Grad. S.P.S.</small>	
*Cheesman, Thomas, Mitchell.....	11th July, 1856
<small>D.L.S.</small>	
Chipman, Willis, Toronto, 103 Bay st.....	4th Oct., 1881
<small>B.A.Sc. (McGill), Mem. Am. Soc. C.E., Mem. Can. Soc. C.E.</small>	
Code, Abraham Silas, Alvinston.....	14th April, 1896
Cozens, Joseph, Sault Ste. Marie.....	7th July, 1875
<small>D.L.S.</small>	
*Davidson, Alexander, Arkona.....	11th Oct., 1858
<small>D.L.S.</small>	
Davidson, Walter Stanley, Sarnia.....	9th April, 1884
Davis, Allan Ross, Wabigoon.....	8th Jan., 1886
<small>B.A.Sc. (McGill.)</small>	
Davis, John, Alton.....	5th April, 1878
Davis, William Mahlon, Woodstock.....	11th April, 1885
<small>Grad. R. M. Coll., (Kingston), City Engineer.</small>	
Deacon, Thomas Russ, Rat Portage.....	12th Nov., 1892
<small>Grad. S.P.S., Town Engineer.</small>	
Deans, William James, Oshawa.....	11th July, 1884
DeMorest, Richard Watson, Sudbury.....	9th April, 1889
<small>M.E.</small>	
Dickson, James, Fenelon Falls.....	6th April, 1867
<small>D.L.S., Ins. of Crown Land Surveys.</small>	

LIST OF MEMBERS.

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NAME AND P.O. ADDRESS.	DATE OF ADMISSION BY BOARD.
Dobbie, Thomas William, Tilsonburg..... D.L.S.	11th July, 1856
Dobie, James Samuel, Port Arthur..... B.A.Sc. (Toronto).	21st Feb., 1898
Doupe, Joseph, Winnipeg, Man., 169 Edmonton st..... D.L.S., P.L.S. (Man.), C.E. (McGill).	13th Jan., 1863
Ducker, William A., Winnipeg, Man., 334 Pacific ave..... D.L.S., P.L.S. (Man.)	6th April, 1882
Esten, Henry Lionel, Toronto, 157 Bay st....	7th Jan., 1887
Evans, John Dunlop, Trenton..... D.L.S., Chief Eng. Cent. Ont. Ry., Eng. for Weddell Bridge & Engine Works.	8th July, 1864
Fair, John, Brantford.....	13th April, 1875
Fairbairn, Richard Purdom, Toronto, 127 Major st..... Surveyor for Dept. of Pub. Works.	7th Oct., 1876
Fairchild, Charles Court, Simcoe..... Grad. S.P.S.	9th April, 1894
Farncomb, Alfred Ernest, Fort William.....	9th April, 1895
Farncomb, Frederick William, London, 213 Dundas 'st.....	6th Nov., 1889
Fawcett, Thomas, Ottawa, Dept. of Interior... Dom. Topographical Surveyor.	6th Jan., 1881
Fitton, Charles Edward, Orillia, Box 142.... D.L.S.	10th April, 1879
FitzGerald, James William, Peterborough, Box 333..... D.L.S.	13th July, 1857
Flater, Frederick William, Petrolea.....	9th April, 1888
Ford, William Butterton, Hamilton.....	21st Feb., 1898
Foster, Frederick Lucas, Toronto, 157 Bay st. D.L.S.	9th April, 1863
Francis, John James, Sarnia P.O., Box 304... D.L.S.	16th Oct., 1861
*Fraser, Charles, Wallaceburg..... D.L.S.	5th Aug., 1847
Galbraith, William, Bracebridge..... D.L.S.	4th April, 1883

NAME AND P.O. ADDRESS.	DATE OF ADMISSION BY BOARD.
Gamble, Killaly, Toronto, 88 Charles st. D.L.S., P.L.S. (Man.), Captain R.A. (Ret'd).	6th April, 1888
Gardiner, Edward, St. Catharines. D.L.S.	6th Jan., 1866
Gaviller, Maurice, Collingwood, Box 773. C.E. (McGill), D.L.S.	6th Jan., 1866
Gibbons, James, Renfrew. Grad. S.P.S.	15th April, 1890
Gibson, Harold Holmes, Willowdale.	8th Sept., 1891
*Gibson, James Alexander, Oshawa. D.L.S.	7th April, 1855
Gibson, Peter Silas, Willowdale. C.E. M.S. (Mich. Univ.), D.L.S., Mem. Can. Soc. C.E., Engineer Tp. of York.	10th July, 1858
Gibson, Wilbert Silas, Willowdale.	21st Feb., 1898
Gilliland, Thomas Brown, Eugenia. D.L.S.	11th July, 1868
Gillon, Douglas John, Fort Frances. Grad. R.I.E. Coll.	9th Nov., 1895
Graydon, Aquila Ormsby, London. City Engineer.	8th July, 1880
Griffin, Albert Dyke, Woodstock, P.O. Box 612.	11th Nov., 1890
Hanning, Clement George, Preston, Lock Box 130. D.L.S., C.E. (Trin. Coll., Dublin).	19th July, 1858
Hart, Milner, Toronto, 103 Bay st. D.L.S.	11th July, 1863
Harvey, Thomas Alexander, Steelton, Penn. C.E. (R.F.I., Troy, N.Y.)	13th Nov., 1893
Heaman, John Andrew, London, Albion Building.	16th Nov., 1896
Henderson, Eder Eli, Henderson P.O., Maine Grad. S.P.S.	7th April, 1887
Henry, Frederick, London, Albion Building.	7th April, 1887
*Hermon, Royal Wilkinson, Rednersville. D.L.S.	13th July, 1857

LIST OF MEMBERS.

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NAME AND P.O. ADDRESS.	DATE OF ADMISSION BY BOARD.
Hobson, Joseph, Montreal, G. T. Ry. Office. D.L.S., Chief Eng. Grand Trunk Railway System.	3rd Oct., 1855
Hopkins, Marshall Willard, Rat Portage. B.A.Sc. (McGill), Assoc. Mem. Can. Soc. C.E., Chief Eng. I.R.R. Co.	13th Nov., 1893
Hutcheon, James, Guelph. Grad. S.P.S., City Engineer.	10th Nov., 1891
Innes, William Livingstone, Peterborough, Trent Navigation Office. C.E. (Toronto University).	14th April, 1892
Irwin, James Moore, Rat Portage. D.L.S.	27th Dec., 1893
James, Darrell Denman. B.A., B.A.Sc. (Toronto University).	3rd Nov., 1891
James, Silas, Toronto, 77 Victoria st. D.L.S.	19th July, 1858
Johnson Robert Thornton, Rat Portage.	9th April, 1889
Jones, Charles Albert, Petrolea. D.L.S.	8th April, 1881
Jones, John Henry, Sarnia. D.L.S.	10th Oct., 1863
Jones, Thomas Henry, Brantford. City Engineer, B.A.Sc. (McGill).	10th Oct., 1878
*Keefer, Thomas Coltrin, Ottawa. D.L.S., C.E.	14th Aug., 1840
Kennedy, James Henry, St. Thomas, P.O. Box 434. C.E. (Toronto University), Mem. Can. Soc. C.E.	7th April, 1887
Kippax, Hargreaves, Huron, South Dakota. C.E. (Toronto University), Assistant to Surveyor-General.	7th July, 1877
*Kirk, Joseph, Stratford P.O., Box 373. D.L.S.	16th Feb., 1843
Kirkpatrick, George Brownly, Toronto, Dept. of Crown Lands. D.L.S., Director of Surveys.	13th April, 1863
Laird, James Stewart, Essex. D.L.S.	6th April, 1867
Laird, Robert, Rat Portage. Grad. S.P.S.	11th Nov., 1887
Lewis, John Bower, Ottawa, Brunswick House D.L.S., P.L.S. (Quebec), C.E.	4th Oct., 1883
Lougheed, Aaron, Port Arthur. D.L.S.	12th Nov., 1888
*Low, Nathaniel Edward, Wiarnton. D.L.S.	11th July, 1856

NAME AND P.O. ADDRESS.	DATE OF ADMISSION BY BOARD.
Lumsden, Hugh David, Toronto, 63 Homewood ave.	4th Jan., 1866 C.E., D.L.S., M.I.C.E., Mem. Can. Soc. C.E.
*Lynch-Staunton, Francis Hardwick, Hamilton	11th Oct., 1856 D.L.S.
Macdougall, Allan Hay, Port Arthur	11th April, 1859 D.L.S., Town Engineer.
MacKenzie, William, Sarnia	11th April, 1896 Grad. R.M.C. (Kingston).
MacKenzie, William Lyon, Kuskonook, B.C., via Nelson, B.C.	7th April, 1887 C.E., Asst. Eng. Crow's Nest Pass Ry.
MacPherson, Duncan, Montreal	9th Jan., 1884 Grad. R.M.C., M.I.C.E., Mem. Can. Soc. C.E., Div. Eng. Eastern Div. C.P. Ry.
McAree, John, Rat Portage	6th April, 1867 Dominion Topographical Surveyor, B.A.Sc. (Toronto University).
*McCallum, James, Fort Frances	30th Mar., 1849 D.L.S.
McCubbin, George Albert, St. Thomas, Box 423	9th Nov., 1895 Asst. City Engineer.
McCulloch, Andrew Lake, Galt	10th Nov., 1888 Grad. S.P.S., Assoc. Mem. Can. Soc. C.E.
McDonell, Augustine, Chatham, 4 & 5 Ebert's Block	11th July, 1863 D.L.S.
McDowall, Robert, Owen Sound	11th Nov., 1890 Town Engineer, Grad. S.P.S.
McEvoy, Henry Robinson, St. Marys	10th July, 1875 D.L.S.
McFadden, Moses, Neepawa, Man	13th April, 1858 D.L.S., P.L.S. (Man.)
McFarlen, George Walter, Toronto, Court House	11th Nov., 1889 Grad. S.P.S.
McGeorge, William Graham, Chatham, Box 225	8th Jan., 1865 D.L.S.
McGrandle, Hugh, Huntsville	5th Jan., 1883
McKay, Owen, Windsor, P.O. Box 167	7th Jan., 1887 Grad. S.P.S., Chief Eng. D. & L. E. Ry.

NAME AND P.O. ADDRESS.	DATE OF ADMISSION BY BOARD.
McKenna, John Joseph, Dublin D.L.S.	9th July, 1860
McLatchie, John, Nelson, B.C. D.L.S., P.L.S. (Que., Man. and B.C.).	9th Jan., 1864
McLean, James Keachie, Elora D.L.S.	8th April, 1876
McLean, William Arthur, Toronto, Parliament Buildings	21st Feb., 1898
McLennan, Murdoch John, Williamstown. B.A.Sc. (McGill), D.L.S.	13th Nov., 1893
McLennan, Roderick, Toronto, 115 Avenue rd. D.L.S.	20th June, 1846
McNab, John Duncan, Owen Sound	9th Oct., 1879
McPherson, Archibald John, Galt. B.A.Sc. (Toronto), City Engineer.	10th April, 1897
McPhillips, George, Windsor D.L.S., P.L.S. (Man.)	9th July, 1885
Malcolm, Sherman, Blenheim D.L.S.	11th Oct., 1858
Manigault, William Mazyck, Strathroy, P.O. Box 300. D.L.S.	8th July, 1876
Marshall, James, Holyrood D.L.S.	6th Oct., 1866
Meadows, William Walter, St. Thomas Grad. S.P.S.	21st Feb., 1898
Miles, Charles Falconer, Rat Portage, Hilliard House. D.L.S.	13th Jan., 1862
Miller, Frederick Fraser, Napanee	8th Jan., 1885
Moore, John MacKenzie, London, Albion Building.	9th Oct., 1879
Moore, John Harrison, Smith's Falls Grad. S.P.S.	11th Nov., 1889
Morris, Alfred Edmund, Perth	10th April, 1879
Morris, James Lewis, Pembroke D.L.S., C.E. (Toronto University).	7th July, 1886
Mountain, George Alphonse, Ottawa Mem. Can. Soc. C.E., D.L.S., P.L.S. (Que.), Chief Eng. Can. Atlantic and O.A. & B. Ry.	9th Jan., 1884

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NAME AND P.O. ADDRESS.	DATE OF ADMISSION BY BOARD.
Murdoch, William, Rat Portage..... <small>D.L.S., C.E.</small>	10th Jan., 1860
Murphy, Charles Joseph, Toronto, 157 Bay st.	6th Oct., 1886
Newman, John James, Windsor.....	21st Feb., 1898
Newman, William, Windsor, 57 Sandwich st. w..... <small>Grad. S.P.S.</small>	12th Nov., 1892
Niven, Alexander, Haliburton..... <small>D.L.S.</small>	8th July, 1859
Ogilvie, William, Dawson City, Yukon Dist.. <small>D.L.S., Commissioner for Yukon District.</small>	12th July, 1869
O'Hara, Walter Francis, Chatham..... <small>D.L.S.</small>	14th April, 1892
Paterson, James Allison, Toronto, 23 Adelaide st. e..... <small>C.E., Mem. Can. Soc. C.E.</small>	5th April, 1878
Patten, Thaddeus James, Little Current.....	5th Jan., 1883
Peterson, Peter Alexander, Montreal, P.Q.. <small>D.L.S., C.E., Mem. Can. Soc. C.E., Chief Engineer Can. Pac. Ry.</small>	16th July, 1863
Pinhey, Charles Herbert, Ottawa, 630 Wellington ave..... <small>D.L.S., Grad. S.P.S., Assoc. Mem. Can. Soc. C.E.</small>	12th Nov., 1888
Proudfoot, Hume Blake, Bonheur..... <small>D.L.S., C.E. (Toronto University).</small>	6th Jan., 1882
Purvis, Frank, Eganville..... <small>D.L.S.</small>	7th April, 1875
Rainboth, Edward Joseph, Ottawa..... <small>D.L.S.</small>	11th Nov., 1887
Rainboth, George Charles, Aylmer, Que.... <small>D.L.S., F.L.S. (Que.)</small>	11th July, 1868
Ritchie, Nelson Thomas, Dryden.....	9th Nov., 1888
Roberts, Vaughan Maurice, St. Catharines...	5th April, 1887
Robertson, James, Glencoe..... <small>Grad. S.P.S.</small>	11th July, 1885
Robinson, Franklin Joseph, Barrie..... <small>Grad. S.P.S.</small>	21st Feb., 1898
Roger, John, Mitchell..... <small>Grad. S.P.S.</small>	10th Nov., 1888

LIST OF MEMBERS.

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NAME AND P.O. ADDRESS.	DATE OF ADMISSION BY BOARD.
*Rombough, William R., Durham.....	14th Nov., 1848 D.L.S.
Rorke, Louis Valentine, Sudbury.....	14th April, 1890 D.L.S.
Ross, George, Welland.....	10th July, 1879 B.A.Sc. (McGill), D.L.S.
*Rubidge, Tom S., Cornwall.....	9th Feb., 1849 D.L.S., Asst. Eng. Dept. Rys. and Canals.
Russell, Alexander Lord, Port Arthur.....	16th April, 1873 D.L.S.
Sankey, Villiers, Toronto, City Hall.....	11th Jan., 1878 Grad. R.I.E. Coll., D.L.S., City Surveyor.
Saunders, Bryce Johnston, Fort William.....	7th Jan., 1885 B.A.Sc. (McGill), D.L.S.
Scane, Thomas, Ridgetown.....	7th Jan., 1865 D.L.S.
*Schofield, Milton C., Guelph.....	28th Sept., 1843 D.L.S.
Schwitzer, John Edward, Rat Portage.....	16th Nov., 1896 B.A.Sc. (McGill.)
Seager, Edmund, Rat Portage.....	8th July, 1861 D.L.S.
Selby, Henry Walter, Dinorwic, C. P. Ry.....	8th Jan., 1876 D.L.S.
Sewell, Henry DeQuincy, Rat Portage.....	9th July, 1885 D.L.S., A.M.I.C.E.
Silvester, George Ernest, Sudbury.....	12th Nov., 1892 Grad. S.P.S.
Sing, Josiah Gershom, Meaford.....	9th Jan., 1879 D.L.S.
Smith, Angus, Ridgetown.....	14th April, 1896 Grad. S.P.S.
Smith, George, Woodville, Box 77.....	7th April, 1881 Engineer for Co. Victoria and four Townships.
Smith, Henry, Toronto, Crown Lands Dept.....	8th Nov., 1861 Supt. Colonization Roads, D.L.S., Mem. Can. Soc. C.E.
Speight, Thomas Bailey, Toronto, Yonge St. Arcade.....	6th Jan., 1882 D.L.S.
Squire, Richard Herbert, Brantford, 30 Arthur st.....	14th April, 1896 B.A.Sc. (Toronto University).
Steele, Edward Charles, Port Arthur.....	9th April, 1889

NAME AND P.O. ADDRESS.	DATE OF ADMISSION BY BOARD.
Stewart, Elihu, Collingwood.....	8th April, 1872 D.L.S.
*Stewart, George Alexander, Calgary, Alta.....	8th July, 1852 D.L.S.
Stewart, John, Montreal.....	11th Nov., 1887 D.L.S.
Stewart, Walter Edgar, Aylmer.....	12th April, 1892
*Strange, Henry, Rockwood.....	30th Nov., 1838 D.L.S., C.E.
Taylor, William Verner, Gananoque.....	7th Nov., 1896 Grad. S.P.S.
Tiernan, Joseph Martin, Tilbury Centre.....	7th Jan., 1886
Traynor, Isaac, Dundalk.....	16th April, 1873 D.L.S.
Turnbull, Thomas, Winnipeg, Man., C. P. R. Office.....	6th July, 1878 D.L.S., C.E. (Toronto University).
Tyrrell, James Williams, Hamilton, 42 James st. n.....	8th April, 1885 Co. Eng. for Wentworth, C.E. (Toronto University), D.L.S.
*Unwin, Charles, Toronto, 126 Seaton st....	12th April, 1852 D.L.S.
Ure, Frederick John, Woodstock.....	7th April, 1887 C.E.
Van Buskirk, William Fraser, Stratford.....	7th April, 1888 Grad. R. M. Coll.
Van Nostrand, Arthur J., Toronto, Yonge St. Arcade.....	30th Oct., 1882 D.L.S.
Wadsworth, Vernon Bayley, Toronto, 103 Bay st.....	9th April, 1864 D.L.S.
Wagner, William, Ossowo, Man.....	13th April, 1858 D.L.S.
Walker, Alfred Paverley, Toronto, Room 508, Union Station, C. P. Ry., Eng. Office.....	6th Jan., 1882
Wallace, Charles Hugh, Hamilton.....	9th Nov., 1889 D.T.S., C.E. (Trin. Coll., Dublin), Asst. City Engineer.
Wallace, James Nevin, Hamilton, Spectator Building, James st. s.....	21st Feb., 1898 B.A., B.E. (Trin. Coll., Dublin).

LIST OF MEMBERS.

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NAME AND P.O. ADDRESS.	DATE OF ADMISSION BY BOARD.
Ward, Archeson Thomas, Toronto, Yonge St. Arcade.....	10th April, 1897
Warren, James, Walkerton, Box 190..... <small>D.L.S., Assoc. Mem. Can. Soc. C.E.</small>	7th Oct., 1864
Watson, John McCormack, Orillia, P.O. Box 224.....	13th April, 1892
*Weatherald, Thomas, Goderich, P.O. Box 273..... <small>D.L.S., C.E.</small>	12th Jan., 1856
West, Robert Francis, Orangeville.....	7th April, 1881
Wheelock, Charles Richard, Orangeville..... <small>Treasurer County of Dufferin.</small>	7th Jan., 1886
Whitson, James Francis, Toronto, Crown Lands Dept.....	9th Jan., 1886
Wicksteed, Henry King, Cobourg..... <small>D.L.S., C.E.</small>	7th Jan., 1886
Wiggins, Thomas Henry, Cornwall..... <small>Grad. S.P.S., D.L.S., Town Engineer.</small>	10th Nov., 1891
Wilde, John Absalom, Sault Ste. Marie.....	9th April, 1889
Wilkie, Edward Thomson, Carleton Place... <small>D.L.S.</small>	11th April, 1891
Williams, David, Kingston..... <small>D.L.S.</small>	9th April, 1864
*Winter, Henry, Thornyhurst..... <small>D.L.S., C.E.</small>	11th July, 1853
*Wood, Henry O., Billings' Bridge..... <small>D.L.S.</small>	10th Oct., 1855
*Yarnold, William Edward, Port Perry, P.O. Box 44..... <small>D.L.S.</small>	7th April, 1854

REGISTERED AND WITHDRAWN.

The names of those who have become "Associates" under By-law No. 39 are marked*.

NAME AND P.O. ADDRESS.	DATE OF ADMISSION BY BOARD.
Apsey, John Fletcher, Cumberland, Queen City Hotel, Md.....	6th Jan., 1886 Grad. S.P.S.
Blake, Frank Lever, Toronto, Meteorological Office	13th April, 1875 D.L.S.
Bowman, Arthur Meyer, Mahan, Beaver Co., Pa.....	11th Nov., 1887 Grad. S.P.S., Staff of U.S. Engineers.
Bowman, Franklin Meyer, Bellevue, Allegheny Co., Pa.....	11th April, 1892 Grad. S.P.S., Engineer Structural Iron Works.
Brady, James, Victoria, B.C., Box 815.....	15th July, 1862 M.E.
Burnet, Hugh, Victoria, B.C.....	5th April, 1887 P.L.S. (B.C.).
Cambie, Henry John, Vancouver, B.C.....	8th July, 1861 P.L.S. (B.C.).
Coleman, Richard Herbert, Toronto, Canada Co. Offices, Imperial Bank Chambers....	6th Oct., 1877
Drewry, William Stewart, Ottawa, Dept. of Interior.....	5th April, 1883 D.L.S.
Edwards, George, Thurso, Que.....	6th Jan., 1866
*Ellis, Henry Disney, Kuching, Sarawak, Borneo	7th April, 1877 D.L.S., Commr. of Pub. Works and Surveys.
Galbraith, John, Toronto, School of Prac. Science.....	13th April, 1875 M.A., D.L.S., Prof. Engineering.
Gibson, George, St. Catharines.....	10th April, 1860 D.L.S.
*Gilmore, Robert, Toronto, 294 Huron st....	11th April, 1856 D.L.S., C.E.

LIST OF MEMBERS.

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NAME AND P.O. ADDRESS.	DATE OF ADMISSION BY BOARD.
Green, Thomas Daniel, Ottawa, Dept. of Indian Affairs.....	7th Jan., 1885 D.L.S.
*Harris, John Walter, Winnipeg, Assm't Com. Dept.....	6th Oct., 1866 P.L.S. (Man.), D.L.S.
Hermon, Ernest Bolton, Vancouver, B.C.....	7th Oct., 1885 P.L.S. (B.C.), D.L.S.
Jephson, Richard Jermy, Calgary, Alta.....	7th April, 1877 P.L.S. (B.C.), D.L.S.
Johnson, Sydney Munnings, Greenwood, B.C.....	9th Nov., 1895 B.A.Sc. (Toronto University), P.L.S. (B.C.)
Kains, Tom, Victoria, B.C.....	11th July, 1873 D.L.S., P.L.S., (B.C.) Surveyor General B.C.
Klotz, Otto Julius, Ottawa, 437 Albert st.....	6th Jan., 1876 C.E. (Mich. University), Dominion Topographical Surveyor.
Lane, Andrew, Sparrow's Point, Md.....	4th April, 1895 Grad. S.P.S., Draftsman Maryland Steel Co.
Lendrum, Robert Watt, South Edmonton, Alta.....	8th Jan., 1874 D.L.S.
Livingstone, Thomas Chisholm, Winnipeg, Man.....	10th Jan., 1859 D.L.S.
MacLeod, Henry Augustus F., Ottawa, 340 Cooper st.....	11th Oct., 1856 C.E., D.L.S.
MacMillan, James Alexander, Calgary, Alta...	6th Jan., 1877 P.L.S. (B.C.)
*McMullen, William Ernest., St. John, N.B. . .	11th Nov., 1892 Asst. Eng. C. P. Ry.
Magrath, Charles Alexander, Lethbridge, Alta. .	1st Nov., 1881 B.A.Sc. (McGill), D.L.S., P.L.S. (B.C.)
Moore, Thos. Alexander, London South....	12th Nov., 1892
Munro, John Vicar, New York, N.Y., 359 West 31st st.....	9th April, 1895
Pearce, William, Calgary, Alta.....	12th Oct., 1872 D.L.S., P.L.S. (B.C.)
Ponton, Archibald William, Ottawa, Dept. of Interior.....	9th April, 1880 D.L.S.
Pope, Robert Tyndall, Ireland.....	13th April, 1875 C.E., D.L.S.

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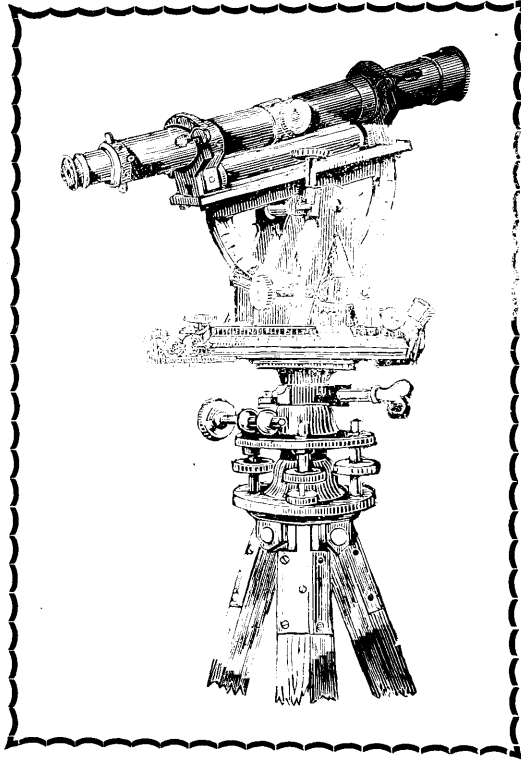
NAME AND P.O. ADDRESS.	DATE OF ADMISSION BY BOARD.
Reid, James Hales, Bowmanville, Box 35 C.E., F.G.S.	6th Oct., 1860
Reid, John Lestock, Prince Albert, Sask. D.L.S.	8th April, 1870
Reiffenstein, James Henry, Ottawa, Dept. of Interior	16th April, 1873 D.L.S.
Reilly, William Robinson, London, 361 Simcoe st.	7th April, 1881 D.L.S., P.L.S. (Man.)
Rogers, Richard Birdsall, Peterborough B.A.Sc. (McGill), D.L.S.	9th Jan., 1879
Ross, Joseph Edmund, New Westminster, B.C.	11th Nov., 1890 P.L.S. (B.C.)
Sanderson, Daniel Leavens, Coral, Mich.	4th Oct., 1882
Shaw, Charles Æneas, Greenwood, B.C. P.L.S. (B.C.)	6th Oct., 1877
Sherman, Ruyter Stinson, Vancouver, B.C. P.L.S. (B.C.)	12th April, 1890
Simpson, George Albert, Winnipeg Man. C.E., D.L.S., M.P.	7th Oct., 1864
Spry, William, Toronto C.E., D.L.S.	19th July, 1858
*Stewart, Louis Beaufort, Toronto, School of Prac. Science Dominion Topographical Surveyor, Lect. in Surveying.	6th April, 1882
Strathern, John, Vancouver, B.C. P.L.S. (B.C.), D.L.S.	5th Oct., 1876
Tracey, Thomas Henry, Vancouver, B.C. P.L.S. (B.C.), C.E., D.L.S.	8th April, 1870
Vicars, John Richard Odum, Kamloops, B.C. D.L.S., P.L.S. (B.C.)	5th Jan., 1887
Weekes, Abel Seneca, Westaskiwin, Alta. D.L.S.	12th April, 1890
Wheeler, Arthur Oliver, New Westminster, B.C.	8th July, 1881 P.L.S. (B.C.), D.L.S.
Willson, Alfred, Toronto, Can. Co. Offices, Imperial Bank Chambers D.L.S., Commissioner Canada Company.	6th Oct., 1866
Wilkins, Frederick William, Ottawa, Dept. of the Interior Dominion Topographical Surveyor.	6th Jan., 1877

LIST OF MEMBERS.

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SUMMARY.

Active members subject to dues.....	210
Active members exempted from dues.....	21
Withdrawn from practice (including Associates).....	52
Dead	21
	<hr/>
Total number enrolled since incorporation.....	304



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